Public Works and Government Services Canada

Requisition Number: _____

MERX I.D. Number: _____

SPECIFICATIONS for:

Pacific Rim National Park
Washroom Buildings

Project No: R.078666.001

March 10, 2016

APPROVED BY:

_____ _____
Regional Manager, AES Date

_____ _____
Construction Safety Coordinator Date

TENDER:

_____ _____
Project Manager Date

SPECIFICATION DIVISION	SECTION		PAGES
INDEX	00 00 10	Table of Contents	6
	00 01 07	Seal and Signature	2
DIVISION 01	01 11 00	Summary of Work	3
GENERAL REQUIREMENTS	01 11 55	General Instructions	9
	01 31 19	Project Meetings	2
	01 32 16.07	Construction Progress Schedule – Bar (GANTT) Chart	4
	01 33 00	Submittal Procedures	4
	01 35 33	Health and Safety Requirements	8
	01 35 43	Environmental Procedures	3
	01 41 00	Regulatory Requirements	1
	01 45 00	Quality Control	3
	01 51 00	Temporary Utilities	2
	01 52 00	Construction Facilities	4
	01 56 00	Temporary Barriers and Enclosures	2
	01 61 00	Common Product Requirements	3
	01 71 00	Examination and Preparation	2
	01 73 00	Execution	2
	01 74 11	Cleaning	2
	01 74 19	Waste Management and Disposal	7
	01 77 00	Closeout Procedures	1
	01 79 00	Demonstration and Training	1
	01 91 13	General Commissioning (Cx) Requirements	8
	01 91 33	Commissioning Forms	2
	01 91 51	Building Management Manual (BMM)	3
DIVISION 02	02 41 16	Structure Demolition	4
EXISTING CONDITIONS	02 82 00.02	Asbestos Abatement Intermediate Precautions	8
	02 83 11	Lead Basepaint (Abatement Intermediate Precautions)	8
DIVISION 03	03 10 00	Concrete Forming and Accessories	4
CONCRETE	03 20 00	Concrete Reinforcing	5
	03 30 00	Cast-in-Place Concrete	6
DIVISION 05 METALS	05 50 00	Metal Fabrications	6
DIVISION 06	06 10 11	Rough Carpentry	6
WOOD, PLASTICS	06 17 53	Shop-Fabricated Wood Trusses	6
&COMPOSITES	06 18 20	Parallel Strand Lumber (PSL)	6
	06 20 00	Finish Carpentry	4
	06 40 00	Architectural Woodwork	9

DIVISION 07	07 11 00	Dampproofing	2
THERMAL & MOISTURE	07 13 52	Modified Bituminous Sheet Waterproofing	6
PROTECTION	07 21 00	Thermal Insulation	2
	07 27 00.01	Air Barriers - Descriptive or Proprietary	5
	07 42 13	Metal Wall Panels	3
	07 46 46	Fiber-cement Vertical Panel System	4
	07 61 13	Standing Seam Sheet Metal Roofing	7
	07 62 00	Sheet Metal Flashing and Trim	4
	07 92 00	Joint Sealants	6
DIVISION 08	08 06 10	Door Schedule	2
OPENINGS	08 11 00	Metal Doors and Frames	6
	08 11 16	Aluminum Doors and Frames	5
	08 44 13	Glazed Aluminum Curtain Walls	8
	08 71 00	Door Hardware	9
	08 80 50	Glazing	4
DIVISION 09	09 06 00	Room Finish Schedule	2
FINISHES	09 21 16	Gypsum Board Assemblies	6
	09 22 16	Non-Structural Metal Framing	5
	09 28 13	Cementitious Backing Board	4
	09 30 13	Ceramic Tiling	8
	09 91 13	Exterior Painting	10
	09 91 23	Interior Painting	13
DIVISION 10	10 14 00	Signage and Wayfinding	10
SPECIALTIES	10 21 13.13	Metal Toilet Compartments	4
	10 28 10	Toilet and Bath Accessories	6
	10 80 00	Miscellaneous Specialties	2
DIVISION 22	22 10 10	Plumbing Pumps	5
PLUMBING	22 11 16	Domestic Water Piping	6
	22 13 17	Drainage, Waste and Vent Piping	3
	22 34 05	Domestic Water Heaters	3
	22 40 00	Plumbing Fixtures	9
	22 42 01	Plumbing Specialties and Accessories	5
DIVISION 23	23 05 00	Common Work Results – Mechanical	13
HEATING, VENTILATING &	23 05 01	Use of Mechanical Systems During Construction	1
AIR CONDITIONING	23 05 05	Installation of Pipework	3
	23 05 13	Common Motor Requirements for Mechanical Equipment	3
	23 05 21	Thermometer & Pressure Gauges – Piping Systems	3
	23 05 29	Hangers & Supports for Piping & Equipment	8
	23 05 48	Vibration & Seismic Controls for Ductwork, Piping & Equipment	5
	23 05 53	Mechanical Identification	5
	23 05 93	Testing, Adjusting and Balancing	5
	23 07 13	Thermal Insulation for Ducting	6

	23 07 19	Thermal Insulation for Piping	8
	23 08 00	Commissioning of Mechanical Systems	3
	23 08 01	Performance Verification Mechanical Piping	2
	23 09 33	Electric and Electronic Control System for Mechanical System	6
	23 31 10	Cleaning of Mechanical Duct Systems	2
	23 31 14	Metal Ducts	8
	23 33 00	Air Duct Accessories	5
	23 33 14	Dampers	3
	23 34 00	HVAC Fans	4
	23 37 13	Diffusers, Grilles & Registers	3
	23 37 20	Louvres and Vents	3
	23 85 00	Electric Heaters	4
	23 90 00	Mechanical Schedules	9
DIVISION 26 ELECTRICAL	26 05 02	Common Work Results – Electrical	6
	26 05 20	Wire and Box Connectors (0-1000V)	1
	26 05 21	Wires and Cables (0-1000V)	3
	26 05 25	Seismic Restraints	2
	26 05 28	Grounding and Bonding	3
	26 05 29	Hangers and Supports for Electrical Systems	2
	26 05 31	Splitters, Junction Boxes, Pull Boxes and Cabinets	2
	26 05 32	Outlet Boxes, Conduit Boxes, Pull Boxes and Fittings	2
	26 05 34	Conduits, Conduit Fastenings and Conduit Fittings	3
	26 05 44	Installation of Cables in Underground Ducts	2
	26 05 45	Direct Buried Underground Ducts	2
	26 05 46	Overhead Service	2
	26 05 47	Underground Service	1
	26 09 25	Lighting Control Devices	5
	26 23 00	Low Voltage Switchgear	1
	26 24 01	Service Equipment	2
	26 24 17	Panelboards Breaker Type	2
	26 27 16	Electrical Cabinets and Enclosures	3
	26 27 26	Wiring Devices	3
	26 28 21	Moulded Case Circuit Breakers	2
	26 29 03	Control Devices	8
	26 41 00.02	Secondary Lightning Arresters	1
	26 50 00	Lighting	4
	26 60 00	Electric Heating & Ventilation Equipment & Controls	3
	26 95 00	Connection to Mechanical Equipment	2
	Appendix ‘A’	Connection to Mechanical Equipment	2
DIVISION 31 EARTHWORK	31 05 16	Aggregate Material	5
	31 23 10	Excavating, Trenching and Backfilling	8
	31 23 13	Rough Grading	3
	31 23 17	Rock Removal	3
	31 24 13	Roadway Embankments	4

DIVISION 32	32 11 19	Granular Sub-Base	3
EXTERIOR IMPROVEMENTS	32 11 23	Aggregate Base Course	3
	32 12 16	Asphalt Paving	13
	32 16 15	Concrete Walks, Curbs and Gutters	5
	32 32 13	Packaged Sewage Lift Station	8
DIVISION 33	33 05 13	Manholes and Catch Basin Structures	5
UTILITIES	33 11 16	Site Water Utility Distribution Piping	24
	33 31 13	Public Sanitary Utility Sewerage Piping	13
	33 34 00	Sanitary Utility Sewerage Force Mains	14
	33 36 00	Sanitary Sewage Tank	3
	33 41 00	Storm Utility Drainage Piping	11
	33 46 16	Subdrainage Piping	3

APPENDICES:

APPENDIX 1	Hazardous Building Materials Assessment	419
APPENDIX 2	Geotechnical Investigation	119
APPENDIX 3	Site Photos	13
APPENDIX 4	Interior Finish Material & Colour Schedule	4
APPENDIX 5	Extra Parts, Material & Equipment List	3

DRAWING LIST

ARCHITECTURAL

A-00	COVER SHEET
A-0.1	WALL TYPE, LEGEND & NOTES
A-1.1	GREEN POINT #1 & #4 COVER SHEET
A-1.2	GREEN POINT #1 EXISTING/DEMOLITION SITE PLAN, PROPOSED SITE PLAN, & SECTIONS
A-1.3	GREEN POINT #4 EXISTING/DEMOLITION SITE PLAN, PROPOSED SITE PLAN, & SECTIONS
A-1.4	GREEN POINT #1 & #4 TYPICAL FLOOR PLAN, REFLECTED CEILING PLAN, ROOF PLAN & FLOOR TILE PATTERN PLAN
A-1.5	GREEN POINT #1 & #4YPICAL BUILDING ELEVATIONS
A-1.6	GREEN POINT #1 & #4 RAFT FOUNDATION PLAN & SLAB EDGE PLAN
A-2.1	INCINERATOR ROCK COVER SHEET
A-2.2	INCINERATOR ROCK EXISTING/DEMOLITION SITE PLAN, PROPOSED SITE PLAN, & SECTIONS
A-2.3	INCINERATOR ROCK FLOOR PLAN & REFLECTED CEILING PLAN
A-2.4	INCINERATOR ROCK ROOF PLAN & FLOOR TILE PATTERN PLAN
A-2.5	INCINERATOR ROCK BUILDING ELEVATIONS
A-2.6	INCINERATOR ROCK SLAB EDGE PLAN
A-3.1	WICKANINNISH BEACH COVER SHEET
A-3.2	WICKANINNISH BEACH EXISTING/DEMOLITION SITE PLAN, PROPOSED SITE PLAN, & SECTIONS
A-3.3	WICKANINNISH BEACH FLOOR PLAN, REFLECTED CEILING PLAN, ROOF PLAN & FLOOR TILE PATTERN PLAN
A-3.4	WICKANINNISH BEACH BUILDING ELEVATIONS
A-3.5	WICKANINNISH BEACH SLAB EDGE PLAN
A-4.1	LONG BEACH NORTH & SOUTH COVER SHEET
A-4.2	LONG BEACH NORTH EXISTING/DEMOLITION SITE PLAN, PROPOSED SITE PLAN, & SECTIONS
A-4.3	LONG BEACH SOUTH EXISTING/DEMOLITION SITE PLAN, PROPOSED SITE PLAN, & SECTIONS
A-4.4	LONG BEACH NORTH & SOUTH TYPICAL FLOOR PLAN, REFLECTED CEILING PLAN, ROOF PLAN & FLOOR TILE PATTERN PLAN
A-4.5	LONG BEACH NORTH & SOUTH BUILDING ELEVATIONS

A-4.6 LONG BEACH NORTH & SOUTH SLAB EDGE PLAN
A-5.1 TYPICAL BUILDING PLAN & SECTION DETAILS
A-5.2 TYPICAL BUILDING PLAN & SECTION DETAILS
A-5.3 TYPICAL BUILDING SECTION DETAILS
A-5.4 TYPICAL BUILDING SECTION DETAILS
A-5.5 TYPICAL CHANGE CUBICLE DETAILS
A-6.0 INTERIOR ELEVATIONS
A-7.0 SECTION DETAILS

STRUCTURAL
S101 GENERAL NOTES
S102 GENERAL NOTES & TYPICAL DETAILS
S201 INCINERATOR ROCK FOUNDATION & GROUND FLOOR PLAN AND SECTIONS
S202 INCINERATOR ROCK ROOF PLAN AND SECTIONS
S301 LONG BEACH NORTH FOUNDATION & GROUND FLOOR PLAN AND SECTIONS
S302 LONG BEACH NORTH ROOF PLAN AND SECTIONS
S401 LONG BEACH SOUTH FOUNDATION & GROUND FLOOR PLAN AND SECTIONS
S402 LONG BEACH SOUTH ROOF PLAN AND SECTIONS
S501 WICKANINNISH BEACH FOUNDATION & GROUND FLOOR PLAN AND SECTIONS
S502 WICKANINNISH BEACH ROOF PLAN AND SECTIONS
S601 GREEN POINT NO. 1 FOUNDATION & GROUND FLOOR PLAN AND SECTIONS
S602 GREEN POINT NO. 1 ROOF PLAN AND SECTIONS
S701 GREEN POINT NO. 4 FOUNDATION & GROUND FLOOR PLAN AND SECTIONS
S702 GREEN POINT NO. 4 ROOF PLAN AND SECTIONS

MECHANICAL
M-0 MECHANICAL AND PLUMBING LEGENDS
M-1 TYPE ‘A’ & TYPE ‘A-1’ FLOOR PLANS – MECHANICAL
M-2 GREENPOINT #1 & #4 TYPE ‘B’ FLOOR PLANS & CRAWLSPACE PLANS – MECHANICAL

PLUMBING
P-1 INCINERATOR ROCK – UNDERGROUND & PLUMBING
P-2 LONG BEACH NORTH – UNDERGROUND & PLUMBING
P-3 LONG BEACH SOUTH – UNDERGROUND & PLUMBING
P-4 WICKANINNISH BEACH – UNDERGROUND & PLUMBING
P-5 GREENPOINT #1 – UNDERGROUND & PLUMBING
P-6 GREENPOINT 4 – UNDERGROUND & PLUMBING

ELECTRICAL
E-01 INCINERATOR ROCK - SITE PLAN, SINGLE LINE DIAGRAM & PANELBOARD SCHEDULE
E-02 INCINERATOR ROCK - LIGHTING & POWER PLANS
E-03 INCINERATOR ROCK - LIGHTING/FAN CONTROL PANEL SCHEMATIC DIAGRAM
E-04 LONG BEACH NORTH & SOUTH - SITE PLAN, SINGLE LINE DIAGRAMS & PANELBOARD SCHEDULES
E-05 LONG BEACH NORTH - LIGHTING & POWER PLANS
E-06 LONG BEACH SOUTH - LIGHTING & POWER PLANS
E-07 LONG BEACH NORTH & SOUTH - LIGHTING/FAN CONTROL PANEL SCHEMATIC DIAGRAM (TYPICAL)
E-08 WICKANINNISH BEACH - SITE PLAN & SINGLE LINE DIAGRAM
E-09 WICKANINNISH BEACH - LIGHTING & POWER PLANS
E-10 WICKANINNISH BEACH - LIGHTING/FAN CONTROL PANEL SCHEMATIC DIAGRAM& PANELBOARD SCHEDULES
E-11 WICKANINNISH BEACH – SEWAGE LIFT STATION KIOSK LAYOUT & DETAIL
E-12 WICKANINNISH BEACH – SEWAGE LIFT STATION SCHEMATIC DIAGRAM
E-13 WICKANINNISH BEACH – SEWAGE LIFT STATION SCHEMATIC DIAGRAM

E-14 WICKANINNISH BEACH – SEWAGE LIFT STATION CONTROL PANEL LAYOUT
E-15 GREEN POINT #1 – SITE PLAN, SINGLE LINE DIAGRAM & PANELBOARD SCHEDULE
E-16 GREEN POINT #1 – LIGHTING & POWER PLANS
E-17 GREEN POINT #1 – LIGHTING/FAN CONTROL PANEL SCHEMATIC DIAGRAM
E-18 GREEN POINT #4 – SITE PLAN, SINGLE LINE DIAGRAM & PANELBOARD SCHEDULE
E-19 GREEN POINT #4 – LIGHTING & POWER PLANS
E-20 GREEN POINT #4 – LIGHTING/FAN CONTROL PANEL SCHEMATIC DIAGRAM

CIVIL

C01 GRADING & SERVICING PLAN INCINERATOR ROCK WASHROOM BUILDING
C02 GRADING & SERVICING PLAN LONG BEACH – NORTH WASHROOM BUILDING
C03 GRADING & SERVCING PLAN LONG BEACH – SOUTH WASHROOM BUILDING & PUMP STATION STORAGE TANK
C04 GRADING & SERVICES PLAN WICKANINNISH BEACH WSHROOM BUILDING
C05 GRADING & SERVICES PLAN GREEN POINT #1 WASHROOM BUILDING
C06 GRADING & SERVICES PLAN GREEN POINT #4 WASHROOM BUILDING

REFERENCE DRAWINGS

LONG BEACH

A-1	PR 92-R2	FLOOR PLAN, SCHEDULES, PLUMBING LAYOUTS AND DETAILS
S-1	PR_92_R2	STRUCTURAL LAYOUT AND DETAILS
1	PR_95_R1	VAULT (HOLDING TANK) & FOUNDATION PLAN FLOOR SLAB PLAN LONGITUDINAL VAULT & SLAB SECTION CONSTRUCTION DETAILS
2	PR_95_R1	FLOOR PLAN & ELECTRICAL LAYOUT FLOOR PLAN DRAINAGE FLOOR PLAN WATER SUPPLY BUILDING ELEVATIONS BUILDING SECTION CONSTRUCTION DETAILS PLUMBING & ELECTRICAL SPEC NOTES

WICKANINNISH BEACH

1	NW_PR_75/R21	SITE PLAN – TOILET/CHANGE BUILDING
2	NW_PR_75/R21	FLOOR PLAN, FOUNDATION PLAN, ELEVATIONS & DETAILS
3	NW_PR_75/R21	SECTIONS & DETAILS
4	NW_PR_75/R21	ELECTRICAL & MECHANICAL
5A	NW_PR_75/R21	CORRECTIVE DETAILS, TELEPHONE ALCOVE WALL

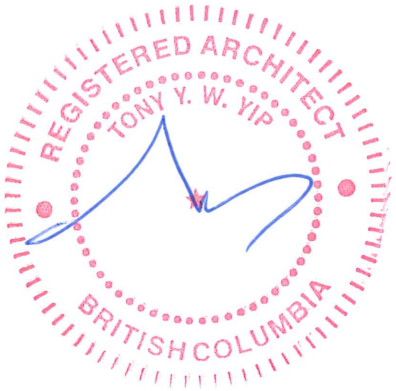
GREEN POINT

1	NW_PR75/R20	KEY PLAN & #1 SITE PLAN, MECHANICAL DETAILS
1R	NW_PR75/R20	KEY PLAN & #1 SITE PLAN, MECHANICAL DETAILS
2	NW_PR75/R20	#2 & #3 SITE PLANS, MECHANICAL DETAILS
3	NW_PR75/R20	PLANS & DETAILS ALTERNATE A – MECHANICAL DETAILS
5	NW_PR75/R20	PLUMBING LAYOUT

CONSULTANTS – SEAL & SIGNATURE

Discipline **Seal/Signature/Date**

Architectural
Chernoff Thompson Architects



Structural Consultant
CWMM Consulting Engineers Ltd.

Mechanical Consultant
JM Bean & Co Ltd.

CONSULTANTS – SEAL & SIGNATURE

Discipline	**Seal/Signature/Date**
Electrical Consultant Watanabe Engineering Ltd.	PROFESSIONAL ENGINEER T. T. WATANABE # 16312 PROVINCE OF BRITISH COLUMBIA Mar 01, 2017
Civil Consultant ISL Engineering	PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA S. J. VERKAIK # 31808 MARCH 2, 2017

END OF SECTION 00 01 07

1.0 RELATED SECTIONS

.1 General Instructions Section 01 11 55

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the demolition of existing and construction of new of the following:

.1 Two (2) washroom/shower buildings at Pacific Rim Green Point Campground, 2039 Pacific Rim Highway, Ucluelet, B.C. Work is comprised of tasks listed in Section 01 11 55 item 1.2.1.

.2 One (1) washroom/change room building at Incinerator Rock

.3 One (1) washroom/change room building at Wickaninnish Beach

.4 Two (2) washroom/change room buildings at Long Beach North and South Location

1.2 CONTRACT METHOD

1 Construct work under lump sum contract.

1.3 WORK BY OTHERS

.1 Co-operate with other Contractors on site in carrying out their respective works and carry out instructions from the Departmental Representative.

.2 Coordinate work with that of other Contractors. If any part of the work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of work.

1.4 WORK SEQUENCE

.1 Demolition and Construction of all buildings are to be carried out in 2 consecutive years (2017 and 2018) in the following sequence:

.1 Phase 1 (September 2017 to March 2018) : Demolition of existing and Construction of new washrooms at Incinerator Rock, Wickaninnish Beach and Long Beach North.

.2 Phase 2 (September 2018 to March 2019) : Demolition of existing and Construction of new washrooms at Green Point Campgroud and Long Beach South.

Exact construction period of each phase to be referred to Section 01 11 55 General Instructions Clause 1.4.

.2 Do not close off usage of roadways, walkways and access to other buildings until alternate usage has been provided.

.3 Maintain fire truck and maintenance truck access along the campground ring road throughout the construction period.

1.5 CONTRACTOR USE OF PREMISES

.1 Co-ordinate use of premises under direction of Departmental Representative.

.2 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.3 At completion of operations the condition of existing work which is specified to remain must be equal to or better than that which existed before new work started.

.4 Obtain and pay for use of additional storage or work areas needed for work under this contract.

.5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

1.6 OWNER OCCUPANCY

.1 During the entire construction period, the owner will occupy adjacent areas for execution of normal operations.

.2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Owner usage of adjacent areas. In the event of a conflict the contractor will accommodate changes to their operations to minimize interference with owner operations.

1.7 OWNER AND CONTRACTOR RESPONSIBILITIES

.1 Owner Responsibilities:

.1 Arrange for delivery of up-to-date utility location information, safety requirements, and any site specific work policies.

.2 Contractor Responsibilities:

.1 Designate Submittals and delivery date for major building components and equipment in progress schedule.

.2 Review all submittals and contract requirements. As soon as it becomes apparent, submit to Departmental Representative written and verbal notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.

.3 Provide any installation inspections required by public authorities.

.4 Receive and unload products and equipment at site.

.5 Review deliveries jointly with Departmental Representative, record shortages, and damaged or defective items.

.6 Handle product at site, including uncrating and storage.

.7 Protect product from damage.

.8 Repair or replace items damaged by Contractor or subcontractor on site (under their control).

1.8 EXISTING SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission. Where work involves breaking into or connecting to existing services, contractor shall submit a request to the Departmental Representative a minimum of 48 hours prior to the event. The contractor will not proceed until approval has been granted. The PWGSC Departmental Representative will make all reasonable efforts to accommodate the request; however PWGSC will not accept delay charges should the request not be accepted.

.2 Minimize duration of interruptions, and where required, provide temporary services to maintain critical systems.

.3 Provide alternative routes for personnel and vehicular traffic.

.4 Establish location and extent of service lines in area of work before starting work. Notify Departmental Representative of findings.

.5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including water, sewer, power and communication services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services, when directed by Departmental Representative to maintain critical systems.

.7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in a manner approved by authorities having jurisdiction.

.9 Record locations of maintained, re-routed and abandoned service lines.

.10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.9 ARCHEOLOGICAL MONITORING

.1 Contractor is responsible to engage an Archeologist to monitor the construction activities during ground disturbance stage of the construction based on the recommendation in the Archeological Monitoring report in Appendix 6.

END OF SECTION 01 11 00

1.0 GENERAL

1.1 CODES

.1 Perform work in accordance with National Building Code for Canada 2010, Workers' Compensation Board of BC, and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Meet or exceed requirements of specified standards, codes and referenced documents.

1.2 DESCRIPTION OF WORK

.1 Work under this Contract comprises, but is not limited to, the provision of all labour, materials, services and equipment necessary for the demolition and construction of the following:

.1 Two (2) washroom/shower buildings at Pacific Rim Green Point Campground, 2039 Pacific Rim Highway, Ucluelet, B.C. Work is comprised of tasks listed in Section 01 11 55 item 1.2.1 as fully described in the Tender Documents.

.2 One (1) washroom/change room building at Incinerator Rock

.3 One (1) washroom/change room building at Wickaninnish Beach

.4 Two (2) washroom/change room buildings at Long Beach North and South Location

1.3 CONTRACT DOCUMENTS

.1 The Contract documents, drawings and specifications are intended to complement each other.

.2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

1.4 TIME OF COMPLETION

.1 For Phase 1 Washrooms, no work on site can begin until October 10, 2017. Stock pile of material after Labour Day, September 4, 2017, is acceptable. Complete the project before Mar 31, 2018

.2. For Phase 2 Washrooms, no work on site can begin until October 9, 2018. Stock pile of material after Labour Day, September 3, 2018, is acceptable. Complete the project before Mar 31, 2019

1.5 HOURS OF WORK

.1 Hours of work:

.1 There is no restriction on hours of work.

1.6 WORK SCHEDULE

.1 Carry out work as follows:

.1 Within 10 working days after Contract award, submit Bar (GANTT) chart as per specification sections 01 32 16.07 Construction Progress Schedule Bar (GANTT) chart. Indicate the following:

.1 Submission of shop drawings, product data, MSDS sheets and samples.

.2 Commencement and completion of work of each section of the specifications or trades for each phase as outlined.

.3 Final completion date within the time period required by the Contract documents.

.2 Do not change approved Schedule without notifying Departmental Representative.

.3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

1.7 DIVISION OF SPECIFICATIONS

.1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.

.2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.

.3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.8 CODE, BYLAWS, STANDARDS

.1 Perform work in accordance with the National Building Code of Canada (NBC) 2010, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application.

.2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.

.3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

.4 In any case of conflict or discrepancy, the most stringent requirements shall apply.

1.9 DOCUMENTS REQUIRED

.1 Maintain one copy each of the following at the job site:
- .1 Contract drawings.
- .2 Contract specifications.
- .3 Addenda to Contract documents.
- .4 Copy of work schedule.
- .5 Reviewed shop drawings.
- .6 Change orders.
- .7 Other modifications to Contract.
- .8 Field test reports.
- .9 Reviewed samples.
- .10 Manufacturer’s installation and application instructions.
- .11 One set of record drawings and specifications for “as-built” purposes.
- .12 National Building Code of Canada 2010.
- .13 Current construction standards of workmanship listed in technical Sections.
- .14 Building Safety Plan.
- .15 Building Permit
- .16 Request for Information (RFI)
- .17 Contemplated Change Notices
- .18 WHMIS Documents
- .19 Site Instructions
- .20 Contractor’s Health and Safety Plan, including map to nearest hospital.

1.10 REGULATORY REQUIREMENTS

.1 Building Permit

- .1 Building permit is not required for this project. Obtain other trades permits required by regulatory municipal and provincial authorities to complete the work.

.2 Provide inspection authorities with plans and information required for issue of acceptance certificates.

.3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

.4 Comply with conditions as stated in Standard Acquisition Clauses and Conditions (SACC) Manual.

1.11 CONTRACTOR'S USE OF SITE

.1 Use of site:

.1 Exclusive and complete for execution of work.

.2 Assume responsibility for assigned premises for performance of this work.

.3 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Departmental Representative.

.4 Provide security of Contractor's work site and all Contractors and Subcontractor's equipment and material. Secure Contractor's work site at the end of each work day.

.5 Perform work in accordance with the Contract documents. Ensure work is carried out in accordance with indicated phasing.

.6 Do not unreasonably encumber site with material or equipment

.7 Any area of the Green Point Campground property to which access is restricted by sign is a secured or restricted area and shall not be entered.

.8 Do not obstruct access to PWGSC property outside of the Contractor's work site. Maintain overhead clearances, keep roadways and walkways clear, and maintain routes for emergency response vehicles.

.2 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with approved schedules.

.3 Do not unreasonably encumber site with material or equipment.

.4 Coordinate with Departmental Representative for material storage on site which belongs to the project but waiting to be installed.

1.12 EXAMINATION

.1 Examine site and be familiar and conversant with existing conditions likely to affect work.

1.13 EXISTING SERVICES

.1 Where Work involves breaking into or connecting to existing services, carry out work as directed by Departmental Representative or the authority having jurisdiction.

.2 Record locations of maintained, re-routed and abandoned service lines.

.3 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.14 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space, and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative at least 48 hours prior to impending installation and obtain approval for actual location.

.4 Submit field drawings or shop drawings to indicate the relative position of various services and equipment when required by the Departmental Representative and/or as specified.

1.15 CUTTING AND PATCHING

.1 Cut existing surfaces as required to accommodate new work.

.2 Remove items so shown or specified.

.3 Do not cut, bore, or sleeve load-bearing members.

.4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.5 Fit work airtight to pipes, sleeves, ducts and conduits.

.6 Conceal pipes, ducts and wiring in raised floors, wall and ceiling construction of finished areas except where indicated otherwise.

.7 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.

.8 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.

1.16 SETTING OUT OF WORK

1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.2 Provide devices needed to lay out and construct work.

.3 Supply such devices as templates required to facilitate Departmental Representative's inspection of work.

1.17 ACCEPTANCE OF SUBTRADES

1 Each trade shall examine surfaces prepared by others and job conditions which may affect his work, and shall report defects to the General Contractor. Commencement of work shall imply acceptance of prepared work or substrate surfaces.

1.18 QUALITY OF WORK

.1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.

.2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2010 and Construction Standards as specified herein.

.3 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

1.19 WORKS COORDINATION

.1 Coordinate work of sub-trades:

.1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.

.2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
- .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.
- .2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
  - .1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.
  - .2 Identify on coordination drawings, building elements, services lines, rough-in points and indicate location services entrance to site.
- .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
- .4 Publish minutes of each meeting.
- .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
- .6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.

.3 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.

.4 Work cooperation:
- .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
- .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.
- .3 Ensure disputes between subcontractors are resolved.
- .4 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
- .5 Maintain efficient and continuous supervision.

1.20 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 In accordance with Section 01 33 00, submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.

.2 Allow sufficient time for the following:
- .1 Review of product data.
- .2 Approval of shop drawings.
- .3 Review of re-submission.
- .4 Ordering of approved material and/or products. Refer to individual technical sections of specifications.

1.21 PROJECT MEETINGS

.1 Contractor will arrange project site meetings and assume responsibility for setting times and recording and distributing minutes.

1.22 TESTING AND INSPECTION

.1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative are specified in Sections 01 45 00.

.2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
.2 Inspection and testing performed exclusively for Contractor's convenience.
.3 Testing, adjustment and balancing of mechanical and electrical equipment and systems.
.1 Mill tests and certificates of compliance.
.2 Tests specified in the contract documents to be carried out by Contractor which may be under the Departmental Representative's supervision.

.3 Within 15 working days after Contract award provide a list of proposed testing services or testing laboratories for Departmental Representative's approval.

.4 The Departmental Representative may require, and pay for, additional inspection and testing services not included in paragraph 1.22.2.

.5 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.

.6 Contractor shall furnish labour and facilities to carry out specified testing and notify Departmental Representative in advance of planned testing.

.7 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.8 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.

.9 Provide Departmental Representative with 2 copies of testing laboratory reports as soon as they are available.

1.23 SURVEYING

.1 All construction layout and final accurate construction records shall be the responsibility of the contractor and shall be set by a licensed land surveyor in the Province of British Columbia.

.2 Contractor to submit name of licensed land surveyor to PWGSC during first project meeting (startup meeting).

1.24 AS-BUILT DOCUMENTS

.1 The Departmental Representative will provide 8 sets of drawings and 4 sets of specifications and PDF files, including 2 sets of drawings and specification and original AutoCAD files for "as-built" purposes.

.2 Keep one set of current white prints of all contract drawings and all addenda, revisions, clarifications, change orders, and reviewed shop drawings in the site office; and have them available at all times for inspection by the Consultant.

.3 As the work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.

.4 Provide accurate as-built drawings by a qualified professional surveyor identifying the various elements shown on the drawings in the requested format. As-built survey is to be provided in UTM/Geodetic coordinates compatible with NAD83.

.5 At completion of the Work, transfer all deviations, including those called up by addenda, revisions, clarifications, shop drawings and change order, to a set of Issued for Construction drawings. Submit the 'red-marked' as-built set to the Departmental Representative in hard copy with contractor's review stamp and date confirming that the set submitted are a true record of "as-built" information.

.6 Refer to Section 01 78 00 – Close-out Submittals.

1.25 CLEANING

.1 Refer to Section 01 74 11 - Cleaning.

1.26 DUST CONTROL

.1 Provide temporary dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.

.2 Maintain and relocate protection until such work is complete.

1.27 ENVIRONMENTAL PROTECTION

.1 Prevent extraneous materials from contaminating air beyond construction area, by providing temporary enclosures during work.

.2 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers.

.3 Ensure proper disposal procedures in accordance with all applicable territorial regulations.

1.28 MAINTENANCE MATERIALS, SPECIAL TOOLS AND SPARE PARTS

.1 Specific requirements for maintenance materials, tools and spare parts are specified in individual technical sections of specifications.

.2 Also refer to Appendix for complete list of spare parts, fixtures, and equipment required for this project.

1.29 ADDITIONAL DRAWINGS

.1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with drawings referred to in the Contract Documents.

.2 Departmental Representative will furnish up to a maximum of eight (8) sets of Contract drawings and four (4) sets of specification for use by the Contractor at no additional cost. PDF files of all documents will be provided. Should more documents be required, the Departmental Representative will provide them at additional cost.

1.30 BUILDING SMOKING ENVIRONMENT

.1 Smoking within the building and within 7.5m of all air intakes is not permitted.

1.31 SYSTEM OF MEASUREMENT

.1 The metric system of measurement (SI) will be employed on this Contract.

1.32 FAMILIARIZATION WITH SITE

.1 Before submitting tender, visit site as indicated in tender documents and become familiar with all conditions likely to affect the cost of the work.

1.33 SUBMISSION OF TENDER

.1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

1.34 COST BREAKDOWN

.1 Before submitting the first progress claim, submit a breakdown of the Contract price in detail as directed by the Departmental Representative and aggregating Contract price. After approval, the cost breakdown will form the basis of progress payments.

.2 Within 2 weeks after award of contract, provide a monthly cash flow projection for the whole contract period in detail as directed by Departmental Representative. Contractor should provide a monthly update of the cash flow projection according to the actual work schedule.

1.35 RELICS & ANTIQUITIES

.1 Relics and antiquities and items of historical or scientific interest shall remain property of Department. Protect such articles and request directives from Departmental Representative.

.2 Give immediate notice to Departmental Representative if evidence of archaeological finds are encountered during excavation/construction, and await Departmental Representative's written instructions before proceeding with work in this area.

.3 Departmental Representative may assign a qualified archaeologist to monitor the site during ground disturbing activities.

1.36 TREE REMOVAL

.1 The project requires an experienced tree services company with fallers and buckers that are certified in the province of British Columbia. All trees to be felled, limbed, bucked, branches chipped and all materials transported in preparation for the construction of new washroom facilities. All felled trees will have branches chipped. Tree trunks and large limbs are to be bucked into suitable lengths for transport to a designated site on Ocean terrace road off the Wickaninnish Road. Prior to unloading the designated site must have filter cloth put down. Tree stumps must be removed from the construction site. No timber mark is required.

.2 The contractor must perform work in accordance to all of the BC's Occupational Health and Safety Regulations as they pertain to workplace safety with specific regulations regarding falling, bucking, and tree climbing.

1.37 BUSINESS LICENSES FOR CONSTRUCTION PROJECTS

1. Contractor and all subcontractors are required to obtain a license from Parks Canada. Cost of license is approximately $58.80 subject to minor annual adjustment.

1.38 ARCHAEOLOGICAL MONITORING

1. Contractor is responsible to engage an Archaeologist to monitor the construction activities during all ground disturbance stage(s) of the construction based on the recommendation in the Archaeological assessment Report in Appendix 6. The said Archaeologist will need to provide appropriate written reports to Departmental Representative during and after completion of all the ground disturbance stage(s)..

1.39 STOCKPILE MATERIAL

1. The area that can be utilized to stockpile material from September to October in each phase will be a portion of the parking lot adjacent to the kiosk. Size of stockpile will be limited to a certain

area or some existing regular parking stalls as designated by Departmental Representative. The contractor must inform Departmental Representative of the area required for the stockpile area so as to ensure campers or visitors access is maintained. Departmental Representative will make the final decision if the contractor's proposed stock pile area is acceptable or not.

END OF SECTION 01 11 55

1.0 GENERAL

1.1 ADMINISTRATIVE

.1 Schedule and administer site meetings throughout the progress of the work on a regular basis or at the call of Departmental Representative.

.2 Prepare and distribute agenda at least three (3) days prior to the meetings.

.3 Distribute written notice of each meeting seven (7) days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within five (5) days after meetings and transmit to meeting participants and affected parties not in attendance, Departmental Representative and Consultants.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRE-CONSTRUCTION MEETING

.1 Within 15 days after award of Contract: Departmental Representative will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Attendance will include, but is not limited to, the Departmental Representative, members of Parks Canada representatives.

.3 Departmental Representative to establish time and location of preconstruction meeting, Contractor to notify parties concerned a minimum of 4 working days before meeting.

.4 Departmental Representative will chair the meeting, record minutes and issue minutes.

.5 Agenda to include:

- .1 Introduction of official representative of participants in the Work.
- .2 Start date on site.
- .3 Communication Protocol for submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 - Temporary Facilities.
- .5 Site safety in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .6 Communication Protocol for proposed changes, change orders, procedures, approvals required.
- .7 Owner's Work.
- .8 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.11 Monthly progress claims, administrative procedures, photographs, hold backs.
.12 Appointment of inspection and testing agencies or firms.

1.3 PROGRESS MEETINGS

.1 During course of Work and two weeks prior to Project Completion, schedule progress meetings bi-weekly.

.2 Attendance to include but is not limited to Departmental Representative, Parks Canada Representatives, Contractor, and major subcontractors.

.3 Contractor responsible to record minutes of meetings and circulate to attending parties and affected parties not in attendance within five (5) days after meeting.

.4 Record next meeting dates in the meeting minutes or notify parties minimum of seven (7) days in advance for other ad-hoc meetings.

.5 Agenda to include, at a minimum, the following:
.1 Review, approval of minutes of previous meeting.
.2 Review of Health and Safety including any incidents, near misses, and WorkSafe BC visits.
.3 Review of Work progress since previous meeting.
.4 Coordination discussions with Parks Canada.
.5 Construction schedule review.
.6 Review of off-site fabrication delivery schedules.
.7 Corrective measures and procedures to regain projected schedule.
.8 Request for Information (RFI) log review.
.9 Engineering Disciplines Reviews.
.1 Architectural
.2 Structural
.3 Mechanical
.4 Electrical
.5 Civil
.10 Change order log review.
.11 Review submittal schedule.
.12 Review updated as built.
.13 Review and resolve site issues.
.14 New business.

END OF SECTION 01 31 19

1.0 GENERAL

1.1 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

.5 Clearly show sequence and interdependence of construction activities and indicate:

1 Start and completion of all items of Work, their major components and interim milestones completion dates.

.2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:

.1 Time for submittals, re-submittal and review.

.2 Time for fabrication and delivery of manufactured products for Work.

.3 Interdependence of procurement and construction activities.

.3 Include sufficient detail for project activities to assure adequate planning and execution of work. Activities should generally range in duration from 3 to 15 days each.

.4 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated to allow coordination and control of project activities. Show continuous flow from left to right.

.5 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being whenever possible, continuous series of activities throughout length of project to form critical path.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to Departmental Representative within 28 working days after Award of Contract Project schedule in form of Bar (GANTT) Chart for planning, monitoring and reporting of project progress.

1.4 REVIEW OF THE SCHEDULE

.1 Allow 10 working days for Departmental Representative to review proposed schedule. Make necessary changes to proposed schedule within 5 days.

.2 Submit letter ensuring the schedule has been prepared in coordination with major subcontractors and suppliers.

.3 Promptly provide additional information to validate practicability of schedule as required by Departmental Representative.

.4 Submittal of Schedule indicates that it meets Contract Requirements and will be executed generally in sequence.

1.5 COMPLIANCE WITH SCHEDULE

.1 Comply with reviewed schedule.

.2 Proceed with significant changes and deviations from schedule sequence of activities which cause delay only after review by Departmental Representative.

.3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.

.1 Corrective measures may include:

.1 An increase of personnel on the site for effective activities or work packages.

.2 An increase in materials and equipment.

.3 Additional work shifts, longer hours.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule that shows milestone and activity types and expand from the following items:

.1 Award.

.2 Shop Drawings, Samples and Approvals.

.3 Permits.

.4 Mobilization.

.5 Mock-ups and Approvals.

.6 Procurement.

.7 Construction.

.8 Installation.
.9 Site Works.
.10 Training.

1.7 PROJECT SCHEDULE REPORTING

.1 On an ongoing basis, schedule on job site must show “progress to date”. Arrange participation on and off site of subcontractor and suppliers, as and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.

.2 Maintain a daily log of progress of the work:
  .1 Submit daily force report to Departmental Representative daily prior to noon the following day indicating:
    .1 Total number of personnel on site.
    .2 Major subcontractors on site listed by trade.
    .3 Major equipment on site, i.e. excavators, cranes, drills.
    .4 Concrete volumes.
    .5 Visitors to site.
    .6 Weather
    .7 Documents required from Departmental Representative to Contractor to maintain.

.3 Perform schedule update monthly dated on last working day of the month. Update to reflect activities completed to date, activities in progress, logic and duration changes.

.4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.

.5 Requirements for monthly progress monitoring and reporting are basis for progress payment request.

.6 Submit monthly schedule updates with the progress payment request.

.7 Submit monthly written reports based on schedule, showing Work to Date performed, comparing work progress planned and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work Schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
  .1 Description of progress made.
  .2 Pending items and status of: Permits, shop drawings, samples, mockups, deliveries, change orders, possible time extension.
  .3 Status of Contract Completion Date and Milestones.
  .4 Current and Anticipated problem areas, potential delays and corrective measures.

.8 Submit weekly 3 week look ahead schedule to Departmental Representative on each Friday of the Week indicating the planned tasks of the next three week period.

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

END OF SECTION 01 32 16.07

1.0 GENERAL

1.1 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.10 Keep one reviewed copy of each submission on site.

.11 Do not proceed with work until relevant submissions are reviewed by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 When specified in the Contract document, submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia of Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 10 days for Departmental Representative's review of each submission, unless noted otherwise.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental

Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification sections and as Departmental Representative may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
- .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of Construction and Contract Documents.
- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

.22 Shop drawings format larger than 11” x17” (275mm x 430mm) must be submitted with hardcopies together with electronic format. Submit sufficient copies such that Departmental Representative will keep 5 copies plus contractor’s distribution and maintenance manual.

.23 Electronic submissions will only be reviewed and returned electronically. No hardcopies will be returned to contractor.

.24 All electronic submissions to be uploaded to Document Control System FTP site hosted by

PWGSC.

1.3 SAMPLES

.1 Submit for review samples in duplicate as required in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will be kept onsite and will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.5 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement and as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Viewpoints and their locations as reasonably determined by Departmental Representative.

.4 Provide photographic documentation of adjacent existing conditions prior to commencement of construction for determining and accidental damage as a result of contractor’s work.

.5 Frequency of photographic documentation: monthly as directed by Departmental Representative.

.1 Upon completion of: demolition, framing and services before concealment of Work, and as directed by Departmental Representative.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Submit electronic copies of test results and inspection reports required as noted in each section of specifications.

END OF SECTION 01 33 00

1.0 GENERAL

1.1 REFERENCES

.1 Government of Canada.
- .1 Canada Labour Code - Part II
- .2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):
- .1 Part 8, Safety Measures at Construction and Demolition Sites.

.3 The Canadian Electric Code (as amended)

.4 Canadian Standards Association (CSA) as amended:
- .1 CSA Z797-2009 Code of Practice for Access Scaffold
- .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
- .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures
- .4 CSA Z1006-10 Management of Work in Confined Spaces.
- .5 CSA Z462- Workplace Electrical Safety Standard

.5 National Fire Code of Canada 2010 (as amended)
- .1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.

.6 American National Standards Institute (ANSI):
- .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.7 Province of British Columbia:
- .1 Workers Compensation Act Part 3-Occupational Health and Safety.
- .2 Occupational Health and Safety Regulations

SPEC NOTE:
Delete sections not included in the Contract specifications and note that this is not an exhaustive list.

1.2 RELATED SECTIONS

.1 Refer to the following current NMS sections as required:

.1	Project management and coordination:	Section [013100]
.2	Construction progress schedules:	Section [013218]
.3	Submittals procedures:	Section [013300]
.4	Health and safety for contaminated sites:	Section [013515]
.5	Special procedures - traffic control:	Section [013531]
.6	Procedures for deconstruction of structures:	Section [013573]
.7	Temporary utilities:	Section [015100]
.8	Construction facilities:	Section [015200]
.9	Temporary barriers and enclosures:	Section [015600]
.10	Structure demolition:	Section [024116]

.11	Underground storage tanks removal:	Section [026500]
.12	Asbestos abatement:	Section [028210] [028211] [028212]
.13	Polychlorinated biphenyl (PCB) abatement:	Section [028400]
.14	Rock removal:	Section [312317]

1.3 WORKERS' COMPENSATION BOARD COVERAGE

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 COMPLIANCE WITH REGULATIONS

.1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

1.5 SUBMITTALS

.1 Submit to Departmental Representative submittals listed for review. [in accordance with Section 013300]

.2 Work effected by submittal shall not proceed until review is complete.

.3 Submit the following:

- .1 Site Specific Health and Safety Plan.
- .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
- .3 Copies of incident and accident reports.
- .4 Complete set of current Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .5 Emergency Procedures.

.4 The Departmental Representative will review the Contractor's Site Specific Health and Safety Plan and emergency procedures, and provide comments to the Contractor within [5] days after receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.

.5 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.

.6 Submission of the Site Specific Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
- .1 Be construed to imply approval by the Departmental Representative.
- .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
- .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 RESPONSIBILITY

.1 Assume responsibility as the Prime Contractor for work under this contract.

.2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 HEALTH AND SAFETY COORDINATOR

SPEC NOTE:

.1 The Health and Safety Coordinator:
- .1 Be responsible for completing all health and safety training and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
- .2 Be responsible for implementing, revising, daily enforcing, and monitoring the Site Specific Health and Safety Plan.
- .3 Be on site during execution of work.

1.8 GENERAL CONDITIONS

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
- .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
- .2 Secure site at night time [or provide security guard] as deemed necessary to protect site against entry.

1.9 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:
.1 Multi-employer work site.
.2 Federal employees and general public.
.3 See Pre-construction Hazard Assessment Form Appendix X

1.10 UTILITY CLEARANCES

.1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work

.2 The Contractor will not rely solely upon the Reference Drawings or other information provided for utility locations.

1.11 REGULATORY REQUIREMENTS

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.

.2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.12 WORK PERMITS

.1 Obtain specialty permit[s] related to project before start of work.

1.13 FILING OF NOTICE

.1 The General Contractor is to complete and submit a Notice of Project as required by Provincial authorities.

.2 Provide copies of all notices to the Departmental Representative.

1.14 HEALTH AND SAFETY PLAN

.1 Conduct a site-specific hazard assessment based on review of
Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.

.2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:

- .1 Primary requirements:
  - .1 Contractor's safety policy.
  - .2 Identification of applicable compliance obligations.
  - .3 Definition of responsibilities for project safety/organization chart for project.
  - .4 General safety rules for project.
  - .5 Job-specific safe work procedures.
  - .6 Inspection policy and procedures.
  - .7 Incident reporting and investigation policy and procedures.
  - .8 Occupational Health and Safety Committee/Representative procedures.
  - .9 Occupational Health and Safety meetings.
  - .10 Occupational Health and Safety communications and record keeping procedures.
- .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
- .3 List hazardous materials to be brought on site as required by work.
- .4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
- .5 Identify personal protective equipment (PPE) to be used by workers.
- .6 Identify personnel and alternates responsible for site safety and health.
- .7 Identify personnel training requirements and training plan, including site orientation for new workers.

.3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Site Specific Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.15 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
- .1 Designated personnel from own company.
- .2 Regulatory agencies applicable to work and as per legislated regulations.
- .3 Local emergency resources.
- .4 Departmental Representative [site staff].

.2 Include the following provisions in the emergency procedures:
- .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
- .2 Evacuate all workers safely.
- .3 Check and confirm the safe evacuation of all workers.
- .4 Notify the fire department or other emergency responders.
- .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
- .6 Notify Departmental Representative [site staff].

.3 Provide written rescue/evacuation procedures as required for, but not limited to:
- .1 Work at high angles.
- .2 Work in confined spaces or where there is a risk of entrapment.
- .3 Work with hazardous substances.
- .4 Underground work.
- .5 Work on, over, under and adjacent to water.
- .6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

1.16 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:
- .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per [Section 013300].
- .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.
- .3 Provide adequate means of ventilation in accordance with [Section 015100].
- .4 The contractor shall ensure that the product is applied as per manufacturers recommendations.
- .5 The contractor shall ensure that only pre-approved products are brought onto the work site in an adequate quantity to complete the work.

1.17 ASBESTOS HAZARD

.1 Carry out any activities involving asbestos in accordance with applicable Provincial regulations.

.2 Removal and handling of asbestos will be performed as indicated in Sections [024116] and [028210] [028211] [028212].

1.18 PCB REMOVALS

.1 Mercury-containing fluorescent tubes and ballasts which contain polychorinated biphenyls (PCBs) are classified as hazardous waste.

.2 Remove, handle, transport and dispose of as indicated in Section [028400].

1.19 REMOVAL OF LEAD-CONTAINING PAINTS

.1 All paints containing TCLP lead concentrations above 5 ppm are classified as hazardous.

.2 Carry out demolition activities involving lead-containing paints in accordance with applicable Provincial regulations.

1.20 ELECTRICAL SAFETY REQUIREMENTS

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

.1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.

.2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.21 ELECTRICAL LOCKOUT

1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.

SPEC NOTE:
Procedures specified for lockout need to be consistent with site procedures for existing facilities or equipment.

.2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.

.3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.22 OVERLOADING

1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.23 FALSEWORK

.1 Design and construct falsework in accordance with CSA S269.1- 1975 (R2003).

1.24 SCAFFOLDING

.1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 and B.C. Occupational Health and Safety Regulations.

1.25 CONFINED SPACES

.1 Carry out work in confined spaces in compliance with Provincial regulations

1.26 POWDER-ACTUATED DEVICES

.1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

1.27 FIRE SAFETY AND HOT WORK

.1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.

.2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

1.28 FIRE SAFETY REQUIREMENTS

.1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

.3 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the DR is required prior to any gas or diesel tank be brought onto the work site.

1.29 FIRE PROTECTION AND ALARM SYSTEM

.1 Fire protection and alarm systems shall not be:
- .1 Obstructed.
- .2 Shut off.
- .3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.

.3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

1.30 UNFORESEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

1.31 POSTED DOCUMENTS

.1 Post legible versions of the following documents on site:
- .1 Site Specific Health and Safety Plan.
- .2 Sequence of work.
- .3 Emergency procedures.
- .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
- .5 Notice of Project.
- .6 Floor plans or site plans.

.7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
.8 Workplace Hazardous Materials Information System (WHMIS) documents.
.9 Material Safety Data Sheets (MSDS).
.10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

.2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.

.3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.32 MEETINGS

.1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

1.33 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.

.3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

END OF SECTION 01 35 33

1.0 GENERAL

1.1 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.

.3 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.4 Environmental protection plan to include:

- .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
- .2 Names and qualifications of persons responsible for manifesting contaminated soils and hazardous waste to be removed from site.
- .3 Names and qualifications of persons responsible for training site personnel.
- .4 Descriptions of environmental protection personnel training program.
- .5 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods of control runoff and to contain materials on site.
- .7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
- .9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air,

water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, culture resources biological resources and wetlands plan that defines procedures for identifying and protecting historical archeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan to be included and updated, as required.

1.3 FIRES

.1 Fires and burning of rubbish on site is not permitted.

1.4 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials on site.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways.

1.5 DRAINAGE

.1 Provide Erosion and Sediment Control Plan identifying type and location of erosion and sediment controls provided. Ensure plan includes monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3 requirements.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.

.3 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.4 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

.2 Do not use waterway beds for borrow material without Departmental Representative's approval.

.3 Waterways to be free of excavated fill, waste material and debris.

.4 Design and construct temporary crossings to minimize erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

1.7 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities' emission requirements.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.4 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

.1 Provide temporary enclosures where directed by Departmental Representative.

1.8 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zone.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.9 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.1 Do not take action until after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

END OF SECTION 01 35 43

1.0 GENERAL

1.1 RELATED
.1 General Instructions Section 01 11 55

1.2 REFERENCES AND CODES
.1 Perform Work in accordance with National Building Code of Canada (NBC) 2010 and B.C. Building Code 2012 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:
.1 Contract Documents.
.2 Specified standards, codes and referenced documents.

1.3 BUILDING SMOKING ENVIRONMENT
.1 Comply with smoking restrictions and municipal by-laws.

1.4 NATIONAL PARKS ACT
.1 Perform Work in accordance with National Parks Act when projects are located within boundaries of National Park.

2.0 PRODUCTS

2.1 NOT USED
.1 Not Used.

3.0 EXECUTION

3.1 NOT USED
.1 Not used

END OF SECTION 01 41 00

1.0 GENERAL

1.1 INSPECTION

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Contractor.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

.1 Submit electronic copy of inspection and test reports to Departmental Representative. Testing and Inspection companies engaged by the Contractor will furnish paper copies of reports on site to allow for work to proceed in a timely manner.

.2 Provide copies to subcontractor of work being, inspected or tested or manufacturer or fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.8 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed.

1.9 MILL TESTS

.1 Submit mill test certificates as requested.

1.10 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

.2 Refer to Divisions 22, 23, 25, 26, 27 and 28 for definitive requirements.

END OF SECTION 01 45 00

1.0 GENERAL

1.1 REFERENCES

.1 Canada Green Building Council (CaGBC)

.1 LEED Canada – NC Version 2009 LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

.2 U.S. Environmental Protection Agency (EPA) / Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATION SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.4 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.5 WATER SUPPLY

.1 Water supply is available in the campground. There is no guarantee that the supply will meet construction demand and uninterrupted. Contractor will use this supply at their own risk.

1.6 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.
.2 Protect Work and products against dampness and cold.
.3 Prevent moisture condensation on surfaces.
.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.
.5 Ventilate temporary sanitary facilities.
.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Permanent heating system of building, not to be used when available. Be responsible for damage to heating system if use is permitted.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
.1 Conform with applicable codes and standard.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damages to finishes.
.5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 TEMPORARY POWER AND LIGHT

.1 Department Representative will not provide temporary power during construction for temporary lighting and operating of power tools.

.2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.3 Provide and maintain temporary power and lighting throughout project.

1.8 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by (insurance companies having jurisdiction) (and) governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

2.0 PRODUCTS

2.1 NOT USED

3.0 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to (requirements of authorities having jurisdiction) (sediment and erosion control drawings) (sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent).

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION 01 51 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

1.2 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)
- .1 CCDC 2- 2008, Stipulated Price Contract.

.2 Canada Green Building Council (CAGBC)
- .1 LEED Canada – NC Version 2009 LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1. 189-00, Exterior Alkyd Primer for Wood.
- .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.4 Canadian Standards Association (CSA International)
- .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-0121-M1978 (R2003), Douglas Fir Plywood.
- .3 CAN/CSA-S269.2 – M1987 (R2001), Access Scaffolding for Construction Purpose.
- .4 CAN/CSA-Z321-96 (R2001), Signs and Symbols for the Occupational Environment.

.5 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC) – ID: R0202D, Title: General Conditions ‘C’, In Effect as of: May 14, 2004.

.6 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Proceedures.

1.4 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas which have to be gravelled to prevent tracking of mud.

.3 Indicate use of supplemental or other staging area.

.4 Provide construction facilities in order to execute work expeditiously.

.5 Remove from site all such work after use.

1.5 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

1.6 HOISTING

.1 Provide, operate and maintain hoists (cranes) required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.

.2 Hoists cranes to be operated by qualified operator.

1.7 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.8 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

.3 Clean runways and taxi areas where used by Contractor's equipment.

1.9 SECURITY

.1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.10 OFFICES

.1 Provide office headed to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

.2 Provide marked and fully stocked first-aid case in a readily available location.

.3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.12 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.13 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site.

.2 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by (Departmental Representative) (DCC Representative) Consultant.

1.14 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger and direction signs.

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.7 Construct access and haul roads necessary.

.8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

.9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.10 Dust control: adequate to ensure safe operations at all times.

.11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.13 Provide snow removal during period of Work.

.14 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.15 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

2.0 PRODUCTS

2.1 NOT USED

.1 Not used.

3.0 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to (requirements of authorities having jurisdiction) (sediment and erosion control drawings) (sediment and erosion control drawings) (sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent).

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION 01 52 00

1.0 GENERAL

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)
- .1 CSA-O121-M1978(R2003, Douglas Fir Plywood.

.3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 HOARDING

.1 Erect temporary site enclosure using new minimum 1.83 m high module lock fence. Provide one lockable truck gate. Maintain fence in good repair during the full duration of the construction period.

.2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and constriction procedures.

1.4 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, and open edges of floors and roofs,

.2 Provide as required by governing authorities.

1.5 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.6 DUST TIGHT SCREENS

.1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.7 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.8 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.9 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

.2 Maintain clearance for all egress routes.

1.10 PROTECTION OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.11 PROTECTION OF EXISTING PROPERTY

.1 Provide protection for finished and partially finished property and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

1.12 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

1.13 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

END OF SECTION 01 56 00

1.0 GENERAL

1.1 PRODUCTS/MATERIAL AND EQUIPMENT

.1 Use NEW products/material and equipment unless otherwise specified. The term "products" is referred to throughout the specifications.

.2 Use products of 1 manufacturer for material and equipment of the same type or classification unless otherwise specified.

.3 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.4 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions. Departmental Representative will designate which document is to be followed.

.5 Provide metal fastenings and accessories in the same texture, colour and finish as base metal in which they occur.

- .1 Prevent electrolytic action between dissimilar metals.
- .2 Use non-corrosive fasteners, anchors and spacers for securing exterior work.
- .3 Fastenings which cause spalling or cracking are not acceptable.
- .4 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .5 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .6 Bolts may not project more than 1 diameter beyond nuts.
- .7 Types of washers as follows:
  - .1 Plain type washers: use on equipment and sheet metal.
  - .2 Soft gasket lock type washers: use where vibrations occur.
  - .3 Resilient washers: use with stainless steel.
- .8 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
- .9 Prevent damage, adulteration and soiling of products during delivery, handling and storage. Immediately remove rejected products from site.
- .10 Store products in accordance with suppliers' instructions.
- .11 Touch up damaged factory finished surfaces to Departmental Representative's satisfaction.
  - .1 Use primer or enamel to match original.
  - .2 Do not paint over nameplates.

1.2 QUALITY OF PRODUCTS

.1 Products, materials and equipment (referred to as products) incorporated into work shall be new, not damaged or defective, and of the best quality (compatible with the specifications) for the purpose intended. If requested, furnish evidence as to type, source and quality of the products provided.

.2 Defective products will be rejected regardless of previous inspections.

- .1 Inspection does not relieve responsibility, but is precaution against oversight or error.
- .2 Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Retain purchase orders, invoices and other documents to prove that all products utilized in this Contract meet the requirements of the specifications. Produce documents when requested by the Departmental Representative.

.3 Should any dispute arise as to quality or fitness of products, the decision rests strictly with the Departmental Representative based upon the requirements of the Contract documents.

.4 Unless otherwise indicated in the specifications, maintain uniformity of manufacture for any particular or like item throughout the building.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY OF PRODUCTS

.1 Immediately upon signing the Contract, review product delivery requirements and anticipate foreseeable supply delays for any items.

.2 If delays in supply of products are foreseeable, notify Departmental Representative of such in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the work.

.3 In event of failure to notify Departmental Representative at the start of work and should it subsequently appear that the work may be delayed for such reason, the Departmental Representative reserves the right to substitute more readily available products of similar character, at no increase in either the Contract price or the Contract time.

1.4 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in the specifications, install or erect products in accordance with the manufacturer's instructions.
  .1 Do not rely on labels or enclosures provided with products.
  .2 Obtain written instructions directly from the manufacturer.

.2 Notify Departmental Representative in writing of conflicts between the specifications and the manufacturer's instructions so that the Departmental Representative may establish the course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Departmental Representative to require removal and reinstallation at no increase in either the Contract price or the Contract time.

1.5 CONTRACTOR'S OPTIONS FOR SELECTION OF PRODUCTS FOR TENDERING

.1 Products are specified by "Prescriptive" specifications: select any product meeting or exceeding specifications.

.2 Products specified under "Acceptable Products": select any one of the indicated manufacturers, or any other manufacturer meeting or exceeding the Prescriptive specifications and indicated Products.

.3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.

.4 Products specified to meet particular design requirements or to match existing materials: use only material specified Approved Product. Alternative products may be considered provided full technical data is received in writing by Departmental Representative in accordance with "Special Instructions to Tenderers".

.5 When products are specified by a referenced standard or by or Performance specifications, upon request of Departmental Representative obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.

1.6 SUBSTITUTION AFTER CONTRACT AWARD

.1 No substitutions are permitted without prior written approval of the Departmental Representative.

.2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.

.3 Proposals will be considered by the Departmental Representative if:

.1 Products selected by tenderer from those specified are not available;

.2 Delivery date of products selected from those specified would unduly delay completion of Contract, or

.3 Alternative product to that specified, which is brought to the attention of and considered by Departmental Representative as equivalent to the product specified, and will result in a credit to the Contract amount.

.4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the project. Pay for design or drawing changes required as result of substitution.

.5 Amounts of all credits arising from approval of the substitutions will be determined by the Departmental Representative and the Contract price will be reduced accordingly.

END OF SECTION 01 61 00

1.0 GENERAL

1.1 REFERENCES

.1 A set of construction drawings of existing washrooms in PDF format is available for reference only. The set of drawings may not be full completed set and do not necessarily represent as-built conditions. All existing conditions measurements need to be verified on site.

1.2 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in the province of British Columbia, acceptable to Departmental Representative.

1.3 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Contractor is responsible to provide GPR Survey of existing services as required to verify existing underground condition prior to excavation.

1.4 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.5 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.6 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.7 SUBSURFACE CONDITIONS

.1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

END OF SECTION 01 71 00

1.0 GENERAL

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit written request in advance of cutting or alteration which affects:
- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.3 Include in request:
- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.

.12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management And Disposal.

END OF SECTION 01 73 00

1.0 GENERAL

1.1 REFERENCES

.1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: 2020, Title: General Conditions. In Effect as Of: April 25, 2013.

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

.3 Clear snow and ice from access to building, bank/pile snow in designated areas only.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Provide on-site containers for collection of waste materials and debris.

.6 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Waste Management and Disposal.

.7 Dispose of waste materials and debris off site.

.8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris including that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, millwork floors and ceilings.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep gutters.

.16 Sweep and wash clean paved areas.

.17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.19 Remove snow and ice from access to buildings.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management And Disposal.

END OF SECTION 01 74 11

1.0 GENERAL

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's Waste Management Plan and Goals.

.2 Accomplish maximum control of solid construction waste.

.3 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.

.3 Demolition Waste Audit (DWA): relates to actual waste generated from project.

.4 Inert Fill: inert waste - exclusively asphalt and concrete.

.5 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.11 Separate Condition: refers to waste sorted into individual types.

.12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.

.14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting

requirements.

.15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

1.3 DOCUMENTS

.1 Maintain at job site, one copy of following documents:
- .1 Waste Audit.
- .2 Waste Reduction Workplan.
- .3 Material Source Separation Plan.
- .4 Schedules A, B, C, D, E completed for project.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prepare and submit following prior to project start-up:
- .1 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.
- .2 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.
- .3 Submit 2 copies of Materials Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
- .1 Failure to submit could result in hold back of final payment.
- .2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
- .3 For each material reused, sold or recycled from project, include amount quantities by number, type and size of items and the destination.
- .4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.5 WASTE AUDIT (WA)

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:
- .1 Destination of materials listed.
- .2 Deconstruction/disassembly techniques and sequencing.
- .3 Schedule for deconstruction/disassembly.
- .4 Location.
- .5 Security.
- .6 Protection.
- .7 Clear labelling of storage areas.
- .8 Details on materials handling and removal procedures.
- .9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

.6 Post WRW or summary where workers at site are able to review content.

.7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Complete DWA: Schedule C.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
.1 Transport to approved and authorized recycling facility.

1.9 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect surface drainage, mechanical and electrical from damage and blockage.

.4 Separate and store materials produced during dismantling of structures in designated areas.

.5 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.
.2 Remove co-mingled materials to off-site processing facility for separation.
.3 Provide waybills for separated materials.

1.10 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner, into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:
.1 Number and size of bins.
.2 Waste type of each bin.
.3 Total tonnage generated.
.4 Tonnage reused or recycled.
.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.11 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Provide temporary security measures approved by Departmental Representative.

1.12 SCHEDULING

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

2.0 PRODUCTS

2.1 NOT USED

.1 Not Used.

3.0 EXECUTION

3.1 APPLICATION

.1 Do Work in compliance with WRW.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or

containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
.1 Mark containers or stockpile areas.
.2 Provide instruction on disposal practices.

.2 On-site sale of salvaged recovered reusable and/or recyclable materials is not permitted.

.3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Acoustical Insulation	100	
Doors and Frames	100	
Electrical Equipment	80	
Mechanical Equipment	100	
Metals	100	
Rubble	100	
Wood (uncontaminated)	100	
Other		

.4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	
Plastic Packaging	100	
Rubble	100	
Steel	100	
Wood (uncontaminated)	100	
Other		

3.4 WASTE AUDIT (WA)

The following pertains to Schedule A - Waste Audit (WA). Column-1 refers to the category of waste, and a physical description of the material (e.g. off-cuts, clean drywall, etc.). Column-2 refers to the total quantity of materials received by the Contractor. Measurement units must be specified. Column-3 refers to the estimated percentage of material that is waste. Column-4 refers to the total quantity of waste (column-2 x column-3). Column-5 refers to the areas(s) in which the waste was generated. Column-6 refers to the total percentage of recycled material from the specified total quantity of waste (column-4). Column-7 refers to the total percentage of reused material from the specified total quantity of waste (column-4).

.1 Schedule A - Waste Audit (WA):

(1) Material Category	(2) Material Quantity Unit %	(3) Estimated Waste	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood & Plastics						

Material Description						
Off-Cuts						
Warped						
Plastic						
Cardboard						
Other						
Doors & Windows						
Material Description						
Frames						
Glass						
Wood						
Metal						
Other						

3.6 WASTE REDUCTION WORKPLAN (WRW)

The following pertains to Schedule B - Waste Reduction Workplan (WRW). Column-1 refers to the category and type of waste materials. Column-2 refers to the persons responsible for completing the WRW. Column-3 refers to Column-4 of Schedule A. Column-4 refers to the amount of reused waste predicted and realized. Column-5 refers to the amount of recycled waste predicted and realized. Column-6 refers to the approved recycling facility.

.1 Schedule B:

(1) Material Quantity Category	(2) Person Amount Responsible Waste	(3) Total of Project (unit)	(4) Reused Actual (units)	(5) Recycle Actual (s) Amount	(6) Material Destination (s)
Wood & Plastics					
Material Description					
Chutes					
Warped					
Plastic					
Cardboard Packaging					
Other					
Doors & Windows					
Material Description					
Painted					
Frames					
Glass					
Wood					
Metal					
Other					

3.7 DEMOLITION WASTE AUDIT (DWA)

The following pertains to Schedule C - Demolition Waste Audit (DWA). Column-1 refers to the type of material salvaged. Column-2 refers to the material quantity shown in column-1. Several columns may be required to identify specific demolition areas. Column-3 refers to the unit of measurement used to describe Column-2. Column-4 refers to the total quantity of salvaged material. Column-5 refers to the cumulative volume of salvaged material. Column-6 refers to the total weight in kilograms. Column-7 refers to remarks and assumptions made about the specified material.

.1 Schedule C - Demolition Waste Audit (DWA):

(1) Material Description Assumptions	(2) Quantity	(3) Unity	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks & Assumptions
Wood						
Wood						
Stud						
Plywood						
Baseboard -wood						
Door						
Trim-Wood						
Cabinet						
Doors & Windows						
Panel						
Regular						
Slab Regular						
Wood						
Laminate						
Byfold-Closet						
Glazing						

3.8 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule E - Government Chief Responsibility for the Environment:

.1 Ministry of Environment Lands and Parks
810 Blanshard Street, 4th Floor
Victoria, BC V8V 1X4
604-387-1161 / 604-356-6464

.2 Waste Reduction Commission Soils and Hazardous Waste
770 South Pacific Blvd, Suite 303
Vancouver BC, V6B 5E7
604-660-9550 / 604-660-9596

END OF SECTION 01 74 19

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 RELATED SECTIONS

.1 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION AND DECLARATION

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Departmental Representative's Inspection.

.3 Departmental Representative's Review: Departmental Representative and Contractor will perform review of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.4 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted, and balanced and are fully operational.

.4 Certificates required by authorities having jurisdiction.

.5 Commissioning of all systems: Final commissioning reports have been submitted to the Departmental Representative.

.6 Operation of systems have been demonstrated to Owner's personnel.

.7 Work is complete and ready for Final Inspection.

.2 Submit required forms as described in General Conditions and Standard Acquisition Contract Clause (SACC) manual.

END OF SECTION 01 77 00

1.0 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.

.2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:
- .1 Verify conditions for demonstration and instructions comply with requirements.
- .2 Verify designated personnel are present.
- .3 Ensure equipment has been inspected and put into operation in accordance with Division.
- .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 23 08 00 Commissioning of Mechanical Systems.

.4 Demonstration and Instructions:
- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Instructions: ensure adequate amount of time required for instruction of each item of equipment or system: refer to 1.7 of Section 01 91 31.1.7.

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide electronic & hard copies (Refer to Section 01 78 00 Closeout Submittals) of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
- .1 Instruct Owner's personnel.
- .2 Provide written report that demonstration and instructions have been completed.

END OF SECTION 01 79 00

1.0 GENERAL

1.1 SECTION INCLUDES

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements to Performance Verification of components, equipment, sub-systems, systems, and integrated systems.

1.2 RELATED SECTIONS

.1	Common Product Requirements	Section 01 61 00
.2	Closeout Submittals	Section 01 78 30
.3	Demonstration and Training	Section 01 79 00

1.3 ACRONYMS

.1 AFD – Alternate Forms of Delivery, service provider.

.2 BMM – Building Management Manual.

.3 Cx – Commissioning.

.4 EMCS – Energy Monitoring and Control Systems.

.5 O&M – Operation and Maintenance.

.6 PI – Product Information.

.7 PV – Performance Verification.

.8 TAB – Testing, Adjusting and Balancing.

1.4 REFERENCE

.1 Public Works and Government Services Canada (PWGSC)
- .1 CSA Z320-11 Commissioning Standard.
- .2 ANSI/NETA Standard for Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.5 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
- .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
- .2 Ensure appropriate documentation is compiled into the BMM.
- .3 Effectively train O&M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
- .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
- .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design Criteria: as per client's requirements or determined by designer to meet Project functional and operational requirements.

1.6 COMMISSIONING OVERVIEW

.1 Cx to be a line item of General Contractor's cost breakdown.

.2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.3 Cx is to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

.4 Complete all start-up and verification of systems prior to review by Commissioning Agent.
- .1 To bring mechanical, electrical and building architectural systems and components from a state of static completion to a state of dynamic operation.
- .2 To verify conformance to contract requirements.
- .3 To confirm installations meet requirements of Contract Documents.
- .4 To provide all testing documents and records.
- .5 To ensure completed facility meets contract requirements.
- .6 To provide a documented operator training program.
- .7 To verify accuracy of project record drawings and operating and maintenance manuals.

.5 Departmental Representative will issue Certificate of Substantial Completion when:
- .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
- .2 Equipment, components and systems have been commissioned.
- .3 O&M training has been completed.

1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, Departmental Representative to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by General Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.6 PRE-CX REVIEW

.1 Before Construction:
- .1 Review contract documents, confirm by writing to Departmental Representative.
  - .1 Adequacy of provisions for Cx.
  - .2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:
- .1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:
- .1 Have completed Cx Plan up-to-date.
- .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
- .3 Fully understand Cx requirements and procedures.
- .4 Have Cx documentation shelf-ready.
- .5 Understand completely design criteria and intent and special features.
- .6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.
.8 Ensure systems have been cleaned thoroughly.
.9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
.10 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.7 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.8 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.1 Submit no later than 4 weeks after award of Contract:
.1 Name of Contractor's Cx agent.
.2 Draft Cx documentation.
.3 Preliminary Cx schedule.

.2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 4 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 4 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.9 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.

.2 General Contractor to review and approve Cx documentation submitted by Cx Agent prior to submission to Departmental Representative for review.

.3 Provide completed and approved Cx documentation to Departmental Representative.

1.10 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.07 Construction Progress Schedule Bar (GANTT Chart).

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
.1 Approval of Cx reports.
.2 Verification of reported results.
.3 Repairs, retesting, re-commissioning, re-verification.
.4 Training.

1.11 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings: Section 01 32 16.07 Construction Progress Schedule Bar (GANTT Chart) and as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Section 01 32 16.07 Construction Progress Schedule Bar (GANTT Chart). General Contractor to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of General Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by General Contractor with their Commissioning Agent, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.12 STARTING AND TESTING

.1 General Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.13 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days' notice prior to commencement.

.2 Departmental Representative to witness of start-up and testing.

.3 General Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and general testing in following distinct phases

.1 Included in delivery and installation

.1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Startup: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System PV: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

.4 Document requires tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following
- .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
- .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
- .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
  - .1 Rejected equipment to be removed from site and replace with new.
  - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

.2 Start-up documentation to include:
- .1 Factory and on-site test certificates for specified equipment.
- .2 Pre-start-up inspection reports.
- .3 Signed installation/start-up check lists.
- .4 Start-up reports,
- .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Departmental Representative for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of Certificate of Substantial Performance.

1.17 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

.1 Notify Departmental Representative at least 4 weeks prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

.1 Submit to Departmental Representative for review and approval:
- .1 Complete list of instruments proposed to be used.
- .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:
- .1 2-way radios.
- .2 Ladders.

.3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:
- .1 Under accepted simulated operating conditions, over entire operating range, in all modes.
- .2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.23 EXTRAPOLATION OF RESULTS

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.24 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.25 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.

.2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.26 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx, leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities, complete Cx prior to issuance of Certificate of Substantial Performance.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.27 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.28 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

.1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.29 OCCUPANCY

.1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

1.30 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:
  .1 Accuracy complies with these specifications.
  .2 Calibration certificates have been deposited with Departmental Representative.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.31 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:
  .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:
  .1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:
  .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.32 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

1.33 SUMMARY OF DELIVERABLES FROM CONTRACTOR'S Cx AGENT TO PWGSC

.1 Cx Plan and Schedule.

.2 Accepted shop drawings.

.3 Completed PI forms.

.4 Approved TAB Report.

.5 Approved PV Forms.

6 Approved O & M Manual.

.7 Approved System and Integrated System Test Report

.8 Approved Training and Attendance Form.

.9 Accepted “As-Built” Plans and Specifications.

.10 Certificate of Interim Acceptance.

.11 Final Certificate of Completion.

END OF SECTION 01 91 13

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Commissioning forms to be completed for equipment, system and integrated system.

1.2 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.

.3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative approval.

1.5 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:
- .1 Contractor provides project-specific Commissioning forms with Specification data included.
- .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
- .3 Confirm operation as per design criteria and intent.
- .4 Identify variances between design and operation and reasons for variances.
- .5 Verify operation in specified normal and emergency modes and under specified load conditions.
- .6 Record analytical and substantiating data.
- .7 Verify reported results.
- .8 Form to bear signatures of recording technician.
- .9 Submit immediately after tests are performed.
- .10 Reported results in true measured SI unit values.
- .11 Provide Departmental Representative with originals of completed forms.
- .12 Maintain copy on site during start-up, testing and commissioning period.
- .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 91 51 - Building Management Manual (BMM).

1.8 LANGUAGE

.1 To suit the language profile of the awarded contract.

END OF SECTION 01 91 33

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 This section is limited to portions of the Building Management Manual (BMM) provided to Departmental Representative by Contractor.

.2 Acronyms:

.1 BMM - Building Management Manual.
.2 Cx - Commissioning.
.3 HVAC - Heating, Ventilation and Air Conditioning.
.4 PI - Product Information.
.5 PV - Performance Verification.
.6 TAB - Testing, Adjusting and Balancing.
.7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 216 mm x 279 mm.

.2 Methodology used to facilitate updating.

.3 Drawings, diagrams and schematics to be professionally developed.

.4 Electronic copy of data to be in a PDF with hyperlink from content page to individual sections.

1.3 APPROVALS

.1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.

1.4 GENERAL INFORMATION

.1 Provide Departmental Representative the following for insertion into appropriate Part and Section of BMM:

.1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project - as indicated in Section 1.2 of BMM.
.2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned - as indicated in Section 1.4 of BMM.
.1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
.3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.
.4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.
.5 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.
.6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned - Section 2.0 of BMM.
.7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.
.8 Operating and maintenance manual - Section 3.2 of BMM.
.9 Final commissioning plan as actually implemented.
.10 Completed commissioning checklists.
.11 Commissioning test procedures employed.

.12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative.
.13 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Departmental Representative to review and approve format and organization within 12 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Include completed PI report forms, data and information from other sources as required.

.6 Inventory directory relating to information on installed systems, equipment and components.

.7 Approved project shop-drawings, product and maintenance data.

.8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.

.9 Inventory and location of spare parts, special tools and maintenance materials.

.10 Warranty information.

.11 Inspection certificates with expiration dates, which require on-going re-certification inspections.

.12 Maintenance program supporting information including:
.1 Recommended maintenance procedures and schedule.
.2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL

.1 Samples of LSC Manual will be available from Departmental Representative.

.2 Content of Manual:
.1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.
.2 HVAC emergencies and fuel supply failures.
.3 Intrusion and security breach.
.4 Emergency provisions for natural disasters, bomb threats and other disruptive situations.
.5 Dedicated emergency generators for high security projects, medical facilities and computer systems.
.6 Emergency control procedures for fire, power and major equipment failure.
.7 Emergency contacts and numbers.
.8 Manual to be readily available and comprehensible to non- technical readers.

1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:

.1 General:

.1 Finalized commissioning plan.
.2 WHMIS information manual.
.3 Approved "as-built" drawings and specifications.
.4 Procedures used during commissioning.
.5 Cross-Reference to specification sections.

.2 Architectural and structural:

.1 Inspection certificates, construction permits.
.2 PV reports.

.3 Fire prevention, suppression and protection:

.1 Test reports.
.2 Smoke test reports.
.3 PV reports.

.4 Mechanical:

.1 Installation permits, inspection certificates.
.2 Piping pressure test certificates.
.3 Ducting leakage test reports.
.4 TAB and PV reports.
.5 Charts of valves and steam traps.
.6 Copies of posted instructions.

.5 Electrical:

.1 Installation permits, inspection certificates.
.2 TAB and PV reports.
.3 Electrical work log book.
.4 Charts and schedules.
.5 Locations of cables and components.
.6 Copies of posted instructions.

.2 Assist Departmental Representative with preparation of BMM.

1.8 LANGUAGE

.1 Provide documentation in English only.

1.9 IDENTIFICATION OF FACILITY

.1 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation:

.1 As advised by Departmental Representative.

1.10 USE OF CURRENT TECHNOLOGY

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

.2 Obtain Departmental Representative's approval before starting Work.

END OF SECTION 01 91 51

1.1 RELATED REQUIREMENTS

.1 Asbestos Abatement Intermediate Precautions Section 02 82 00.02

.2 Lead Base Paint Intermediate Precautions Section 02 83 11

1.2 REFERENCES

.1 Definitions:

.1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.

.2 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.

.4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

.2 Reference Standards:

.1 CSA International

.1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Demolition Meetings:

.1 Convene pre-demolition meeting 1 week prior to beginning work of this Section with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify project requirements.

.2 Verify existing site conditions adjacent to demolition work.

.3 Co-ordination with other construction subtrades.

.2 Ensure key personnel site supervisor, project manager and subcontractor representatives WMC attend.

.3 WMC must provide written report on status of waste diversion activity at each meeting.

.4 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

.2 Scheduling:

.1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.

.1 In event of unforeseen delay notify Consultant in writing.

1.4 ACTION & INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Section 01 74 19 - Waste Management Disposal.

.2 WMC is responsible for fulfilment of reporting requirements.

.3 Prior to beginning of Work on site submit detailed Waste Management Plan in accordance with Section 01 74 19 - Waste Management And Disposal and indicate:

.1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
.2 Schedule of selective demolition.
.3 Number and location of dumpsters.
.4 Anticipated frequency of tippage.
.5 Name and address of waste receiving organizations.

.4 Submit PDF copies of receipts from authorized disposal sites and reuse and recycling facilities for material removed from site on a bi-weekly basis upon request of Consultant.
.1 Written authorization from Departmental Representative is required to deviate from receiving organizations listed in Waste Reduction Workplan.

.5 Construction Waste Management:
.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Provincial and Municipal regulations.

1.6 SITE CONDITIONS

.1 Environmental protection:
.1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.

.2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.3 Fires and burning of waste or materials is not permitted on site.

.4 Do not bury rubbish waste materials.

.5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into storm or sanitary sewers.
.1 Ensure proper disposal procedures are maintained throughout project.

.6 Do not pump water containing suspended materials into storm or sanitary sewers, or onto adjacent properties.

.7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction.

.8 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.

.9 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all interior and exterior public areas.

.2 Review "Pre-Construction Hazmat Survey" and take precautions to protect environment.

.3 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous is encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
.1 Proceed only after receipt of written instructions have been received from Consultant.

.4 Notify Departmental Representative before disrupting building access or services.

.5 Extent of Demolition – refer to drawings.

1.7 EXISTING CONDITIONS

.1 If material resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Proceed only after receipt of written instructions has been received from Consultant.

.2 Structures to be demolished are based on their condition at time of examination prior to tendering.

2.0 PRODUCTS

2.1 EQUIPMENT

.1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

3.0 EXECUTION

3.1 EXAMINATION

.1 Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

.4 Disconnect, cap, plug or divert, as required, existing utilities within the building where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.

.1 Immediately notify Departmental Representative and the Owner concerned in case of damage to any utility or service designated to remain in place.

.2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PREPARATION

.1 Protection of in-place conditions:

.1 Work in accordance with Section 01 35 43 - Environmental Procedures.

.2 Prevent movement, settlement or damage of adjacent structures, services and parts of existing building to remain.

.1 Provide bracing, shoring and underpinning as required.

.2 Repair damage caused by demolition as directed by Departmental Representative

.3 Support affected structures and, if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative

.4 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

.1 Disconnect and cap mechanical services.

.2 Natural gas supply lines: remove in accordance with gas company requirements.

.3 Sewer and water lines: remove or provide temporary support if they are to remain as indicated on drawings.

.4 Other underground services: remove and dispose of as indicated on drawings.

3.3 DEMOLITION

.1 Do demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.2 Blasting operations not permitted during demolition.

.3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

.4 Prior to start of Work, remove contaminated or hazardous materials as indicated in Hazardous Material Report from site and dispose of at designated disposal facilities in safe manner and in accordance with recommendation in report.

.5 Demolish structural work as indicated on drawings.

.6 Crush concrete generated due to demolition of concrete structure to size suitable for recycling

.1 Where possible identify markets which will accept crushed material as aggregate.

.7 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.

.8 At end of each day's work, leave Work in safe and stable condition.

.9 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.

.10 Use natural lighting to do Work where possible.

.1 Shut off lighting except those required for security purposes at end of each day.

3.4 CLEANING

.1 Develop Waste Management Plan related to Work of this Section.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.3 Divert excess materials from landfill to site approved, by Departmental Representative.

.4 Designate appropriate security resources / measures to prevent vandalism, damage and theft.

END OF SECTION 02 41 16

1.0 GENERAL

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following Work:

.1 Removal of asbestos containing material from building material within the project area at the existing welding shop, machine shop and pumphouse, as indicated in the Pre-Construction Hazardous Building Material and Survey in Appendix A.

1.2 RELATED REQUIREMENTS

.1 Structure Demolition Section 02 41 16

.2 Lead Basepaint abatement Intermediate Precautions Section 02 83 11

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.205- 94, Sealer for Application of Asbestos Fibre Releasing Materials.

.2 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 Underwriters' Laboratories of Canada (ULC)

.6 BC Occupational Health and Safety Act, WorkSafe BC.

1.4 DEFINITIONS

.1 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.

.2 Asbestos Containing Materials (ACMs): materials that contain 0.1 provincial regulated amount per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.

.3 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.

.4 Authorized Visitors: Departmental Representative, Engineers, or designated representatives, and representatives of regulatory agencies.

.5 Competent worker person : in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the work.

.2 Is familiar with the provincial federal laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.6 Friable Materials: material that when dry can be crumbled pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.7 Glove Bag: prefabricated glove bag as follows:
- .1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
- .2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.
- .3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.
- .4 Straps for sealing ends around pipe.

.8 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.

.9 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.10 Occupied Area: any area of building or work site that is outside Asbestos Work Area.

.11 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.12 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.5 ACTION & INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.

.3 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

.4 Submit proof of Contractor's Asbestos Liability Insurance.

.5 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing waste has been received and properly disposed.

.6 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.7 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.

.8 Submit Worker's Compensation Board status and transcription of insurance.

.9 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
- .1 Encapsulants;

.2 Amended water;
.3 Slow drying sealer.

.10 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

11. Submit Exposure Control Plan as per requirement in WorkSafe BC Part 6.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements and WorkSafe BC.

.2 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn.

.3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area,

and removed from the work area frequently and at regular intervals.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are located as indicated on drawings.

.6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

.7 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into - and exiting from Asbestos Work Area.

1.7 WASTE MANAGEMENT & DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers steel metal plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal banding, flatten and place in designated area for recycling.

.8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial/Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.

.9 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.8 EXISTING CONDITIONS

.1 Reports and information pertaining to ACMS to be handled, removed, or otherwise disturbed and disposed of during this Project is appended in appendix A of this specifications.

.2 Notify Departmental Representative of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

1.9 SCHEDULING

.1 Hours of Work: perform work in accordance with Section 01 11 55 General Instructions

1.10 QUALIFICATIONS

.1 Asbestos Abatement Contractor must have at least 10 years of experience in similar scope and nature of work. Qualifications and resume of personnel involved must be submitted and approved by Departmental Representative.

2.0 PRODUCTS

2.1 MATERIALS

.1 Drop and Enclosure Sheets:
- .1 Polyethylene: 0.15 mm thick.
- .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.

.3 Waste Containers: contain waste in two separate containers.
- .1 Inner container: 0.15 mm thick sealable polyethylene bag or where glove bag method is used, glove bag itself.
- .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
- .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.

.4 Glove bag:
- .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
- .2 The glove bag to be equipped with:
  - .1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the insulation and maintain a sealed enclosure throughout the work period.
  - .2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.
  - .3 A tool pouch with a drain.
  - .4 A seamless bottom and a means of sealing off the lower portion of the bag.
  - .5 A high strength double throw zipper and removable straps, if the bag is to be moved during the removal operation.

.5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.

.6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
- .1 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.

.7 Encapsulant: surface film forming / penetrating type conforming to CAN/CGSB-1.205.

3.0 EXECUTION

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size to be used: 'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.

.3 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.

.1 Use HEPA vacuum or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.

.2 Do not use compressed air to clean up or remove dust from any surface.

.4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.

.2 When removing suspended ceilings and walls themselves do not enclose work area and when removing asbestos containing material from piping or equipment and "glove bag" method is not used erect enclosure of polyethylene sheeting around work area, shut off mechanical ventilation system serving work area and seal ventilation ducts to and from work area.

.5 Before removing suspended ceilings, remove friable material on upper surfaces using HEPA vacuum equipment.

.1 Remove and clean surfaces of ceiling panels using HEPA vacuum, wrap clean panels in 0.10 mm thick polyethylene, and store in building as directed by Departmental Representative.

.2 Clean "T" grid suspension system, disconnect, wrap in 0.10 mm thick polyethylene, and store in building as directed by Engineer.

.6 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.

.1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.

.2 Perform Work in a manner to reduce dust creation to lowest levels practicable.

.7 Pipe Insulation Removal Using Glove Bag:

.1 A glove bag not to be used to remove insulation from a pipe, duct or similar structure if:

.1 It may not be possible to maintain a proper seal for any reason including, without

limitation:
- .1 The condition of the insulation.
- .2 The temperature of the pipe, duct or similar structure.

.2 The bag could become damaged for any reason including, without limitation.
- .1 The type of jacketing.
- .2 The temperature of the pipe, duct or similar structure.

.2 Upon installation of the glove bag, inspect bag for any damage or defects. If any damage or defects are found, the glove bag is to be repaired or replaced. The glove bag to be inspected at regular intervals for damage and defects, and repair or replaced, as appropriately. The asbestos containing contents of the damaged or defective glove bag found during removal are to be wetted and the glove bag and its contents are to be removed and disposed of in an appropriate waste disposal container. Any damaged or defective glove bags are not be reused.

.3 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and close zippers. Seal bag to pipe with cloth straps.

.4 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.

.5 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly. Wet surface of insulation in lower section of bag.

.6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.

.7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.

.8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene taped in place.

.8 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.9 Cleanup:
- .1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.
- .2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.
- .3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.
- .4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
- .5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, Departmental Representative to take air samples on daily basis outside of Asbestos Work Area enclosures in accordance with Provincial/Territorial Occupational Health and Safety Regulations PWGSC requirements.

.1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial/Territorial Occupational Health and Safety Regulations.

.2 If air monitoring shows that areas outside Asbestos Work Area enclosures are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.

.3 Ensure that respiratory safety factors are not exceeded.

.4 During the course of Work, Departmental Representative to measure fibre content of air outside Work areas by means of air samples analyzed by Phase Contrast Microscopy (PCM).

.1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.

END OF SECTION 02 82 00.02

1.0 GENERAL

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following Work:
- .1 Removal of lead based paint from walls and ceilings within the project area.
- .2 Manual demolition of lead-painted plaster walls or building components.

1.2 RELATED REQUIREMENTS

.1	Structure Demolition	Section 02 41 16
.2	Asbestos Abatement Intermediate Precautions	Section 02 82 00.02

1.3 REFERENCES

.1 Department of Justice Canada
- .1 Canadian Environmental Protection Act, 1999 (CEPA).

.2 Health Canada
- .1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).

.3 Human Resources and Social Development Canada (HRSDC)
- .1 Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.

.4 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 U.S. Environmental Protection Agency (EPA)
- .1 EPA 747-R-95-007- 1995, Sampling House Dust for Lead.

.6 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
- .1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).

.7 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
- .1 Lead in Construction Regulation - 29 CFR 1926.62- 1993.

.8 BC Occupational Health and Safety Act, WorkSafe BC.

1.4 DEFINITIONS

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Authorized Visitors: Owner Departmental Representative or designated representatives and representatives of regulatory agencies.

.3 Occupied Area: areas of building or work site that is outside Work Area.

.4 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.

.5 Airlock: ingress or egress system, without permitting air movement between contaminated area and uncontaminated area. Consisting of two curtained doorways at least 2 m apart.

.6 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another. Typically constructed as follows:
- .1 Place two overlapping polyethylene sheets over existing or temporarily framed doorway, securing each along top of doorway, securing vertical edge of one sheet along one vertical side of doorway, and secure other sheet along opposite vertical side of doorway.
- .2 Reinforce free edges of polyethylene with duct tape and add weight to bottom edge to ensure proper closing.
- .3 Overlap each polyethylene sheet at openings 1.5 m on each side.

.7 Action level: employee exposure, without regard to usage of respirators, to an airborne concentration of lead of 50 micrograms per cubic meter of air calculated as 8 hour time-weighted average (TWA). Intermediate precautions for lead abatement are based on airborne lead concentrations greater than 0.05 milligrams per cubic meter of air within Work Area.

.8 Competent person: Professionals capable of identifying existing lead hazards in workplace and taking corrective measures to eliminate them.

.9 Lead in Dust: wipe sampling on vertical and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

1.5 ACTION & INFORMAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of lead based paint waste in accordance with requirements of authority having jurisdiction.

.3 Provide: Provincial Territorial and local requirements for Notice of Project Form.

.4 Provide proof of Contractor's General and Environmental Liability Insurance.

.5 Quality Control:
- .1 Provide Departmental Representative necessary permits for transportation and disposal of lead based paint waste and proof that it has been received and properly disposed.
- .2 Provide proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, entry and exit from Work Area, and aspects of work procedures and protective measures.
- .3 Provide proof that supervisory personnel have attended lead abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.

.6 Product data:
- .1 Provide documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
  - .1 Encapsulants.
  - .2 Amended water.
  - .3 Slow drying sealer.

.7 Submit Exposure Control Plan as per requirement in Worksafe BC Part 6.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to lead paint, in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.2 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers and visitors in Work Area includes:

.1 Respirator NIOSH approved and equipped with filter cartridges with assigned protection factor of 50, acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure in Lead Work Area. Provide sufficient filters so workers can install new filters following disposal of used filters and before re-entering contaminated areas.

.2 Disposable type protective clothing that does not readily retain or permit skin contamination, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.

.2 Requirements for workers:

.1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters, clean coveralls and head covers before entering Equipment and Access Rooms or Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.

.2 Remove gross contamination from clothing before leaving work area. Place contaminated work suits in receptacles for disposal with other lead - contaminated materials. Leave reusable items except respirator in Equipment and Access Room. When not in use in Work Area, store work footwear in Equipment and Access Room. Upon completion of lead abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from Work Area or from Equipment and Access Room.

.3 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers not to use this system as means to leave or enter work area.

.3 Eating, drinking, chewing, and smoking are not permitted in Work Area.

.4 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual lead abatement.

.5 Ensure workers wash hands and face when leaving Work Area. Facilities for washing are located as indicated on drawings.

.6 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.

.7 Ensure no person required to enter Work Area has facial hair that affects seal between respirator and face.

.8 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to Work Areas.

.2 Instruct Authorized Visitors in use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Work Area.

1.7 WASTE MANAGEMENT & DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of lead waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.

.4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 EXISTING CONDITIONS

.1 Reports and information pertaining to lead based paint to be handled, removed, or otherwise disturbed and disposed of during this Project is appended in Appendix A of this specifications.

.2 Notify Departmental Representative of lead based paint discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

1.9 SCHEDULING

.1 Not later than two days before beginning Work on this Project notify the following in writing, where appropriate:
- .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
- .2 Provincial Ministry of Labour.
- .3 Disposal Authority.

.2 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.

.3 Provide Departmental Representative copy of notifications prior to start of Work.

.4 Hours of Work: perform work in accordance with Section 01 11 55 General Instructions. Include in Contract Sum additional costs due to this requirement.

1.10 QUALIFICATIONS

.1 Abatement Contractor must have at least 10 years of experience in similar scope and nature of work. Qualifications and resume of personnel involved must be submitted to Departmental Representative for approval.

2.0 PRODUCTS

2.1 MATERIALS

.1 Polyethylene: 0.15 mm unless otherwise specified; in sheet size to minimize joints.

.2 FR polyethylene: 0.15 mm reinforced fabric bonded both sides with polyethylene.

.3 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.

.4 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for trapping residual lead paint residue.

.5 Lead waste containers: metal fibre type acceptable to dump operator with tightly fitting covers and 0.15 mm sealable polyethylene liners.
- .1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

3.0 EXECUTION

3.1 SUPERVISION
- .1 Approved Supervisor must remain within Lead Work Area during disturbance, removal, or other handling of lead based paints.

3.2 PREPARATION
- .1 Remove and wrap items to be salvaged or reused, and transport and store in area specified by Departmental Representative.

- .2 Work Area:
  - .1 Shut off and isolate HVAC system to prevent dust dispersal into other building areas. Conduct smoke tests to ensure duct work is airtight.
  - .2 Pre-clean fixed casework, and equipment within work areas, using HEPA vacuum and cover with polyethylene sheeting sealed with tape.
  - .3 Clean work areas using HEPA vacuum. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum.
  - .4 Seal off openings, corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.
  - .5 Cover floor surfaces in work area from wall to wall with FR polyethylene drop sheets to protect existing floor during removal.
  - .6 Build airlocks at entrances and exits from work areas to ensure work areas are always closed off by one curtained doorway when workers enter or exit.
  - .7 At point of access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used:
    - .1 CAUTION LEAD HAZARD AREA (25 mm).
    - .2 NO UNAUTHORIZED ENTRY (19 mm).
    - .3 WEAR ASSIGNED PROTECTIVE EQUIPMENT AND RESPIRATOR (19 mm).
    - .4 BREATHING LEAD CONTAMINATED DUST CAUSES SERIOUS BODILY HARM (7 mm).
  - .8 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Authority having jurisdiction.
  - .9 Where water application is required for wetting lead containing materials, provide temporary water supply by use of appropriately sized hoses for application of water as required.
  - .10 Provide electrical power and shut off for operation of powered tools and equipment. Provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.

.3 Worker Decontamination Enclosure System:
- .1 Worker Decontamination Enclosure System includes Equipment and Access Room and Clean Room, as follows:
  - .1 Equipment and Access Room: construct between exit and work areas, with two curtained doorways, one to the rest of suite, and one to work area. Install waste receptor and storage facilities for workers' shoes and protective clothing to be re-worn in work areas. Build large enough to accommodate specified facilities, equipment needed, and at least one worker allowing sufficient space to change comfortably.
  - .2 Clean Room: construct with curtained doorway to outside of enclosures. Provide lockers or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.

.4 Construction of Decontamination Enclosures:
- .1 Construct framing for enclosures or use existing rooms. Line enclosure with polyethylene sheeting and seal with tape, apply two layers of FR polyethylene on floor.
- .2 Construct curtain doorways between enclosures so when people move through or waste containers and equipment are moved through doorway, one of two closures comprising doorway always remains closed.

.5 Separation of Work Areas from Occupied Areas
- .1 Barriers between Work Area and occupied area to be constructed as follows:
  - .1 Construct floor to ceiling lumber metal stud framing, cover with polyethylene sheeting and seal with duct tape. Apply 9 plywood over polyethylene sheeting. Seal plywood joints and between adjacent materials with surface film forming sealer, to create airtight barrier.
  - .2 Cover plywood with polyethylene sheeting and sealed with duct tape.

.6 Maintenance of Enclosures:
- .1 Maintain enclosures in clean condition.
- .2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately.
- .3 Visually inspect enclosures at beginning of each work day.
- .4 Use smoke test method to test effectiveness of barriers as directed by Departmental Representative.

3.3 LEAD-BASE PAINT ABATEMENT

.1 Removal of lead based paint to be performed by scraping or sanding using non-powered hand tools, or manual demolition of lead-painted plaster walls or building components by striking a wall with sledgehammer or similar tool.

.2 Remove lead based paint in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.

.3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to Staging Area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.

.4 After completion of stripping work, wire brush and wet sponge surface from which lead based paint has been removed to remove visible material. During this work keep surfaces wet.

.5 After wire brushing and wet sponging to remove visible lead based paint, and after encapsulating lead containing material impossible to remove, wet clean work area including equipment and access room, and equipment used in process. After inspection by Departmental Representative, apply continuous coat of slow drying sealer to surfaces. Do not disturb work for 8 hours with no entry, activity, ventilation or disturbance during this period.

.6 After enclosing lead painted surfaces, wet clean work area and equipment and access room. During settling period no entry, activity, or ventilation will be permitted.

3.4 INSPECTION

.1 Perform inspection to confirm compliance with specification and governing authority requirements. Deviations from these requirements not approved in writing by Departmental Representative will result in work stoppage, at no cost to Owner.

.2 Departmental Representative will inspect work for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

.3 When lead dust leakage from Work Area occurs Departmental Representative may order Work shutdown.

.1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 LEAD SURFACE SAMPLING-WORK AREAS

.1 Final lead surface sampling to be conducted as follows:

.1 After Work Area has passed a visual inspection for cleanliness approved by Departmental Representative and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period of 8 hours has passed. Departmental Representative will perform lead wipe sampling in Work Area.

.1 Final lead wipe sampling results from horizontal and vertical surfaces where lead based paints have been removed must show lead levels of less than 40 micrograms of lead in dust per square foot. Samples must be collected and analyzed in accordance with EPA 747-R-95-007.

.2 If wipe sampling results show levels of lead in excess of 40 micrograms per square foot, re-clean work area at contractor's expense and apply another acceptable coat of lock-down agent to surfaces.

.3 Repeat as necessary until fibre levels are less than 40 micrograms per square foot.

3.6 FINAL CLEAN-UP

.1 Following specified cleaning procedures, and when lead wipe sampling is below acceptable concentrations proceed with final cleanup.

.2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum equipment.

.3 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labeled waste containers for transport.

.4 Clean-up Work Areas, Equipment and Access Room, and other contaminated enclosures.

.5 Clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.

.6 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

3.7 RE-ESTABLISHMENT OF OBJECTS & SYSTEMS

.1 Repair or replace objects damaged in course of work to their original state or better, as directed by Departmental Representative.

END OF SECTION 02 83 11

PART 1 GENERAL

1.1 Related Work

.1	Section 31 23 10	Excavating, Trenching and Backfilling
.2	Section 03 20 00	Concrete Reinforcing
.3	Section 03 30 00	Cast-In-Place Concrete

1.2 References

.1 Canadian Standards Association (CSA International)

- .1 CSA-A23.1-09/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-14, Engineering Design in Wood.
- .3 CSA O121-M2008 (R2013), Douglas Fir Plywood.
- .4 CSA O151-09 (R2014), Canadian Softwood Plywood.
- .5 CSA O153-13, Poplar Plywood.
- .6 CAN/CSA-O325-07 (R2012), Construction Sheathing.
- .7 CSA O437 Series-93 (R2011), Standards for OSB and Waferboard.
- .8 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
- .9 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork, National Standard of Canada

.2 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 Submittals

.1 Submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.

.2 Submit shop drawings for formwork and falsework.

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada.

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health and Safety Requirements.

.4 Co-ordinate submittal requirements and provide submittals required by Section 01 33 00.

.5 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties,

liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and Comply with CAN/CSA-S269.3 for formwork drawings.

.6 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.7 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.4 Delivery, Storage and Handling

.1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert wood materials from landfill to a recycling, reuse, composting facility as approved by Departmental Representative.

.4 Divert plastic materials from landfill to a recycling, reuse, composting facility as approved by Departmental Representative.

.5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

PART 2 PRODUCTS

2.1 Materials

.1 Materials and resources in accordance with Section 01 61 00 – Requirements.

.2 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series, CSA-O153.

.2 Rigid insulation board: to CAN/ULC-S701.SPEC NOTE: Drawings should designate areas requiring special architectural concrete features.

.3 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.4 Form liners:

.1 Plywood: high density overlay, medium density overlay, Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151 or Poplar to CSA O153 grade, square edge, 20 mm thick.

.5 Form release agent: non-toxic, biodegradable, low VOC.

.6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm^2/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

.7 Falsework materials: to CSA-S269.1.

.8 Sealant: to Section 07 90 00 – Sealants.

PART 3 EXECUTION

3.1 Fabrication and Erection

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Do not place shores and mud sills on frozen ground.

.6 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.8 Align form joints and make watertight.

.1 Keep form joints to minimum.

.9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.12 Line forms for following surfaces:

.1 Outer face of outside girders beams and vertical edge of sidewalk slab.

.2 Soffit of girders and underside of bridge decks if exposed.

.3 Exposed faces of abutments, wingwalls, piers and pylons: do not stagger joints of form lining material and align joints to obtain uniform pattern. Secure lining taut to formwork to prevent folds.

.4 Pull down lining over edges of formwork panels.

.5 Ensure lining is new and not reused material.

.6 Ensure lining is dry and free of oil when concrete is poured.

.7 Application of form release agents on formwork surface is prohibited where drainage lining is used.

.8 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.

.9 Cost of textile lining is included in price of concrete for corresponding portion of Work.

.13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 Removal and Shoring

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 Three days for walls and sides of beams.

.2 Three days for columns.

.3 Three days for beam soffits, slabs, decks and other structural members, or one days when replaced immediately with adequate shoring to standard specified for falsework.

.4 One days for footings and abutments.

.2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

PART 1GENERAL

1.1 Related Work

.1	Section 03 10 00	Concrete Forming and Accessories
.2	Section 03 30 00	Cast-In-Place Concrete

1.2 Measurement Procedures

.1 Measure reinforcing steel in kilograms tonnes of steel incorporated into Work, computed from theoretical unit mass specified in CAN/CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by Departmental Representative.

.2 No measurement will be made under this Section.

.1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

1.3 References

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.1 ACI 315-99, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A143/A143M-07 (R2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.2 ASTM A1064/A1064M-09, Standard Specification for Carbon-Steel wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 ASTM A775/A775M-07b (R2014), Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-A23.3-04 (R2010), Design of Concrete Structures.

.3 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.

.4 CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-M92 (R2013), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.

.6 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2011, Reinforcing Steel Manual of Standard Practice.

1.4 Submittals

.1 Submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.

.3 Submit shop drawings including placing of reinforcement and indicate:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.

.1 Provide type A tension lap splices where indicated unless otherwise indicated.

When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

.5 Quality Assurance: Provide the following to the Departmental Representative.

.1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 Delivery, Storage and Handling

.1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

PART 2PRODUCTS

2.1 Materials

.1 Materials and resources in accordance with Section 01 61 10- Product Requirements.

.2 Substitute different size bars only if permitted in writing by Departmental Representative.

.3 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.4 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.

.5 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.

.6 Deformed steel wire for concrete reinforcement: to ASTM A497/A497M.

.7 Welded steel wire fabric: to ASTM A185/A185M.

.1 Provide in flat sheets only.

.8 Welded deformed steel wire fabric: to ASTM A497/A497M.

.1 Provide in flat sheets only.

.9 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m^2.

.1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.

.2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

.1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.

.3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.

.1 In this case, no restriction applies to temperature of solution.

.4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.

.1 Provide product description as described in PART 1 - SUBMITTALS

.10 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.11 Mechanical splices: subject to approval of Departmental Representative.

.12 Plain round bars: to CSA-G40.20/G40.21.

2.2 Fabrication

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.1 ACI 315R unless indicated otherwise.

.3 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.4 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.5 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 Source Quality Control

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

PART 3EXECUTION

3.1 Preparation

.1 Galvanizing to include chromate treatment.

.1 Duration of treatment to be 1 hour per 25 mm of bar diameter.

.2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

3.2 Field Bending

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 Placing Reinforcement

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.1 When paint is dry, apply thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

3.4 Field Touch-Up

.1 Touch up damaged and cut ends of galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

PART 1 GENERAL

1.1 Related Work

.1 Section 03 10 00 — Concrete Forming and Accessories

.2 Section 03 20 00 — Concrete Reinforcing

1.2 References

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM A1064/A1064M-09, Standard Specification for Carbon-Steel wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .2 ASTM D1751-04 (R2013), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).

.2 Canadian Standards Association (CSA International)

- .1 CSA-A23.1/A23.2-2004 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014) & Update No. 2 (2014).
  - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
- .2 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.

1.3 Design Requirements

Alternative 2 – Provide Performance Specification in accordance with CSA-A23.1/A23.2, and as described in Mixes of PART 2 - PRODUCTS.

1.4 Submittals

.1 Submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.

.2 At least 4 weeks prior to beginning Work, inform Departmental Representative source of fly ash and submit samples to Departmental Representative.

- .1 Do not change source of Fly Ash without written approval of Departmental Representative.

.3 At least 4 weeks prior to beginning Work, submit to Departmental Representative samples of following materials proposed for use: curing compound.

.4 Submit samples of materials to be used in concrete mix for testing:

- .1 Supplementary cementing materials.
- .2 Blended hydraulic cement.
- .3 Admixture.

.5 Submit testing inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.6 Concrete hauling time: submit for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 Quality Assurance

.1 Submit to Departmental Representative, minimum 4 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed to by the Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by the Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

1.7 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.2 Ensure emptied containers are sealed and stored safely.

.3 Use excess concrete for footing bottom.

.4 Divert unused concrete materials from landfill to local facility as reviewed by Departmental Representative.

.5 Provide appropriate area on job site where concrete trucks and be safely washed.

.6 Divert admixtures and additive materials from landfill to approved official hazardous material collections site as reviewed by Departmental Representative.

.7 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard

PART 2 PRODUCTS

2.1 Materials

.1 Cement: to CAN/CSA-A3001, Type GU.

.2 Blended hydraulic cement: Type GUb to CAN/CSA-A3001.

.3 Supplementary cementing materials: with minimum 10% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA A3001.Water: to CSA-A23.1/A23.2.

.4 Air entraining admixture: to CAN/CSA-23.1

.5 Chemical admixtures: to CAN/CSA-A23.1 as approved by Departmental Representative.

.6 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.

.7 Welded steel wire fabric: to ASTM A1064/A1064M

.8 Premoulded joint filler:

.1 Bituminous impregnated fibreboard: to ASTM D1751.

.8 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.

.9 Sealer: boiled linseed oil to ASTM D260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend. Exterior pavement areas : to ASTM C309 Liquid Membrane-Forming compound for Curing Concrete, Type 1.

.10 Other concrete materials: to CSA-A23.1/A23.2.

2.2 Mixes

.1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give the following properties:

.1 Cement: Type GU Portland cement

.2 Minimum compressive strength at 28 days, class of exposure and nominal size of coarse aggregate:

Member	minimum 28-days strength (MPa)	maximum aggregate size (mm)	exposure class Category	air content
Footings, Walls (Interior)	25	25	N	-
Raft interior walls	30	20	N	-
Beam, suspended slabs Perimeter footings/walls,	30	20	N	-
Exterior footings, columns	25	25	F-2	1
Slab on grade (Interior)	35	20	C-4	2
Suspended slabs/Slab on grade (Exterior)	35	20	C-2	1

.3 Slump at time and point of discharge: To CSA-A23.1 Clause 4.3.2.3. When super plasticizers are used, the slump may be increased by shall kept below the point where segregation will occur. The cost of super plasticizers shall be included in the cost of the concrete. Smaller aggregate size may be used where necessary to increase slump.

.4 Air content: To CSA-A23.1 Table 2 & 4 to suit appropriate exposure class.

.5 Chemical admixtures: following admixtures in accordance with to ASTM C494M. Admixtures shall contain no salts or acids.

.6 Concrete mix designs shall be submitted to a material consultant for approval and to Departmental representative for review prior to any concrete work.

.7 maximum 20% fly ash to be used for concrete slabs.

PART 3 EXECUTION

3.1 Preparation

.1 Provide Departmental Representative 48 hours notice before each concrete pour.

.2 Place concrete to CAN/CSA A23.1, Clause 19; Adhere strictly to CSA A23.1 for proper preparation of Cold Weather Concrete.

.3 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.4 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.

.5 Protect previous Work from staining.

.6 Clean and remove stains prior to application of concrete finishes.

3.2 Construction

.1 Perform cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

3.3 Inserts

.1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.

.1 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

3.4 Finishes

.1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA-A23.1/A23.2.

.2 Interior floor slabs to be left exposed to receive epoxy, carpet, sheet vinyl, other covering requiring smooth surface: initial finishing operations followed by final finishing comprising

mechanical floating and steel trowelling as specified in CSA-A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.

.3 Floor slabs to receive mortar bed for ceramic or quarry tile: screed to correct grade to provide broomed texture.

.4 Equipment pads: provide smooth trowelled surface.

.5 Pavements, walks, curbs and exposed site concrete:

.2 Screed to plane surfaces and use [aluminum] [magnesium] [wood] floats.

.3 Provide round edges and joint spacings using standard tools.

.4 Trowel smooth to provide lightly brushed non-slip finish.

3.5 Expansion and Isolation Joints

.1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA-A23.1/A23.2.

3.6 Curing

.1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and in accordance with CSA-A23.1/A23.2.

3.7 Sealing

.1 Following curing, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m^2/L. Allow first coat to dry before applying second coat. Apply poly-siloxane resin blend sealer at 4 m^2/L.

3.8 Site Tolerances

.1 Concrete floor slab finishing tolerance in accordance with CSA-A23.1/A23.2.

3.9 Field Quality Control

.1 Concrete testing: to CSA-A23.1/A23.2 by testing laboratory designated and paid for by Contractor. Accelerated test methods will apply.

3.10 Verification

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance.

3.11 Cleaning

.1 Use trigger operated spray nozzles for water hoses.

.2 Designate cleaning area for tools to limit water use and runoff.

.3 Cleaning of concrete equipment to be done in accordance with Section 01 35 43: Environmental Procedures.

END OF SECTION

PART 1GENERAL

1.1 Related Sections

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.3 Section 03 30 00 - Cast-in-Place Concrete.

.4 Sections 08 11 00 - Metal Doors and Frames

.5 Sections 08 11 16 - Aluminum Doors and Frames

.6 Section 08 71 00 – Door Hardware.

.7 Section 08 80 00 – Installation of Plastic Glazing in Acoustical Screens.

.8 Section 09 91 23 - Interior Painting.

.9 Section 09 91 13 - Exterior Painting.

1.2 References

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM A53/A53M-12, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A269/A269M-14, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307-12, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.

.2 CAN/CSA-G164-M92 (R2013), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA-S16.1-09, Limit States Design of Steel Structures.

.4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.5 CSA W59-13,Welded Steel Construction (Metal Arc Welding) (Imperial Version).

.4 The Environmental Choice Program

.1 CCD-047a-98, Paints, Surface Coatings.

.2 CCD-048-98, Surface Coatings - Recycled Water-borne.

.5 Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual – current edition.

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:

.1 For finishes, coatings, primers and paints.

.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 Quality Assurance

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section.

1.5 Delivery, Storage, and Handling

.1 Packing, Shipping, Handling and Unloading:

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Storage and Protection:

.1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.

.2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.6 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated and cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

PART 2PRODUCTS

2.1 Materials

.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W, 350W.

.2 Steel pipe: to ASTM A53/A53M standard weight and extra strong, double extra strong, black, galvanized finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A307; corrosion resistant types to ASTM A325M, Type 3. Provide all required anchoring devices including anchor clips, bar and strap anchors, expansion bolts and shields, and other devices designed to support and secure work.

.6 Aluminum sheet: proprietary utility sheet, plain, embossed pattern, mm minimum thickness, black, colour.

.7 Stainless steel tubing: to ASTM A269, Type 302, Commercial grade, Seamless welded with AISI No. 4 finish.

.8 Grout: non-shrink, non-metallic, flowable, 15 MPa pull out strength 7.9 MPa at 24 hours.

.9 Security Mesh: Sheets of carbon steel sheet expanded security mesh to requirements of ASTM A569M and to ASTM F1 267, Style: 20 mm, SWD-25 mm x LWD-54 mm, designed for penetration resistance, in sizes x 3 mm thick, 68% open area and 8.5 kg/m².

.10 Security fasteners: screws and bolts with spanner type heads to prevent removal except with special tools; non-corrosive type.

.11 Shop coat primer: to CAN/CGSB-1.40.

.12 Touch-up primer: to CAN/CGSB-1.40.

2.2 Fabrication

.1 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Fabricate items from steel unless indicated otherwise; use galvanized steel for exterior items, unless indicated otherwise.

.3 Use self-tapping shake-proof countersunk flat headed screws on items requiring assembly by screws or as indicated. Use screws for interior work. Use welded connections for exterior work, unless approved otherwise by Departmental Representative.

.4 Where possible, fit and shop assemble work, match mark, ready for erection.

.5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush with sharp edges and corners rounded to 3 mm radius. Where continuous welds may cause distortion of fabrication use stitch welds and plastic filler, grind and sand smooth.

.6 Seal exterior steel fabrications to provide corrosion protection in accordance with CAN/CSA-S16.1.

2.3 Finishes

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2 to CAN/CSA-G164.

.2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.

.3 Shop coat primer: to CAN/CGSB-1.40.

.4 Touch-up primer: to CAN/CGSB-1.40.

2.4 Isolation Coating

.1 Isolate aluminum from following components, by means of bituminous paint:

.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.

.2 Concrete, mortar and masonry.

.3 Wood.

2.5 Shop Painting

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.3 Clean surfaces to be field welded; do not paint.

PART 3EXECUTION

3.1 Erection

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Provide components for building by other sections in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 Miscellaneous Steel Brackets, Caps, Shoes, Beam Supports and Angles

.1 Supply for installation by respective trades. Drill for countersunk screws and anchor bolts.

3.3 Air Pass Through Grille

.1 Description: construct in accordance with details shown on Drawing.

.2 Use security screws for 6 mm Φ carriage bolts (weld head on).

.3 Prime paint.

.4 Paint air pass through grille to match wall colour. Paint formula 15: for primed ferrous metal surfaces.

3.4 Cleaning

.1 Perform cleaning after installation to remove construction and accumulate environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1GENERAL

1.1 Related Sections

.1 Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.

.2 Section 03 30 05 – Anchor bolts

.3 Sections 05 50 00, 06 18 20, 06 17 53 - Steel Shoes and brackets

.4 Structural Drawings S101/S102 – Wood Products General Notes and Typical Details

.5 Section 06 18 20 – Engineered Wood – “Parallam”

.6 Section 06 17 53 – Prefabricated Wood Trusses.

1.2 Reference Standards

.1 Canadian Standards Association (CSA International)

.1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
.2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CSA O121-08 (R2013), Douglas Fir Plywood.
.4 CAN/CSA-O141-05 (R2014), Softwood Lumber.
.5 CSA O151-09 (R2014), Canadian Softwood Plywood.
.6 CAN/CSA-O325-07 (R2012), Construction Sheathing.
.7 Comply with AWPA.M4 and revisions specified in CAN/CSA-080 Series, Supplementary Requirements to AWPA Standard M2.

.2 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2014.

1.3 Quality Assurance

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

.3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.4 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused wood materials from landfill to recycling, reuse and composting facility approved by Departmental Representative.

.5 Do not dispose of preservative treated wood through incineration.

.6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.

.7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative.

.8 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative.

.9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

PART 2PRODUCTS

1.1 Lumber Material

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

.1 Board sizes: "Standard" or better grade.

.2 Dimension sizes: "Standard" light framing or better grade.

.3 Post and timbers sizes: "Standard" or better grade species except as indicated.

.4 Framing and board lumber: in accordance with NBCC 2010 Subsection 9.3.2, except as follows:

.1 Roof joists, studs, chords in built-up beams: D-Fir NLGA No.2 or better U.N.O.

.2 Post and Beams: D-Fir species, NLGA No.1 grade.

.3 Wall studs: D-Fir species, NLGA No.2 grade or better.

.

.3 Glued end-jointed (finger-jointed) lumber products are acceptable for framing of interior non-load bearing studs.

2.2 Panel Materials

.1 Douglas fir plywood (DFP): to CSA O121, standard construction.

.2 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.

2.3 Panel Materials End Uses

.1 Roof sheathing: DFP sheathing grade T&G edge, 12.5 mm thick.

.2 Wall sheathing: DFP sheathing grade square edge, 12.5 mm thick.

.3 Miscellaneous plywood panels: DFP or CSP sheathing grade square edge, 19 mm thick, for wall backing, panel mounting boards and as indicated.

.4 Wall sheathing under wall waterproofing membrane: DFP sheathing grade T&G edge, 16 mm thick pressure preservative treated to para. 2.7.1.

2.4 Sheathing Paper

.1 Exterior wall sheathing paper:
- .1 Single ply asphalt-kraft sheet conforming to CAN/CGSB 51.32M77, US st'd UUB-790a as a 30 minute water resistant paper applied in two layers.

2.5 Damproof Membrane

.1 Wood plates in contact with concrete: use pressure preservative treated wood D-Fir Grade No. 1 or better with compressible gasket filler of either 25 mm fibreglass insulation, closed cell polyethylene sponge 3 mm thick or roll roofing.
- .1 Fibre glass insulation to: Section 07 21 30.
- .2 Roll roofing: to CSA A123.2, Type S.
- .3 Poly closed cell sponge gasket: as approved by Departmental Representative.

.2 Waterproofing membrane: Self-adhering or adhesive-applied SBS modified bituminous membrane minimum 1.5 mm thickness reinforced with material for application over primed substrate; of steel, aluminium, galvanized steel, gypsum board and plywood, conforming to the following:

- .1 Tensile strength: 150 n/5 cm.
- .2 Air permeance: less than 0.01 l/m sq. at 75 Pa pressure difference.
- .3 Sheet membrane: conforming to CGSB 37-GP-56M-1980.
- .4 Acceptable products:
  - .1 Perm-a-Barrier System 4000, Grace Membrane Group
  - .2 BlueSkin SA Air Barrier Membrane, Monsey-Bakor.
  - .3 Sopraseal Stick 1100, Soprema.
  - .4 QSC-705 Carlisle Coatings and Waterproofing.

2.6 Accessories

.1 Nails, spikes and staples: to CSA B111. All nailing shall be common nails. If P-nails (Power driven nails) are intended as substitution, submit P-nails information for Departmental representative's review prior to use. Adjustment of nails spacing or requirements may be required.

.2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and cut steel washers. All bolts and anchor bolts shall conform to ASTM A307. Bolt holes shall be 1 mm larger than the bolt diameter. Bolts in wood shall not be less than 7 diameter from the end and 4 diameters from the edge unless otherwise detailed.

.3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.4 Steel plates: All steel plates used in connection details shall be grade 300W.

.5 Lag screws: Lag screws shall be predrilled with a bit size of 65% of the shank diameter for the threaded portion. Lead holes shall be the same length as the unthreaded portion and the same diameter as the shank. Screw all lags into place. Cut washers shall be provided under heads which bear on wood.

.6 No checks or splits allowed at areas to be bolted or lagged.

.7 All bolts, steel plates/connections and nails for use with red cedar wood to be hot dipped galvanized to ASTM A653 class G90 as produced by Simpson Strong Tie or approved equal by the Departmental representative.

.8 Galvanizing: to CSA G164 unless noted otherwise. Use galvanized fasteners for exterior work, interior highly humid areas.

.9 Joist/beam hangers, post bases: unless noted otherwise shall be hot dipped galvanized as per manufacture and approved by the Departmental representative.

2.7 Finishes

.1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, interior highly humid areas, pressure- preservative, and fire-retardant treated lumber.

.2 Stainless steel: use stainless steel or alloy for fastener for work mentioned in .1 above or alternative are acceptable and at contractors cost.

2.8 Wood Preservative

.1 Surface-applied wood preservative: clear, coloured, or copper napthenate or 5% pentachlorophenol solution, water repellent preservative.

.2 Pentachlorophenol use is restricted to building components that are in ground contact and subject to decay or insect attack only. Where used, pentachlorophenol-treated wood must be covered with two coats of an appropriate sealer.

.3 Structures built with wood treated with pentachlorophenol and inorganic arsenicals must not be used for storing food nor should the wood come in contact with drinking water.

PART 3EXECUTION

3.1 Preparation

.1 Comply with AWPA.M4, use copper napthenate to manufacturer's instructions.

.2 Treat surfaces of material with wood preservative, before installation.

.3 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.4 Re-treat surfaces of PT Lumber and plywood exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.5 Treat material as indicated and as follows:

- .1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck.
- .2 Wood furring for member on outside surface of exterior masonry and concrete walls.
- .3 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.
- .4 Plywood wall sheathing under water proofing membrane.

3.2 Installation

.1 Comply with requirement of NBCC 2010, Part 9 and General Notes on Structural Drawings. Where conflict exists, the more stringent requirements will apply.

.2 Install members true to line, levels and elevations.

.3 Construct continuous members from pieces of longest practical length.

.4 Install spanning members with "crown-edge" up.

.5 Install all exterior pressure treated timber sill plates using 16 DIA. Anchor bolts @ 1000o.c. into ground U.N.O.; refer to structural drawing S102 for shearwall anchorage. Anchor interior non-structural wall sill plates with minimum 12 Dia. Anchor bolts @ 2400 o.c.

.6 Stud walls abutting a concrete or masonry wall shall be bolted to the wall with 12 Dia. Anchor bolts @ 600 o.c. through a double stud.

.7 Install lumber and panel materials so that grade-marks and other defacing marks are not visible or are removed by sanding at location (s) where exposed in final assembly.

.8 All built-up beams to be D-fir Grade No. 2 or better nailed through each lamination using 82 min. nails on a 150 mm grid.

.9 Install plywood roof sheathing with surface grain at right angles to roof framing. Provide solid blocking necessary to ensure maximum span on roof sheathing edge does not exceed 610 mm in either direction.

.10 Install sheathing over framing members as indicated using nails to NBCC part 9 requirements and in accordance with structural drawing.

.11 Install wall sheathing with panel side joints on solid bearing staggered at least 800 mm. Nail at perimeter edge 150 mm o.c. minimum and at interior of panels 300 mm o.c. minimum. Use minimum 65 mm long nails. Refer to general Notes on structural drawing for nailing pattern.

.12 Apply peel and stick waterproof membrane at all window and door openings at jambs, head and sill. Apply waterproofing membrane over wood framing where wood framed wall is adjacent to backfill and concrete.

.13 Apply building paper in two layer application over sheathing using staples or auto-nailer.

.14 Install furring, strapping and solid backing in walls and structures as required to space-out and support casework, cabinets, applied finishes, facings, pipe chases, wall mounted door stops, access hatches, electrical and mechanical fixtures, washroom accessories, benches, prefab showers, overhead door hardware and other work as required. Use solid blocking or 19 mm plywood securely nailed to framing members.

.15 Frame and strap for suspended gypsum board ceiling finishes.

.16 Align and plumb faces of furring and blocking to tolerance of 1:600.

.17 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.

.18 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.19 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized, or steel fasteners.

.20 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.

.21 Install sleepers as indicated.

.22 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

3.3 Erection

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

3.4 Schedules

.1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Material and installation for prefabricated wood trusses.
.2 Sustainable requirements for construction and verification

.2 Related Sections:

.1 Section 01 01 50 – General Instructions for Construction Progress Schedules.
.2 Section 01 01 50 – General Instructions for Submittal Procedures.
.3 Section 01 35 33 - Health and Safety Requirements.
.4 Section 01 01 50 – General Instructions for Sustainable Requirements: Construction.
.5 Section 01 01 50 – General Instructions for Sustainable Requirements: Contractor's Verification.
.6 Section 01 01 50 – General Instructions for Common Product Requirements.
.7 Section 01 01 50 – General Instructions for Construction/Demolition Waste Management and Disposal.
.8 Section 06 10 11 – Rough Carpentry.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA O80 Series-08 (R2012), Wood Preservation.
.2 CAN/CSA-O86-01 (R2006), Engineering Design in Wood.
.3 CAN/CSA-O141-05 (R2014), Softwood Lumber.
.4 CSA S307-M1980 (R2006), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
.5 CSA S347-14, Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
.6 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 National Lumber Grades Authority (NLGA)

.1 NLGA-2014, Standard Grading Rules for Canadian Lumber.

.4 National Research Council (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)

.1 CCMC-2014, Registry of Product Evaluations.

.5 Truss Plate Institute of Canada (TPIC)

.1 TPIC – 2014, Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

1.3 DESIGN REQUIREMENTS

.1 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CAN/CSA-O86.

.2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.

.3 Design trusses, bracing, bridging in accordance with CAN/CSA-O86.1 including supplement CSA-86S1.05 for loads indicated for building locality as ascertained by NBC, Climatic Information for Building Design in Canada and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.

.4 Limit live load deflection to 1/360th of span where plaster and gypsum board ceilings are hung directly from trusses.

.5 Limit live load deflections to 1/240th of span unless otherwise specified or indicated.

.6 Provide camber for trusses as indicated: precamber for dead load plus 25% live load.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.

.2 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

.2 Pre-Installation Meeting:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 01 50 – General Instructions for Construction Progress Schedules - Bar (GANTT) Chart.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

.4 Construction requirements: in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Construction.

.5 Verification: contractor's verification in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Contractor's Verification.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit two copies of Workplace Hazardous Materials Information System WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 61 33 - Hazardous Materials. Indicate VOCs during application and curing.

.3 Shop Drawings:

.4 Each shop and erection drawing submission showing connection details to be signed and stamped by professional engineer registered or licensed in province of British Columbia, Canada.

.5 The Professional Engineer responsible for the shop drawings shall inspect the installation of the work for conformance with the design and the shop drawings, and shall upon completion of the work, provide to the Departmental Representative a completed Schedules S-B: Assurance of Professional Design and Commitment for Field Review by Supporting Registered Professional, and Schedule S-C: Assurance of Professional Field

Review and Compliance by Supporting Registered Professional.

.6 Indicate special structural application and specification as according to local Authorities having jurisdiction.

.7 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates

.8 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.

.9 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.

.10 Do load testing on representative trusses selected by Departmental Representative. Provide certification that trusses meet requirements of CSA S307 and CSA S347.

.11 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

.12 Show location of lateral bracing for compression members.

.13 Test reports: submit certified test reports for prefabricated wood trusses from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.14 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.15 Instructions: submit manufacturer's installation instructions.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with 01 01 50 – General Instructions for Common Product Requirements.

.2 Storage and Protection:

.1 Store trusses on job site in accordance with manufacturer's instructions. Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

.3 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions for Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste in accordance with Waste Management Plan (WMP).

.5 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

.1 Materials and products in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Construction.

.2 Lumber: Hem-Fir or S-P-F species, No 2 or better grade, softwood, S4S, with maximum moisture content of 19% at time of fabrication and to following standards:

.1 CAN/CSA-O141.

.2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.

.3 Fastenings: to CAN/CSA-O86.

2.2 FABRICATION

.1 Fabricate wood trusses in accordance with reviewed shop drawings.

.2 Provide for design camber and roof slopes when positioning truss members.

.3 Connect members using plywood gussets or metal connector plates.

.4 Cut truss members to accurate length, angle, and size to assure tight joints for finished trusses.

.5 Assemble truss to design configuration.

2.3 SOURCE QUALITY CONTROL

.1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.Execution

2.4 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

2.5 ERECTION

.1 Erect wood trusses as indicated in accordance with reviewed approved shop drawings.

.2 Handling, installation, erection, bracing and lifting in accordance with manufacturers instructions.

.3 Make adequate provisions for handling and erection stresses.

.4 Exercise care to prevent out-of-plane bending of trusses.

.5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.

.6 Install permanent bracing in accordance with reviewed shop drawings, prior to application of loads to trusses.

.7 Do not cut or remove any truss material without approval of Departmental Representative.

.8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

2.6 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product[s], and

submit written reports, in acceptable format, to verify compliance of work with Contract.

.2 Manufacturer's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.

.3 Schedule site visits to review work at stages listed:

.1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.

.2 Twice during progress of work at 25% and 60% complete.

.2 Upon completion of work, after cleaning is carried out.

.3 Obtain reports within three days of review and submit immediately to Departmental Representative.

.4 Verification requirements in accordance with Section 01 01 50 – General Instructions for Sustainable Requirements: Contractor's Verification, include:

.1 Materials and resources.
.2 Storage and collection of recyclables.
.3 Construction waste management.
.4 Resource reuse.
.5 Recycled content.
.6 Local/regional materials.
.7 Certified Wood.
.8 Low-emitting materials.

2.7 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment on completion of installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 01 50 – General Instructions for Submittal Procedures.

.2 Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.

.3 Section 01 01 50 – General Instructions for Common Product Requirements.

.4 Section 06 10 11 – Rough Carpentry.

.5 Section 06 17 53 – Shop Fabricated Wood Trusses.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM A36/A36M-12, Specification for Carbon Structural Steel.

.2 ASTM A47/A47M-99 (R2014), Specification for Ferritic Malleable Iron Castings.

.3 ASTM A307-12, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.4 ASTM A653/A653M-13, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.

.3 Canadian Standards Association (CSA International)

.1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.

.2 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 CAN/CSA-G164-M92 (R2013), Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 CAN/CSA-O80 Series-08 (R2012), Wood Preservation.

.5 CAN/CSA-O86.01 (R2006), (including supplement CSA-086S1-05 Limit States Design), Engineering Design in Wood.

.6 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.

.7 CAN/CSA-O122-M2006 (R2011), Structural Glued-Laminated Timber.

.8 CAN/CSA-O177-M2006 (R2011), Qualification Code for Manufacturer's of Structural Glued-Laminated Timber.

.9 CAN/CSA-S16-09, Limit States Design of Steel Structures.

.10 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel Structures.

.11 CAN/CSA-Z808-96, A Sustainable Forest Management System: Guidance Document.

.4 Others

.1 Canada Mortgage and Housing Corporation Report No.11161 issued 80-04-03 Revised 88-11-29

.2 General Notes

1.3 SHOP DRAWINGS

.1 Submit shop and erection drawings in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.

.2 Submit erection drawings in accordance with CAN/CSA-S16.

.3 Shop drawings for members to indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.

.4 Each erection and shop drawing submission shall bear signature and stamp of qualified professional engineer registered or licensed in province of British Columbia, Canada, for items designed by fabricator or manufacturer.

1.4 QUALIFICATIONS

.1 Manufacture structural Parallel Strand Lumber (PSL) Engineered Wood members in plant certified by CSA as meeting requirements of CAN/CSA-O177, class X.

.2 Submit certificate in accordance with CAN/CSA-O177, Appendix B at completion of fabrication.

.3 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

.4 Place Parallel Strand Lumber (PSL) Engineered Wood members indicating manufactured in CSA certified plant.

.5 Certification of material protective sealer.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials of this section in accordance with Section 01 61 00 - Common Product Requirements.

.2 Apply protective sealer to PSL units before shipping unless specified otherwise.

.3 Wrap quality commercial grade members prior to leaving plant with a moisture resistant wrapping.

.4 Use padded, non-marring slings for handling PSL members.

.5 Protect corners with wood blocking.

.6 Slit underside of membrane covering during storage at site. Do not deface member.

.7 Store PSL units and protect from weather, block off ground and separate with stripping, so air may circulate around all faces of members.

.8 Cover PSL units with opaque moisture resistant membrane if stored outside.

.9 Make adequate provision for delivery and handling stresses.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.5 Divert unused paint material from landfill to official hazardous material collections site approved by Departmental Representative.

.6 Do not dispose of unused paint materials or preservative material into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.7 Do not dispose of preservative treated wood through incineration.

.8 Do not dispose of preservative treated wood with materials destined for recycling or reuse.

.1 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental Representative.

.9 Dispose of unused wood preservative material at official hazardous material collections site approved by Departmental Representative.

.10 Divert unused wood materials from landfill to recycling, reuse, and composting facility approved by Departmental Representative.

Part 2 PRODUCTS

2.1 MATERIALS

Parallel Strand: Douglas Fir-Larch, Hem Fir and Douglas Fir-Larch, Lodgepole Pine and/or Spruce to CAN/CSA-O122 as manufactured by,

Property	Grade 2.0 E Stress (MPa)	Grade 2.2 E Stress (MPa)
Flexural Stress, f_b	20.0	22.0
Tension parallel to grain, f_t	16.5	16.5
Compression parallel to grain, f_c	20.0	20.0
Compression to perpendicular to grain, f_{cp}		
load parallel to wide face of strand	5.17	5.17
load perpendicular to wide face of strand	3.31	3.31
Horizontal shear, f_v		
load parallel to wide face of strand	2.0	2.0
load perpendicular to wide face of strand	1.45	1.45
Modulus of elasticity, MOE	13790	15170

.1 Adhesive: to CSA O112 Series, to grade of service required in accordance with CAN/CSA-O122.

.2 Sealer for PSL members: penetrating type, clear, non-yellowing liquid.

.3 Fastenings:

- .1 Split ring connections: hot rolled carbon steel, SAE 1010, meeting requirements of SAE handbook.
- .2 Shear plate connections.
  - .1 Pressed steel type: hot rolled carbon steel, SAE 1010, meeting requirements of SAE handbook.
  - .2 Malleable iron type: to ASTM A47/A47M, grade [350].
- .3 Lag screws: to general notes.
- .4 Bolts: to ASTM A307.
- .5 Side plates: to CAN/CSA-G40.20/G40.21 or ASTM A36.
- .6 Drift pins: to ASTM A307.
- .7 PSL rivets: hot dip galvanized to CAN/CSA-G40.20/G40.21, ASTM A36.
- .8 Nails and spikes: to CSA B111.
- .9 Truss plates: light gauge galvanized sheet steel to ASTM A653, grade A, yield point 230 MPa.

.4 Shop coat primer for steel connections: to CAN/CGSB-1.40.

.5 Galvanizing: to CAN/CSA-G164, hot dipped, minimum zinc coating of 610 g/m^2.

.6 Preservative: Pressure treatment to CSA-080-Series 97 applies in accordance with manufacturers instructions.

2.2 FABRICATION

.1 Fabricate members to following classifications:

.1 All 68mm thick parallel strand members shall be Grade 2.2E.

.2 All other thickness shall be Grade 2.0E.

.2 Mark parallel strand members for identification during erection. Marks not to be visible in final assembly.

.3 Do not apply sealer to areas which are to receive stained finish or preservative treatment.

.4 Design connections to CAN/CSA-O86, and CAN/CSA-S16 unless specifically detailed, to resist shears, moments and forces indicated.

.1 Fabricate in accordance with CAN/CSA-S16.

.5 Galvanize or prime paint connections after fabrication.

Part 3 Execution

3.1 PRESERVATIVE TREATMENT

.1 Pressure treat all indicated members with preservative and fire-retardant in accordance with CAN/CSA-O80 Series after fabrication.

3.2 ERECTION

.1 Protect protective sealer from damage before erection.

.1 Touch up damaged areas on site with specified sealer.

.2 Erect parallel strand members in accordance with reviewed shop drawings and in strict accordance with manufacturer's instructions.

.3 Except where detailed otherwise on the drawings provide lateral support at points of bearing to prevent lateral displacement and rotation.

.4 Brace and anchor materials until permanently secured by the structure.

.5 Where members are framed into masonry or concrete provide a minimum 12 mm air space at ends and sides of member.

.6 Parallel strand members supported on concrete shall be separated from the concrete surface with .05 mm polyethylene sheet or type S roll roofing.

.7 Nailing to conform to table 9.23.3.4 of the National Building Code - 2010. Nails installed on the narrow face, parallel to the glue lines shall be spaced a minimum of 100 mm for 76 mm common nails and a minimum of 75 mm for 64 mm common nails.

.8 Notching and drilling is not permitted without prior approval of Departmental Representative.

.9 Splice and joint only at locations indicated on reviewed shop drawings.

.10 Parallel strand lumber shall have a moisture content not exceeding 12% at time of installation.

.12 Remove from site all damaged members. Repairs are not permitted.

.13 Fir all members closely and accurately to all other members and other assemblies.

.14 Field cutting and alteration of members is not permitted without Departmental Representative 's approval.

.15 Collect waste wood pieces from cutting for reuse where appropriate.

END OF SECTION

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Rough Carpentry Section 06 10 11

.2 Door Hardware Section 08 71 00

1.2 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards, 1st edition, 2009 (AWS).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-11.3-M87, Hardboard.

.3 CSA International
- .1 CSA B111-74 (R2003), Wire Nails, Spikes and Staples.
- .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O141-05, Softwood Lumber.
- .5 CSA O151-09, Canadian Softwood Plywood.
- .6 CSA O153-13 Poplar Plywood.

.4 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.
- .3 FSC Accredited Certified Bodies.

.5 National Lumber Grades Authority (NLGA)
- .1 NLGA Standard Grading Rules for Canadian Lumber 2008.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168 2005, Adhesives and Sealants Applications.

.7 Underwriters Laboratories of Canada (ULC)
- .1 CAN4-S104-10 Standard Method for Fire Tests of Door Assemblies.
- .2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for plywood MDF and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements.

.3 Shop Drawings:
- .1 Submit drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Indicate details of construction, profiles, jointing, fastening and other related details.
- .3 Indicate materials, thicknesses, finishes and hardware.

.4 Samples:
- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.

.5 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

.6 Test and Evaluation Reports: submit certified test reports for composite wood from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

.1 Lumber by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).

.2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.

.3 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada to CAN4-S104 and CAN/ULC-S105.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect wood products from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan Waste Reduction Workplan related to Work of this Section

.5 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal

2.0 PRODUCTS

2.1 MATERIALS

.1 Softwood lumber: S4S, moisture content 19% or less in accordance with following standards:
- .1 CSA O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber
- .3 AWMAC custom or premium grade, where noted, moisture content as specified.
- .4 Machine stress-rated lumber is acceptable.

.2 Hardwood lumber: moisture content 10% or less in accordance:
- .1 AWMAC custom grade, moisture content as specified.

.3 Panel Material: Urea-formaldehyde free
- .1 Recycled content: provide information indicating recycled content on a % (Post-Consumer + ½ Post-Industrial)
- .2 FSC certified.
- .3 Douglas fir plywood (DFP): to CSA O121, standard construction. 6.1.5 and 6.2.5 where both sides exposed to view.
- .4 Hardwood plywood: to ANSI/HPVA HP-1.
- .5 Medium density fibreboard (MDF): to ANSI A208.2, density 640-800 kg/m³.
- .6 Decorative overlaid composite panels.
  - .1 Decorative overlay, heat and pressure laminated with suitable resin to thickness indicated MDF urea-formaldehyde free core.
  - .2 Overlay bonded to both faces where exposed two sides, and when panel material require surface on one side only, reverse side to be overlaid with a plain (buff) balancing sheet.
  - .3 Furniture finish: stain wood grain pattern selected by Departmental Representative.
  - .4 Edge finishing: edges dadoed or saw kerfed to take plastic "T" moulding in width and colour to match melamine finish.

2.2 ACCESSORIES

.1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.2 Wood screws: plain, type and size to suit application.

.3 Splines: wood

.4 Adhesive and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

3 .0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Do finish carpentry to AWS Custom Grade.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

3.3 CONSTRUCTION

.1 Fastening:
- .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by finish carpentry installation.

END OF SECTION 06 20 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Joint Sealants	Section 07 92 00
.3	Interior Painting	Section 09 91 23

1.2 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 2009.

.2 Canada Green Building Council (CaGBC)
- .1 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For Commercial Interiors.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.4 CSA International
- .1 CSA B111-74 (R2003), Wire Nails, Spikes and Staples.
- .2 CSA O112.4 SERIES-M1977 (R2006), Standards for Wood Adhesives.
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O141-05, Softwood Lumber.
- .5 CSA O151-09, Canadian Softwood Plywood.
- .6 CSA O153-M1980 (R2008), Poplar Plywood.

.5 American National Standards Institute (ANSI)
- .1 ANSI/NPA A208.1-09, Particleboard.
- .2 ANSI/NPA A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
- .3 ANSI/HPVA HP-1 04, Standard for Hardwood and Decorative Plywood.

.6 ASTM International
- .1 ASTM E 1333-96 (2002), Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using A Large Chamber.
- .2 ASTM D 2832-92 (R2005), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.7 ASTM D 5116-06, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.8 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1.

.9 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .2 GS-36-00, Commercial Adhesives.

.10 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS)

.11 National Electrical Manufacturers Association (NEMA)
- .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

.12 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.

.13 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2003(R2007).

.14 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1113-A2007, Architectural Coatings.
.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 SUBMITTALS
.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for architectural woodwork and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Indicate details of construction, profiles, jointing, fastening and other related details.
.1 Scales: profiles half-full sized, details quarter-full sized.
.2 Indicate materials, thicknesses, finishes and hardware.
.3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

.4 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit duplicate samples of solid surface and quartz surface.

.5 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Sustainable Design Submittals:
.1 Construction Waste Management:
.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating amount of construction wastes that are recycled or salvaged.
.2 Recycled Content:
.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
.3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
.4 Certified Wood:
.1 Submit listing of wood products and materials used, produced from wood obtained from forests certified by FSC Accredited Certification Body in accordance with FSC-STD-01-001.
.2 Submit manufacturer's FSC Chain-of-Custody Certificate number.
.5 Low-Emitting Materials:
.1 Submit listing of adhesives and sealants and paints and coatings used in building,

comply with VOC and chemical component limits or restrictions requirements.

.2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins, and laminate adhesives used in building, stating that they contain no urea-formaldehyde.

1.4 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.

.3 Mock-ups:

.1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.

.1 Shop prepare one base cabinet unit, wall cabinet, counter top and shelving unit complete with hardware and shop applied finishes, and install where directed by Departmental Representative.

.2 Allow 72 hours for inspection of mock-up by Departmental Representative before proceeding with Work.

.3 When accepted, mock-up will demonstrate minimum standard for Work.

.4 Do not proceed with work prior to receipt of written acceptance of mock-up by Departmental Representative.

.5 Mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.1 Protect millwork against dampness and damage during and after delivery.

.2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect architectural woodwork from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work

.5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

1.6 COORDINATION & VERIFICATION

.1 Verify all dimensions & existing conditions on job site prior to all shop fabrication and work on site. Where major discrepancies occur, alert Departmental Representative.

.2 Coordinate work of this section with that of wall, electrical and mechanical sections where millwork interfaces with drywall partitions, plumbing, electrical outlets, etc.

.3 It shall be the responsibility of this section to verify the dimensions and installation details for all Departmental Representative supplied equipment and furnishings requiring cut-outs, adaptations and interfacing with millwork items.

1.7 INSPECTION

.1 Architectural woodwork shall be manufactured and/or installed to AWMAC Quality Standards (Custom Grade) and shall be subject to an inspection at the plant and/or site, by an appointed inspector approved by the M.M.A.B.C. (the BC Chapter of AWMAC). Such inspection costs shall be included in the tender price for this project. Shop drawings shall be submitted for review or approval before any work is commenced. Where it is deemed necessary by the Departmental Representative, a sample cabinet (consisting of a minimum of 1 drawer, 1 door, showing precisely the materials, hardware and the type of construction the manufacturer intends to use), shall be submitted for inspection.

.2 Any work which does not meet AWMAC Quality Standards as specified, shall be replaced by this Section at no additional cost to the Department Representative and to the satisfaction of the Departmental Representative and the inspector.

1.8 GUARANTEE

.1 This section shall furnish the Departmental Representative with a two (2) year M.M.A.B.C. (The BC Chapter of AWMAC) Guarantee Certificate or an equivalent maintenance bond, to the full value of the architectural woodwork sub-contract, certifying that the architectural woodwork supplied will be in accordance with the Standards incorporated in the AWMAC Quality Standards manual, latest edition.

.2 The Guarantee shall cover replacing and refinishing to make good any defects in architectural woodwork due to faulty workmanship or defective materials supplied by this Section, which appear during a two (2) year period following the substantial completion of the Project.

2.0 PRODUCTS

2.1 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

1 This schedule is attached in the appendix and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.2 MATERIALS

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 15% or less in accordance with following standards:
- .1 CSA O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 AWMAC custom grade, moisture content as specified.
- .4 Forestry Stewardship Council (FSC) certified.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Hardwood lumber: moisture content 15% or less in accordance with following standards:
- .1 National Hardwood Lumber Association (NHLA).
- .2 AWMAC custom grade, moisture content as specified.

.4 Douglas fir plywood (DFP): to CSA O121, standard construction, FSC certified.
.1 Plywood resin to contain no added urea-formaldehyde.

.5 Canadian softwood plywood (CSP): to CSA O151, standard construction, FSC certified.
.1 Plywood resin to contain no added urea-formaldehyde.

.6 Hardwood plywood: to ANSI/HPVA HP-1, FSC certified.
.1 Plywood resin to contain no added urea-formaldehyde.

.7 Poplar plywood (PP): to CSA 0153, standard construction, FSC certified.
.1 Plywood resin to contain no added urea-formaldehyde.

.8 Hardboard:
.1 To CAN/CGSB-11.3, FSC certified.
.2 Hardboard resin to contain no added urea-formaldehyde.

.9 MDF (medium density fibreboard) core: to ANSI/NPA A208.2, Grade Custom, density 769 kg/m², FSC certified.
.1 Medium density fibreboard performance requirements to: ANSI/NPA A208.2.
.2 MDF resin to contain no added urea-formaldehyde.

.10 Nails and staples: to CSA B111.

.11 Wood screws: stainless steel, type and size to suit application.

.12 Splines: metal.

.13 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
.1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.

2.3 SOLID SURFACE VANITY

.1 Quartz Surface (SS-1)
.1 Composition:
.1 Synthetic resin - <10% by weight
.2 Quartz (Crystalline silica) - >40-90% by weight
.3 Colorant - <1% by weight
.4 Additives - <1% by weight
.2 Technical Data:

.1	Abrasion Resistance (Weight Loss):	To ASTMD 4060	1094 mg
.2	Izod Impact Strength:	To ASTM D 256 (Method A)	13.3 J/m
.3	Boiling Water Resistance	To NEMA LD3 2000 3.5	No Effect
.4	Colorfastness	To ANZI Z124.6.5.1	Pass
.5	Compression Strength (Dry) Compression Strength (Wet)	To ASTM C 170 To ASTM C 170	209 MPa 203 MPa
.6	Density	To KSF 2530	4.465 g/cm^3
.7	Deflection Temperature Under Load (1.82 MPa)	To ASTM D 648	243˚ C

.8	Flammability Flame Spread Smoke Developed	To ASTM E-84, NFPA 255	Class A
9	Flexural Modulus Flexural Strength	To ASTM D 790 To ASTM D 790	39.7 GPa 41.4 MPa
.10	Freeze & Thaw Cycling	To ASTM C 1026	Unaffected
.11	Fungal & Bacterial Resistance	To ASTM G 21	No Growth
.12	Barcol Hardness	To ASTM D 2583	86
.13	Rockwell Hardness (HRM)	To ASTM D 785 (Procedure	115
.14	Point Impact	To ANSI Z124.6.4.2.1	Pass
.15	Slip Resistance Static Coefficient of Friction (Dry) Static Coefficient of Friction (Wet)	To ASTM To C1028 To ASTM To C1028	0.67 0.49
.16	Stain Resistance	To ANSI Z124.6.5.2	Pass
.17	Tensile Strength	To ASTM D 638	17.8 MPa
.18	Thermal Expansion	To ASTM D-696	1.52 x10^{-5} in/in/°C
.19	Water Absorption Long-term & Short-term	To ASTM D 570 (24hr. Immersion)	<0.011%
20	Wear & Cleanability	To ANSI Z124.6.5.3	Pass

.3 Thickness: 13 mm UNO
.4 Colour: Turquoise with randomly spaced translucent fine tone-on-tone particles.
.5 Sheet Size: As shown on drawings
.6 Acceptable Product: Refer to Interior Finish Material and Colour Schedule

.2 Solid Surface (SS-2)

.1 Material:

.1 Non-porous, homogeneous material maintaining the same composition through the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:

.1 Flammability: Flame Spread Index: 0 and Smoke Development Index: 5 when tested to CAN/ULC-S102.

.2 Cpmtaoms a minimum of 13% pre-consumer recycled content as verified by SCS.

.2 Technical Data:

.1	Tensile Strength	6000 psi min	ASTM D638
.2	Tensile Modulus	1.5 x 10^6 psi min	ASTM D638
.3	Tensile Elongation	0.4% min.	ASTM D638
.4	Flexural Strength	10000 psi min	ASTM D790
.5	Flexural Modulus	1.2 x 10^6 psi min	ASTM D790
.6	Hardness	>85-Rockwell "M" scale min.	ASTM D785
.7	Thermal Expansion	3.90 x 10^{-5} in./in./°C (2.2 x 10^{-5} in./in./°F)	ASTM E228
.8	Fungi and Bacteria	Does not support microbial growth	ASTM G21 & G22

.9	Microbial Resistance	Highly resistant to mould growth		UL 2824
.10	Ball Impact	No fracture - 1/2 lb. Ball: 1/4" slab - 36" drop 1/2"* slab - 144" drop * - approximate weight per sq ft		NEMA LD 3, Method 3.8
.11	Weatherability	ΔE^*_{94}<5 in 1,000 hrs		ASTM G155
.12	Flammability			ASTM E84, NFPA 255 & UL 723
.13	Flame Spread		<25	
.14	Smoke Developed		<25	
.15	Class		A	NFPA 101®, Life Safety Code

.3 Thickness: 13 mm UNO

.4 Color: Monochromatic yellow-based material, color similar to unprocessed fibers, in a smooth matrix with randomly spaced translucent particles and a small tone-on-tone particles.

.5 Sheet Size: As shown on drawings.

.6 Acceptable product: Refer to Interior Finish Material and Color Schedule

.3 Accessories:

.1 Silicone Sealant: Mildew-resistant, FDA-compliant sealant recommended by manufacturer, in colour to match solid surface.

.2 All other accessories as recommended by solid surface manufacturer.

.3 Ultra-Bond G Adhesive: Pre-measured and pre-tinted two part adhesive colored to match surfacing.

.4 Sink: Integral sink(s) as selected from manufacturer's standard sink designs, and colors, and formed integrally with countertops. Sink size to be approximately 416 mmx330 mm x 140 mm deep back overflow, shape to comply with accessibility requirement for clear space below sink.

.5 Backsplash and Sidesplash = Integral Coved (2 piece not acceptable).

2.4 FABRICATION

.1 Fabricate material in accordance with manufacturer's Fabrication Guide.

.2 Fabricate countertops, sinks, and splash of 13 mm thick material unless otherwise indicated.

.3 Cut and finish component edges with clean, sharp returns. Finished edges shall have a 1.6 mm radius.

.4 Integral Cove: Provide shop fabricated integrally molded coves at backsplash and ends where against walls or other vertical surfaces, with 9.5 mm radius between top and splash.

.5 Integral Sinks shall be formed integrally with countertops.

.6 Cutouts for sinks shall be smooth and uniform without saw marks. The top and bottom of openings shall be finished smooth. Maintain minimum 6 mm radius for sink cutouts.

.7 Cutouts for accessories shall be smooth and uniform without saw marks. The top and bottom of openings shall be finished smooth.

.8 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.

.9 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.10 Shop assemble work for delivery to site in size easily handled and to ensure passage through building

openings.

3.0 EXECUTION

3.1 EXAMINATION

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Do architectural woodwork to Quality Standards of AWMAC.

.2 Install vanity in accordance with manufacturer's instructions installation guidelines and recommendations.

.3 Install prefinished millwork at locations shown on drawings.
.1 Position accurately, level, plumb straight.

.4 Form joints using manufacturer's approved adhesive, with joints inconspicuous in finished work.

.5 Cure countertops for 24 hours, minimum, before exposure to moisture or pressure.

.6 Corner joints: Form 3 mm-wide joints, sealed with manufacturer’s color-matching silicone sealant.

.7 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.8 Provide integral backsplashes and end splashes as shown on the Drawings.

.9 Field joints shall be hard seamed unless otherwise specified.

.10 Attach solid surfaces material to leveled supports on frame with dabs of silicone every 457 to 610 mm.

.11 Fasten solid surface material to frame by anchoring screws to supports at all corner blocks.

.12 Screws should not come in contact with solid surface material, as this may cause cracking of countertop.

.13 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.14 Fasten and anchor millwork securely.

.15 Use draw bolts in countertop joints.

.16 At junction of counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.
- .2 Remove excess glue from surfaces.
- .3 Solid surface to be cleaned as per manufacturer's instructions.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect millwork from damage until final inspection.

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by architectural woodwork installation.

3.5 SCHEDULE

.1 Plastic Laminate: Refer to Interior Finish Material and Colour Schedule.

END OF SECTION 06 40 00

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Dampproofing to backfilled sides of poured-in-place concrete foundation walls and footings under the main floor where the main floor is above grade.

1.2 RELATED SECTIONS

.1 Cast-In-Place Concrete Section 03 30 00

.2 Air Barriers - Descriptive or Proprietary Section 07 27 00.01

1.3 SUBMITALS

.1 Product Data: Submit Manufacturers Product Data and Recommended Installation Methods in accordance with Section 01 33 00 Submittal Procedures.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Deliver and store materials undamaged and, where applicable, in their original wrappings or containers with manufacturer's labels and seals intact. Store materials on a dry floor in a weatherproof enclosure.

2.0 PRODUCTS

2.1 MATERIALS

.1 General: All materials used in this contract shall be of the highest quality as manufactured by nationally recognized manufacturers and of the type indicated on the drawings and in this specification.

.2 Dampproofing Material: fluid applied, VOC compliant, one part moisture curing elastomeric modified polyurethane waterproofing membrane.

.3 Primer shall conform to requirements of CGSB-37-GP-9.

3.0 EXECUTION

3.1 EXAMINATION

.1 Examine all surfaces to which the work of this Section is to be applied and ensure that all conditions are suitable to provide a complete and satisfactory installation. Conform to manufacturer's requirements for minimum application temperatures and humidity.

.2 Commencement of work will indicate acceptance of surfaces and conditions.

.3 Report any unsatisfactory surfaces or conditions to Departmental Representative.

3.2 WORKMANSHIP AND APPLICATION

.1 Surfaces receiving treatment shall be smooth, hard, free from projections and fins, loose particles, holes, grease, oil or dirt.

.2 Dampproofing:

.1 Dampproofing shall conform to standards of manufacturer's recommended methods of surface application of asphalt emulsions by. The rate of application shall be 1.0 to 1.5 l/m^2 or as otherwise recommended by manufacturer.

.2 Dampproofing shall be applied in two coats from 100 mm below finished grade down the wall and to the top of the footing. Application shall be by spray or brush.

.3 Fill all visible porous surfaces or air pockets with specified asphalt mastic after first coat of dampproofing application.

.4 Special applicator will be required for application of dampproofing to confined spaces.

3.3 PROTECTION AND CLEAN-UP

.1 Protect the work of other sections from damage resulting from the work of this section.

.2 At the completion of the work, remove all accumulated containers, brushes, and debris, and leave the work in a neat and tidy condition. Deposit rubbish in containers provided.

END OF SECTION 07 11 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Rough Carpentry — Section 06 08 99

.2 Thermal Insulation — Section 07 21 00

.3 Air Barriers – Descriptive or Proprietary — Section 07 27 00.01

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM D 6164- 05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-56M- 80b (A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meeting one week prior to beginning waterproofing Work, with waterproofing contractor's representative and Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer’s installation instructions and warranty requirements.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Provide for review by Departmental Representative prior to commencing work, two copies of most recent technical waterproofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide two copies of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements for: Primers.

.3 Provide shop drawings and indicate:

.1 Flashing, control joints, details, transitions and lapping details according to construction sequencing.

.4 Manufacturer's Certificate: certify that products meet or exceed specified requirements.

.5 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.

.6 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.

1.5 QUALITY ASSURANCE

.1 For each type of work, obtain primary materials from single manufacturer, which has produced that type of product successfully for not less than 10-Years. Provide ancillary materials only as recommended by manufacturer of membrane materials for use with roofing system specified.

.2 Installer shall be approved by the manufacturer of the materials prior to tender; shall be experienced in the application of the materials and shall supply job references to show similar installations in satisfactory waterproof condition at least 5 years of age.

.3 Successful Contractors shall not sub contract any work unless special approval is received from the Consultant. Sub-contracting of work without approval shall be considered a violation of the contract.

.4 Mock-ups
- .1 Construct mock-up in accordance with Section 01 45 00 Quality Control.
- .2 Mock-up may be part of finished work if acceptable to Departmental Representative.
- .3 Provide a minimum of 3 days' notice to Departmental Representative to review installation of slab membrane prior to raft slab pour.

1.6 DELIVERY, STORAGE & HANDLING

.1 Provide and maintain dry, off-ground weatherproof storage.

.2 Store rolls of membrane in upright position.

.3 Remove only in quantities required for same day use.

.4 Handle waterproofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

.5 Store and manage hazardous materials in accordance with Section 01 35 33 - Health and Safety Requirements

.6 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

1.7 SITE CONDITIONS

.1 Ambient Conditions in accordance with manufacturer's requirements.

1.8 WARRANTY

.1 The product manufacturer shall issue a written and signed document in the name of the owner, certifying the product will meet all the physical characteristic published by the manufacturer, for a period of 5 years, starting from the date of completion of installation of membranes. No letter amending the manufacturer's standard warranty will be accepted and the warranty certificate must reflect these requirements.

1.9 INSPECTION AUTHORITY

.1 Arrange manufacturer's representative to inspect the work on site.

.2 The presence of an Inspector shall in no way excuse the Contractor from performing the Work in accordance with the contract Documents and keeping with the best practices of the trades.

.3 The Contractor shall inform the Inspection Agency seven (7) days prior to commencement of work.

2.0 PRODUCTS

2.1 MEMBRANE

.1 Non-woven polyester reinforced SBS modified bitumen membrane, specifically designed for blind side waterproofing, with a sanded under face with a four inch self-adhered selvage edge covered by a silicone release film. The top face, against which the concrete is poured, has a polyester fleece with a four inch self-adhered selvage edge covered by a silicone release film.

.2 Properties Standards:

Thickness	ASTM D 3767	108 mils (2.70 mm)
Tensile strength	ASTM D 412	23.7/18.5 MPa
Ultimate elongation	ASTM D 412	67/74 %
Flexibility at cold temperature	ASTM D1970	Unaffected at -23 °C
Puncture resistance	ASTM E154	1210 N
Tear resistance	ASTM D 5601	125 N
Lap peel adhesion	ASTM D1876	1360 N/m
Water absorption	ASTM D 570	0.5 %
Adhesion of poured concrete	ASTM D 903	(Mod.) 2880 N/m
Water Vapor Permeance	ASTM E96	(Procedure B) 0.21 ng/Pa.s.m²

2.2 SURFACE PRIMER

.1 Primer used specifically for self-adhered membranes to substrates such as wood, metal or concrete. Primer is composed of a blend of natural resins and synthetic rubber; may be spray or roller applied (if required by construction conditions or detailing).

2.3 REINFORCEMENT MEMBRANE

.1 Self-adhered waterproofing membrane composed of SBS modified bitumen and a Tri-Laminate Woven Polyethylene Facer. The self-adhesive underside is covered by a silicone release sheet.

2.4 PREFABRICATED DRAINAGE BOARD

.1 Composite drainage board consisting of a post-industrial recycled polypropylene drainage core of fused entangled filaments and a geocomposite fabric bonded to one side.

Properties	**Standards**	**Values**
Thickness	ASTM D-1777	0.45 in.
Compressive Strength	ASTM D-1621	30,000 psf
Flow@ 3000 psf & 1.0 Gradient	ASTM D-4716	16 gpm/ft
Puncture Strength	ASTM D-4833	70 lbs.
Flow Rate	ASTM D-4491	120 gpm/ft²
Grab Tensile Strength	ASTM D-4632	120 lbs
Apparent Opening Size (AOS)	ASTM D-4751	70 sieve
Roll Dimensions		39” x 100’ (324 sf)

2.5 PROTECTION BOARD

.1 Asphaltic Hardboard: pre-molded, semi-rigid asphaltic protection board composed of bitumen, mineral core and reinforcement. Provide 3 mm (0.125 in.) thick hardboard on horizontal surfaces not receiving steel reinforced slab. Where steel reinforcing bars are to be used, apply two layers of 3 mm (0.125 in.) thick hardboard or one layer of 6 mm (0.25 in.) thick hardboard.

2.6 ACCESSORIES

.1 Waterproofing Mastic : one part urethane mastic containing SBS modified bitumen, fibers and mineral fillers.

.2 Waterproofing Liquid Membrane for conduits and piping penetrations: high performance, two component, rapid curing PMMA (poly methyl methacrylate) acrylic resin formulation for use at end

laps only. Acceptable products: Alsan RS 230 Flash or Siplat's Parapro 123.

.3 Protection Board:
- .1 A semi-rigid protection board composed of a mineral fortified asphaltic core formed between two saturated fibreglass felts.
- .2 Characteristics:
  - .1 Thickness: 3mm
  - .2 Board Size: Width: 1.22m Length: 1.52m

.4 Termination Bar:
- .1 Hexagonal Stainless Steel plate and Stainless Steel fasteners for outboard waterproofing. Standard of Acceptance to meet Factory Mutual.

.5 Drainage Layer:
- .1 To be double dimpled sheeting with integral geo-textile made of high density polyethylene. Filter mat to be polyethylene. Compressive strength of approximately 90 kg/m^2. Drainage capacity of approximately 72 l/min-m. Resistance to root penetration and rotproof.

.6 Protection Layer:
- .1 Provide protection sheet over horizontal underslab membrane. Membrane to be as per manufacturer's recommendation.

3.0 EXECUTION

3.1 EXAMINATION AND PREPARATION OF SURFACES

.1 Surface examination and preparation must be completed in conformance with manufacturer's recommendations.

.2 Before waterproofing work begins, the Departmental Representative and the contractor will inspect and approve substrate condition and ensure that related work has been properly executed. If necessary, a non-conformity notice will be issued to the contractor so that required corrections can be made. The start of the membrane application will mean that substrate conditions are acceptable for work completion.

.3 Before commencing work, all surfaces must be smooth, dry with no standing water affecting raftslab membrane, clean and free of ice and debris as per manufacturer's recommendations.

.4 No materials will be installed during rain or snowfall.

.5 Concrete must be cured a minimum of fourteen (14) days and an adhesion test is recommended before membrane application.

.6 Verify the compatibility of all membrane components with curing compounds, coatings or other materials which are already installed on the surfaces to be treated.

.7 Any cracks over 3 mm wide should be reported to the Departmental Representative. After review, the crack should be filled in with waterproofing mastic. A 150 mm (6 inches) wide strip of membrane should be installed, centered over the crack.

3.2 METHOD OF EXECUTION

.1 Work shall be performed on a continuous basis as surface and weather conditions allow.

.2 Adjoining surfaces shall be protected against any damage that could result from the waterproofing installation.

3.3 EQUIPMENT

.1 Maintain all equipment and tools in good working order.

3.4 PRIMER APPLICATION

.1 Surface where heat-welded membrane is applied shall receive an asphalt primer coating at the rate of 0.15 to 0.20 l/m2. Application rate may vary depending on surface condition.

3.5 WATERPROOFING MEMBRANE INSTALLATION

.1 To begin application, align the first roll of membrane to a previously drawn chalk line.

.2 All inside and outside corners must be pre-stripped with a 300 mm (12 in.) wide strip of membrane centered over the corner. This membrane must be installed in direct contact with the substrate not leaving any voids under the membrane strip. Outside corners should be double lapped.

.3 Weld the membrane using a propane gas torch.

.4 Subsequent rolls must be installed in the same manner and should be aligned with the preceding roll with a side lap of at least 75 mm. End laps must be overlapped at least 100 mm.

.5 Holes and tears in the membrane must be repaired with the appropriate membrane material. The repair must exceed the affected surface area by at least 100 mm.

.6 Prior to backfilling, it is recommended to protect waterproofing system with protection boards. Backfilling should commence immediately after installation of protection boards.

.7 The uppermost edge of the membrane is to be mechanically fastened to the concrete substrate using termination bars. The termination bar should surpass the top edge of the membrane.

.8 Apply mastic on the top edge of termination bar to prevent water accumulation and infiltration.

.9 Any waterproofing membrane left exposed after backfilling shall be protected from ultra violet and mechanical damages.

.10 All membrane lap joints to be torched and reinforced.

.11 For horizontal underslab membrane, install loose lay membrane, torch and weld seams, install protection sheet on top of membrane.

.12 Mechanically fasten stainless steel termination bar with gumlip edge to receive termination caulking.

3.6 DRAINAGE BOARD INSTALLATION

.1 Adhere the drainage panels directly on the exposed insulation surface by applying a uniform pressure on the entire surface.

.2 Backfill as soon as possible after drainage board installation within 72 hours maximum.

3.7 DRAINAGE LAYER INSTALLATION

.1 Install drainage layer according to manufacturer's recommendation by mechanical fastening.

.2 Install dimpled sheet and geo-textile so they overlap at the edges.

.3 Geo-textile to face outward – towards backfill side.

.4 Wrap the top edge of the drainage mat with the filter fabric facer to prevent soil from getting into dimples. Provide stainless steel mechanical fasteners to clamp drainage mat in place. Do not use mechanical fastener through waterproofing membrane. Use only intermittent fasteners that do not penetrate through the insulation layer into the membrane.

3.8 FIELD QUALITY CONTROL

.1 Inspection and testing of roofing systems and application will be carried out by testing laboratory designated by Owner and paid for by the Contractor.

.2 Field Review will be carried out on a daily basis during the entire roof installation procedure.

.3 Written "Daily" inspection reports to be distributed to Departmental Represenative.

3.9 CLEANING

.1 Remove bituminous markings from finished surfaces.

.2 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION 07 13 52

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Insulation and moisture protection as indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

.1	Cast-in-Place Concrete	Section 03 20 00
.2	Rough Carpentry	Section 06 10 11
.3	Finish Carpentry	Section 06 20 00
.4	Air Barriers- Descriptive or Proprietary	Section 07 27 00.01
.5	Standing Seam Sheet Metal Roofing	Section 07 61 13
.6	Aluminum Doors and Frames	Section 08 11 16
.7	Glazed Aluminum Curtain Walls	Section 08 44 13
.8	Gypsum Board Assemblies	Section 09 21 16

1.3 PRODUCT DELIVERY, STORAGE & HANDLING

.1 Materials shall be stored in a dry and protected area, off the ground, in original undamaged, sealed container with manufacturer's labels and seals in tact. Avoid freezing.

1.4 PROJECT CONDITIONS

.1 Review manufacturer's recommendations for ambient temperatures during and after application.

.2 Report to general contractor in writing, defects of work prepared by other trades and unsatisfactory site or environmental conditions.

.3 Examine surfaces to ensure they are dry, clean, free of oil, grease, dirt, paint, mull scale or other deleterious material that would impair bonding.

.4 Commencement of work shall imply acceptance of surfaces and conditions.

2.0 PRODUCTS

.1 Roof Insulation Polyisocyanurate: Thermal Resistance of R28 minimum of any point of the roof. Shall conform to CAN/CGSB-51.26-M86 factory finished both sides with a nominal 2 lb./ft^3 density, compressive strength of 140 Kpa (20 psi) minimum and meet ULC S704. Facers must not have organic matter.

.2 Wall Cladding Exterior Insulation: Mineral Wool Insulation, non-combustible to ULC CAN 4-S114, zero flame spread and smoke development to ULC S102, 75 mm thick thermal resistance of R14 minimum.

.3 Interior Wall Assembly Acoustics Batt: Mineral Wool Insulation. Comply Type 1 CAN/ULC - S702.

.4 Exterior insulation to foundations and underslad: below grade shall be closed cell Type 4 polystyrene insulation. Exterior insulation above grade shall either be protected with an asphalt impregnated protection board. Insulation board to have ship lap joint.

.5 Curtain Wall Spandrel Insulation: Mineral Wool Insulation, non-combustible to ULC CAN 4-S114, zero flame spread and smoke development to ULC S102. Acceptable product: Roxul curtain rock, thermal resistance of R20.

3.0 EXECUTION

3.1 INSPECTION

.1 Ensure that surfaces to receive insulation are clean and free of obstructions.

.2 Do not install insulation in framing until roofing is complete and the building is enclosed.

3.2 WORKMANSHIP

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.2 Install batt and rigid insulation to all other areas indicated on drawings to thickness shown.

.3 Fit closely around electrical boxes, pipes, ducts, frames, joists, and other objects in or passing through insulation.

3.3 INSTALLATION

.1 Batt insulation installation for interior wall

.1 Install batt insulation for acoustic separations so as to press on drywall over entire surface area.

.2 Cut and trim insulation neatly, to fit spaces. Use batts free of ripped backs and/or edges. Butt edges and ends tightly.

.2 Perimeter Raft Foundation

.1 For insulation over waterproofing membrane, use only adhesion method. Do not penetrate any below grade waterproofing.

.3 Semi-Rigid insulation installation for exterior wall

.1 Apply semi-rigid insulation at all other areas indicated on drawings to thickness shown. Fasteners: mechanical fastened.

.2 Fasteners: Impale type, non-corrosive, perforated 50 X 50 mm cold rolled carbon steel 0.8 mm thick, fused to membrane, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25mm diameter washers of self locking type.

.3 Butt joints tightly, offset vertical joints. Use insulation boards free from chipped or broken edges.

.4 Install material in accordance with manufacturer's instructions.

3.4 CLEANING

.1 Remove waste and excess material off site at completion of application. Repair and make good any defects to this application or any defects caused by this application.

END OF SECTION 07 21 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Dampproofing	Section 07 11 00
.2	Thermal Insulation	Section 07 21 00
.3	Standing Seam Sheet Metal Roofing	Section 07 61 13
.4	Sheet Metal Flashing & Trim	Section 07 62 00
.5	Metal Doors & Frames	Section 08 11 00
.6	Aluminum Doors & Frames	Section 08 11 16
.7	Glazed Aluminum Curtain Walls	Section 08 44 13

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-19.13M-M87, Sealing Compound, One Component, Elastomeric Chemical Curing.
- .2 CAN/CGSB-19.24M-M90, Multi-Component, Chemical Curing Sealing Compound.
- .3 CGSB 19-GP-14M-84, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

.2 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health Safety Requirements.

.3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .1 Existing Substrate Condition: report deviations, as described in PART 3 -EXAMINATION in writing to Departmental Representative.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 QUALITY ASSURANCE

.1 Qualifications:
- .1 Applicator: company specializing in performing work of this section with minimum 5 years documented experience with installation of air/vapour barrier systems.

.2 Mock-Up:
- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Construct typical exterior wall panel, incorporating louvre and door frame, insulation, illustrating materials interface and seals.
.3 Locate in location as agreed to with Departmental Representative.
.4 Mock-up may remain as part of finished work.
.5 Allow 72hours for inspection of mock-up by Departmental Representative before proceeding with air/vapour barrier Work.

.3 Schedule site visits with Departmental Representative, to review Work, at stages listed:
.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
.2 Minimum twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out, prior to cover up by other building component.

1.5 DELIVERY STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Avoid spillage: immediately notify Departmental Representative if spillage occurs and start clean up procedures.

.4 Clean spills and leave area as it was prior to spill.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.7 AMBIENT CONDITIONS

.1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

1.8 SEQUENCING

.1 Sequence work in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Charts.

.2 Sequence work to permit installation of materials in conjunction with related materials and seals.

1.9 WARRANTY

.1 For sealant and sheet materials the 12 months warranty period is extended to 24 months.

2.0 PRODUCTS

2.1 SELF ADHESIVE MEMBRANE

.1 Membrane composed of high temperature grade SBS modified bitumen and a Tri-laminate woven polyethylene face on the top surface. The self-adhesive bottom surface is protected by a silicone release sheet.

.1 Water Vapour transmission 202 g/m² /24 hours/ASTM E96/B (Dessicant).
.2 Dry Tensile Strength 41 lbf/182N MD, 29 lbf/129N CD, ASTM D 828.
.3 Average Dry Breaking Force 127 lbf/565N MD, 91 lbf/405N CD, ASTM D 5034.
.4 Accelerated Aging, Pass, ICC-ES AC 48, 25 cycles.
.5 Cycling and Elongation, Pass, ICC-ES AC48, 100 cycles at -29°C (20°F).
.6 Application Temperature Minimum 5°C (41°F).
.7 Flame Spread Index 0, Class A, ASTM E-84.
.8 Smoke Developed 105, Class A, ASTM E-84.
.9 Membrane thickness, Minimum 40 mil.
.10 Air Permeance, Pass, ASTM E 2178 (Maximum 0.02 L/m²s @ 75Pa or 0.004 cfm/ft² @ 1.57pcf) ASTM E 2357 – assembly, Pass.
.11 Criteria for Water Resistive Barriers, Pass, ICC-ES AV 38.
.12 Low Temp Flexibility, Pass, ICC-AC38/3.3.4.
.13 Peel-adhesion to Unprimed Plywood, PASS, ICC-ES AC48, Control 62 lbf/ft-905N/m, After 7 day water immersion 54 lbf/ft-788N/m, After accelerated aging 72 lbf/ft-1051N/m, After UV exposure 77 lbf/ft-1124N/m
.14 Water Penetration Resistance around Nails, PASS, AAMA 711-05 and ASTM D 1970 modified.

2.2 SEALANTS

.1 Sealants in accordance with Section 07 92 10 - Joint Sealing.

.2 Sealant compatible with membrane as recommended by the manufacturer:
.1 Silicone Sealant specifically for use with self-adhered membrane.

.3 Primer: recommended by sealant manufacturer as appropriate to application.

.4 Substrate Cleaner: non-corrosive type recommended by sealant manufacturer and compatible with adjacent materials.

2.3 PRIMER

.1 Apply primer to plywood according to manufacturer’s specification. Ensure proper adhesion and compatibility to the membrane.

2.4 ACCESSORIES

.1 Provide mechanically fastened stainless steel termination bar with gumlip edge.

3.0 EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

.1 Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials.

3.3 EXAMINATION

.1 Verify that surfaces and conditions are ready to accept work of this section.

.2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.

.3 Report unsatisfactory conditions to Departmental Representative in writing.

.4 Do not start work until deficiencies have been corrected.
.1 Beginning of Work implies acceptance of conditions.

3.4 PREPARATION

.1 All surfaces to receive the membrane must be thoroughly cleaned so as to have removed all concrete spatter, job dirt, laitance, from release agents, curing compounds, or any other substance which could inhibit the adhesion, and long term performance of the membrane.

.2 All honeycombing in concrete shall be grouted flush prior to application of primer.

.3 Apply primer as per manufacturer’s recommendation to all surfaces to receive the membrane. Use a 2 coat application on gypsum board or plywood substrate.

.4 Prepare in accordance with manufacturer’s instructions.

.5 Apply a horizontal membrane strip over vertical leg and fasteners of all horizontal cladding supports. Seal top with mastic regular.

.6 Fill all joints or gaps wider than ¼” with galvanized steel sheet steel or wood backing and apply 12” strip of membrane over joints prior to application of the field membrane. Seal all side laps without factory bitumen self-adhering edge and all top laps with mastic.

3.5 APPLICATIONS

.1 Apply in accordance with manufacturer’s instructions.

.2 All joints within and between back up walls and window frames shall be sealed according to detail drawings.

.3 Ensure continuity of air barrier. Co-ordinate construction of roof/wall junction to maintain continuity of air barrier from wall to roof. Co-ordinate with construction of exterior walls to maintain continuity of air barrier between various exterior wall construction types.

.4 Shingle laps to drain. Minimum side and end laps as per manufacturer’s recommendation with a minimum of 75mm.

.5 Membrane should be adhered onto window frame section as per detail drawings.

.6 Lap and seal air barrier membrane over through-wall flashing at base of wall and at all horizontal wall flashings.

.7 Lap roof membrane flashing over air/vapour barrier membrane at parapets and seal.

.8 Seal all through-wall equipment flanges with air barrier membrane flashing strips; apply mastic to edges.

.9 Seal all metal fabrication flanges with air/vapour barrier membrane flashing strips; apply mastic to edges.

.10 Seal all horizontal drip flashings to air/vapour barrier membrane with minimum 150 mm strips of membrane flashing applied horizontally; apply mastic to edges of flashing membrane.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.7 PROTECTION OF WORK

.1 Protect finished work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Do not permit adjacent work to damage work of this section.

.3 Ensure finished work is protected from climatic conditions.

END OF SECTION 07 27 00.01

1.0 GENERAL

1.1 SECTION INCLUDES

.1 Supply and install preformed metal soffit panels, including all necessary supporting structure, girts, clips, flashings, sealants, gaskets, caulking and accessories to full extent shown on drawings and as specified herein. This section applies to metal soffit under roof overhang.

1.2 RELATED SECTIONS

.1	Rough Carpentry	Section 06 10 11
.2	Standing Seam Sheet Metal Roofing	Section 07 61 13
.3	Sheet Metal Flashing and Trim	Section 07 62 00

1.3 SUBMITTALS

.1 Submit 300 x 300 mm size sample of wall cladding material, of color and profile specified, in accordance with Section 01 33 00 Submittal Procedures.

.2 Submit product data or shop drawings in accordance with Section 01 33 00 showing the profiles of preformed metal cladding units, and the detail of forming, jointing (gaskets if any), internal supports, anchorages, trim, flashing and accessories. Show details of weatherproofing at edges, terminations and penetrations of the metal cladding work. Show small scale layout and elevations of entire work.

.3 Shop drawings to be designed and prepared under the supervision of a registered Professional Engineer registered in British Columbia. All submitted shop drawings shall be sealed and signed by the said Professional Engineer. The same Professional Engineer shall provide NBCC letter of Assurance Schedule B1, B2 and C-B as per Appendix E in this specification confirming the work is designed and installed in conformance with the structural design criteria.

1.4 EXISTING CONDITIONS

.1 Before commencing erection, examine the structure carefully. Notify the Consultant of any defects and have the base surfaces corrected as required. Do not work until corrective measures are taken.

.2 Commencement of work signifies acceptance of all base surfaces.

1.5 WARRANTY

.1 The metal cladding installation and material shall be warranted against the penetration of rain, snow, ice or environmental elements, to be rigid and safely able to withstand all wind and snow loads, not to deflect, buckle, twist or pull away from fastenings over a period of two (2) years from the date of Substantial Performance. Defects occurring within the two year warranty period shall be rectified at no cost to the Owner.

2.0 PRODUCTS

2.1 MATERIALS

.1 Exterior Soffit Cladding and Trim Materials

.1 Minimum 24ga sheet steel.

.2 All exposed sheet metal or cladding material to be silicone modified polyester pre-painted finish.

.2 Profile:

.1 MC – 305 x 25mm Metal Cladding perforated flat profile with mid rib, colour to match standing seam sheet metal roofing colour of respective buildings.

.3 Assembly and Installation Accessories: Provide manufacturer's standard fasteners, brackets, clips, anchoring devices, furring strips, spacers, flashings, closures, adhesives, joint sealers, expansion joints and other components needed for a complete permanently weather proof installation. Use materials which are non-corrosive, non-deteriorating, and compatible with the panel faces. All exposed fasteners shall be painted to match siding panels.

.4 Trims and Custom Break Shapes: Provide trim components as part of the preformed metal cladding work, including all flashing and collars, capping, seam covers, end stops and filler pieces, etc. Match the material and finish of the exterior panels, thickness minimum 0.61 mm (22 ga).

.5 Flashings: shall be of the same material and finish as metal cladding, thickness minimum 0.759 mm.

.6 Closure Strips: shall be of same material and finish as metal cladding, thickness minimum 0.759 mm.

.7 Sealant: for metal cladding system with the colour to match adjoining surfaces, field applied around all openings, and to side of all cladding. Sealant shall comply with Section 07 92 00.

.8 Z-Girt: Stainless steel, Thermally broken, adjustable with PVC spacers, composed of inner short sections of angle and a continuous angle to the outside, tie together with a screw fastener.

.9 Aluminum vented bug screen at metal soffit.

2.2 PANEL FABRICATION

.1 Determine the section properties of the metal cladding panel systems in strict accordance with the requirements of the National Building Code, Canadian Structural Design Manual including CSA S136, Design of Light Gauge Steel Structured Members.

.2 Metal cladding panel systems shall withstand all live loads resulting from wind or a combination of wind and temperature as defined in the National Building Code without exceeding the maximum working stress of 20,000 psi for steel members or the maximum deflection of 1/180th of the span.

.3 Form sections square, true and accurate to size, free of distortion and other defects detrimental to appearance or performance.

.4 Provide resilient gaskets or spacers between metal components of panel assemblies, and between panels, as required to eliminate metal-to-metal contact and movement noises in the completed work, which might result from thermal or structural movements.

3.0 EXECUTION

3.1 PREPARATION

.1 Wherever possible, take field measurements prior to completion of shop fabrication and finishing of preformed metal cladding. Do not delay job progress; allow for trimming where final dimensions cannot be established before fabrication.

3.2 INSTALLATION

.1 Comply with panel manufacturer's instructions and approved Engineered shop drawing for assembly, installation and erection of preformed metal cladding.

.2 Apply a coat of bituminous paint, concealed, on one or both surfaces wherever dissimilar metals would otherwise be in contact. Use gasket fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

.3 Anchor component parts of the preformed metal cladding securely in place, providing for necessary thermal and structural movement as recommended by manufacturer and as indicated on Engineered

Shop Drawings. Make corners square, surfaces true and straight in all planes and lines accurate to profiles.

.4 Tolerances: Erect the Work plumb, level and true to line with tolerances not exceeding 6 mm in runs of 6 m.

.5 Install exterior corners, fillers and closure strips with individually formed and profiled work using concealed fasteners.

.6 Install sealants for the preformed metal cladding work as indicated and as required for performance. Comply with sealant manufacturer's instructions for installation and curing.

.7 Install starter strips, backer plates, drip caps, outside custom corners and other trims and flashings, as indicated on the drawings and as required to provide a complete and finished product.

.8 All flashing in contact with steel preformed metal cladding as herein described shall be steel and by this trade, escept as noted otherwise.

.9 Isolate all dissimilar materials.

.10 Apply waterproof membrane between all members/supports for metal cladding connecting to back-up structure and weather barrier. Ensure membrane projects 25 mm beyond all sides of every member to provide a complete seal around fastenings.

.11 Do not install cladding in direct contact with lead or copper or in areas where run off from these metals on to the cladding surface may occur.

3.3 CLEANING

.1 Clean exposed surfaces of preformed metal cladding work promptly after completion of installation. Comply with recommendations of both the panel and coating manufacturers.

.2 Clean up and remove from the site all surplus materials and rubbish resulting from the Work of this Section.

END OF SECTION 07 42 13

1.0 GENERAL

1.1 DOCUMENTS

.1 This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 REFERENCES

.1 American Society of Civil Engineers (ASCE) 7 - Minimum Design Loads for Buildings and Other Structures.

.2 ASTM International (ASTM):

.1 B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.2 C1186 - Standard Specification for Flat, Non-Asbestos, Fiber-Cement Sheets.

.3 E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

.4 E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

.5 E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C..

.6 E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.3 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Thermal Insulation	Section 07 21 00
.3	Air Barriers – Descriptive or Proprietary	Seation 07 27 00.01
.4	Sheet Metal Flashing and Trim	Section 07 62 00
.5	Joint Sealants	Section 07 92 00
.6	Metal Doors and Frames	Section 08 11 00
.7	Aluminum Doors and Frames	Section 08 11 16
.8	Glazed Aluminum Curtain Walls	Section 08 44 13

1.4 SUBMITTALS

.1 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00. Indicate dimensions, proposed siding profiles, reinforcement , anchorage, fastenings and method of installation, schedule of wall elevations, trim and closure pieces, fascia and related work.

.2 Construction details should accurately reflect actual job conditions.

.3 Shop drawings to be stamped and signed by professional engineer registered or licensed in the Province of British Columbia, Canada. Submit NBCC 2010 letter of Assurance schedule B1, B2 and C-B as per appendix in this specification.

.2 Samples:

.1 Submit samples in accordance with Section 01 33 00.

.1 Samples: 305mm x 152mm panel sample, 75mm long trim sample.

.2 Submit copies of specifications, installation data and other pertinent manufacturer's literature

1.5 DELIVERY, STORAGE AND HANDLING

.1 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

.2 Stack claddings on edge or lay flat on a smooth, level surface. Protect edges and corners from chipping.

.3 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

.4 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

.5 Do not use damaged materials.

1.6 PROJECT CONDITIONS

.1 At exterior locations, install weather-resistive barriers and claddings to dry surfaces.

.2 Verify existing conditions and substrates before starting work. Repair any punctures or tears in the weather-resistive barrier or any other unsatisfactory conditions before installation of the siding.

.3 Protect sidings from other trades.

1.7 QUALITY ASSURANCE

.1 Single Source Responsibility: Panels, metal trim, and fasteners furnished by single manufacturer.

.2 Installer Qualifications: Minimum 5 years documented experience in work of this Section.

.3 Mockup:

.1 Size: Minimum (1200 x 2400mm)

.2 Show: Moisture barrier, insulation furring, panels, trim, flashings, and joint sealers. Include one horizontal flashing and one external corner.

.3 Locate where directed.

.4 Approved mockup may remain as part of the Work.

1.8 WARRANTIES

.1 Provide manufacturer's non-pro-rated 30 year warranty providing coverage against hail and termite damage and defects in materials and workmanship.

.2 Provide manufacturer's 15 year warranty providing coverage against peeling, cracking, and chipping of panel finish.

.3 Provide installer's 2 years warranty providing coverage against defects in installation.

2.0 PRODUCTS

2.1 MATERIALS

.1 Fiber Cement Vertical Panel System:

- .1 Source: Hardie Panel HZ5 or approved equivalent.
- .2 Meet ASTM C1186, Grade A, Type II..
- .3 Formulated from Portland cement, ground sand, cellulose fibers, additives, and water; formed under pressure to required profile.
- .4 Size: 47-1/2 inches (1207 mm) wide x 95-1/2 inches (2426 mm) long; accommodate 1/2 inch (13 mm) gap between panels.
- .5 Thickness: 5/16 inch (7.5 mm).
- .6 Surface texture: Cedarmill.
- .7 Fire hazard classification: Maximum flame spread/smoke developed rating of 0/5, tested to ASTM E84.
- .8 Combustibility; Noncombustible, tested to ASTM E136.
- .9 Finish: ColorPlus factory-applied, baked on finish,
  - .1 FC1 – Heathered Moss (JH50-20)
  - .2 FC2 – Cobble Stone (JH40-10)
  - .3 FC3 – Autumn Tan (JH20-20)
  - .4 FC4 – Timber Black (JH40-30)

.2 Trim:

- .1 Same material as panel system
- .2 Texture: Rustic Grain
- .3 Color: To Match Panel
- .4 Dimensions: 20mm thick x 64mm (3/4” thick x 2.5”)

2.2 ACCESSORIES

.1 Fasteners: Stainless steel, Tor pan head type as recommended by panel manufacturer, of equal or greater holding power than required by manufacturer’s Code compliance reports.

.2 Sheet Metal Flashings and Trim: Specified in Section 07 62 00.

.3 Edge Sealer: Type recommended by panel manufacturer.

3.0 EXECUTION

3.1 INSTALLATION

.1 Install panel system in accordance with manufacturer's instructions and approved Shop Drawings.

.2 Install trim:

- .1 Vertical panel-to-panel joints: Install Vertical Trim per Drawing layout.
- .2 Horizontal panel-to-panel joints: Install Horizontal Trim per Drawing layout.
- .3 Inside corners: Install Inside Corner Trim.
- .4 Outside corners: Install Outside Corner Trim.
- .5 Over openings in walls and at bottom of walls: Install Drip Cap Trim.

.3 Fasten trim at maximum 305mm on center or as shown on drawings.

.4 Leave 13 mm gap between horizontal drainage flashings and bottom of panel above. Do not seal this space.

.5 Allow minimum vertical clearance between edge of panel system and adjacent materials in accordance with manufacturer's instructions.

.6 Cut panels to fit around penetrations with maximum 6mm gaps. Smooth and seal cut edges.

.7 Fasten panel system at maximum spacing as per Engineer’s design. Fasteners to be covered by vertical trim.

.8 Apply joint sealer between panel system and adjacent surfaces as specified in Section 07 92 00 except at horizontal drainage flashings.

END OF SECTION 07 46 46

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Thermal Insulation	Section 07 21 00
.2	Air Barriers – Descriptive or Proprietary	Section 07 27 00.01
.3	Metal Wall Panels	Section 07 42 13
.4	Sheet Metal Flashing and Trim	Section 07 62 00

1.2 REFERENCES

.1 Aluminum Association (AA).
- .1 AA DAF-45-R03, Designation System for Aluminum Finishes - 9th Edition.
- .2 AA ASM-35-October 2000, Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A 240/A 240M-02a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .3 ASTM A 653/A 653M-02a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM A 792/A 792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
- .5 ASTM B 32-00e1, Standard Specification for Solder Metal.
- .6 ASTM B 370-98, Standard Specification for Copper Sheet and Strip for Building Construction.
- .7 ASTM D 523-89(1999), Standard Test Method for Specular Gloss.
- .8 ASTM D 822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.3 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
- .2 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.
- .3 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .4 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.4 Canadian Standards Association (CSA International).
- .1 CAN/CSA A123.3-98, Asphalt Saturated Organic Roofing Felt.

.5 Department of Justice Canada (Jus).
- .1 Canadian Environmental Protection Act (CEPA), 1999.

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

.7 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC).
- .1 CCMC-2002, Registry of Product Evaluations.

.8 Transport Canada (TC).
.1 Transportation of Dangerous Goods Act (TDGA), 1992.

1.3 SUBMITTALS

.1 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, and cleaning procedures.

.2 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.

.4 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures. Shop drawings to be signed and sealed by Professional Engineer registered in Province of British Columbia. The said engineer to provide NBCC 2010 Schedule B1, B2 and C-B as per appendix in this specification.

.5 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame.

.6 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.7 Submit duplicate 300 x 300mm samples of each sheet metal material.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.7 Ensure emptied containers are sealed and stored safely.

.8 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

.9 Unused paint, caulking, and sealing compound materials must be disposed of at an official hazardous material collections site as approved by Departmental Representative.

.10 Unused paint, caulking, and sealing compound materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.11 Fold up metal banding, flatten and place in designated area for recycling.

1.5 GUARANTEE

.1 Provide the RCABC five (5) year guarantee for new roofing systems and flashings specified in this Section. Guarantee shall cover all materials, installation and workmanship for a period of five (5) years from the date of Substantial Performance of the Project.

2.0 PRODUCTS

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: to ASTM A 653/A 653M], commercial quality, with Z275 coating, prefinish as specified in section 2.2 minimum base metal thickness- 24 gauge.
Acceptable Product: 305mm wide flat panel completed with 25mm high standing seam or snap lock.

2.2 PREFINISHED SHEET STEEL

.1 Prefinished steel with factory applied minimum 2 coats silicone modified polyster:
- .1 Class F1S
- .2 Colour Schedule: (Colours to match Vicwest Weather XL)
  - .1 MR-1 Regent Grey 56082
  - .2 MR-2 Charcoal 56072

2.3 ACCESSORIES

.1 Assembly and Installation Accessories: Provide manufacturer's standard fasteners, brackets, clips, anchoring devices, furring strips, spacers, flashings, closures, adhesives, joint sealers, expansion joints and other components needed for a complete permanently weater proof installation. Use materials which are non-corrosive, non-deteriorating, and compatible with the panel faces. All exposed fasteners shall be painted to match siding panels.

.2 Trims and Custom Break Shapes: Provide trim components as part of the preformed metal cladding work, including all flashing and collars, capping, seam covers, end stop and filler pieces, etc. Match the material and finish of the exterior panels, thickness minimum 0.61mm (24ga).

.3 Flashings: shall be of the same material and finish as metal cladding, thickness minimum 0.61mm(24ga)

.4 Closure Strips: shall be of same material and finish as metal cladding, thickness minimum 0.61mm(24ga)

.5 Sealant: for metal cladding system shall be gummable non-skinning butyl, with the colour to match adjoining surfaces, field applied around all openings, and to side of all cladding. Sealant shall compley with Section 07 92 00.

.6 Z-Girt: Thermally broken, adjustable with PVC spacers, composed of inner short sections of angle and a continuous angle to the outside, tie together with a screw fastener.

2.4 FABRICATION

.1 Fabricate aluminum sheet metal in accordance with AA ASM-35.

.2 Determine the section properties of the metal cladding panel systems in strict accordance with the requirements of the National Building Code; Canadian Structural Design Manual including

CSA S136, Design of Light Gauge Steel Structured Members.

.3 Metal cladding panel systems shall withstand all live loads resulting from wind or a combination of wind and temperature as defined in the BC Building Code without exceeding the maximum working stress of 20,000 psi for steel members or the maximum deflection of 1/180th of the span.

.4 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.

.5 Hem exposed edges on underside 12 mm, mitre and seal.

.6 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.7 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.

.8 Protect dissimilar metals against oxidization by backpainting with isolation coating where indicated.

2.5 AIR/WATER/VAPOUR BARRIER MEMBRANE (ROOF UNDERLAYMENT)

.1 SBS modified self-adhesive membrane composed of SBS modified bitumen and a tri-laminated woven polyethylene facer. The underface is covered with a silicone release film.

.2 Primer

.1 All substrates must be primed according to manufacturer's recommendations. Substrate to be sound & clean, free of loose materials or contaminants.

.3 Properties:

.1	Thickness:	0.8 mm (31 mil)	
.2	Dimensions:	40.8 x 1.14 m (134 x 3.7 ft.)	
.3	Gross / Net coverage per roll:	46.5 / 43.5 m^2 (500 / 468 ft^2)	
.4	Weight:	0.77 kg/m^2 (0.16 lb/ft^2)	
.5	Selvedge width:	75 mm (3 in)	
.6	Top face:	Tri-laminate woven polyethylene	
.7	Underface:	Silicone release film	
.8	Rolls per skid:	25	
.9	Tensile strength, MD/XD:	ASTM D5147	9.5 / 13 KN/m (54 / 74 lbf/in)
.10	Ultimate elongation, MD/XD:	ASTM D5147	33 / 25%
.11	Cold bending:	ASTM D5147	-50 °C (-58 °F)
.12	Static puncture:	ASTM D5602	400 N (90 lbf)
.13	Tear resistance, MD/XD:	ASTM D1970	423 / 458 N (95 / 103 lbf)
.14	Lap adhesion:	ASTM D1876	1000 N/m (68 lbf/ft)
.15	Water absorption:	ASTM D5147	0.1 % max.
.16	Peel resistance on steel:	ASTM D903	950 N/m (5.4 lbf/in)
.17	Water vapour permeance:	ASTM E96 (Procedure B)	1.7 ng/Pa.s.m^2 (0.03 perm)
.18	Air permeability:	ASTM E2853 (75 Pa)	< 0.0002 L/sec • m^2

3.0 EXECUTION

3.1 EXAMINATION

.1 Examine and obtain all necessary measurements of previously executed work which may affect the work of this Section.

.2 Report any discovered discrepancies to the Contractor so that instructions may be give for the necessary remedial work.

3.2 PREPARATION

.1 Wherever possible, take field measurements prior to completion of shop fabrication and finishing of preformed metal cladding. Do not delay job progress; allow for trimming where final dimensions cannot be established before fabrication.

3.3 STORAGE AND HANDELING

.1 Exercise care in storing, handling and placing the roof panels to prevent damage likely to impair the adequacy or appearance of the material in the finished structure.

.2 Damaged material shall be replaced or corrected to the satisfaction of the Consultant and any costs incurred shall be borne by the parties responsible for the damage.

3.4 AIR/WATER/VAPOUR BARRIER

.1 Install air/water/vapour barrier according to RCABC specifications or to manufacturer's recommendations for cold adhesive application as applicable.

3.5 PRIMER

.1 Prime plywood and metal surfaces to be directly adhered with bituminous membrane and allow to dry.

3.6 MEMBRANE APPLICATION

.1 Align membrane and remove 600mm (24") of release paper. Apply to surface keeping the roll in line. Adhere the remainder of the membrane roll by removing the silicone paper as the membrane is unrolled, pass a broom over the surface to remove any air trapped under the membrane.

.2 Install subsequent rolls in similar fashion and align with preceding rolls with a side lap of minimum 75 mm (3"). End laps must overlap a minimum of 150mm (6").

.3 Field membrane shall extend up curb section a minimum of 76mm (3"). Curb membrane shall extend down the wall and back onto the field membrane and minimum of 150mm (6"). This application shall produce a 'shingle lap" over the field membrane resulting in an inside corner which consists of two (2) plies of waterproofing membrane.

.4 Roll a linoleum roller over the deck membrane application to improve initial adhesion to the substrate.

.5 Apply a trowelled bead of SBS bitumen mastic to top terminations of curb membrane at the end of each days work.

3.7 METAL STANDING SEAM ROOFING

.1 Erect Standing Seam Roofing to manufacturer's instructions and in accordance with the drawings and details over roofing membrane and Plywood Sheathing.

.2 All erection work shall be the responsibility of the manufacturer and such erection work shall be carried out by the manufacturer's trained erection crews or manufacturer's approved erector in strict accordance with manufacturer's directions and reviewed shop drawings.

.3 Metal roofing shall be installed to the slope as indicated on the drawings.

.4 Anchor component parts of the preformed metal cladding securely in place, providing for

necessary thermal and structural movement as recommended by manufacturer. Make corners square, surfaces true and straight in all planes and lines accurate to profiles.

.5 Tolerances: Erect the work plumb, level and true to line with tolerances not exceeding 6 mm in runs of 6 m.

.6 Install exterior corners, fillers and closure strips with individually formed and profiled work using concealed fasteners.

3.8 FLASHING INSTALLATION

.1 Use concealed fasteners where appropriate. Exposed fasteners to be of same color as sheet.

.2 Lock end joints and caulk to provide weather-tight seal. Use standing seam joints in flashings to RCABC Standards. Seal all joints in flashings.

.3 Provide all flashings to make metal roofing watertight.

.4 Install matching cap flashing at ridges, eaves, skylights, walls and other locations as indicated.

.5 Flashing color to match metal cladding colors where exposed to view.

.6 Flashing details shown on the drawings indicate the general type and appearance required. Carry out all work in a proper workmanlike manner to RCABC Standards and details. Form proper returns to stop ends and work to and around all features as necessary.

.7 Make all roof areas watertight as required. Flash openings and items projecting through roofing. Bend up flashing as required; fold and clip neatly and secure in straight lines free from wrinkles and undulations. Fastening to be concealed and watertight. Carefully place, form and trim breaks. Bond and neutralize soldering.

.8 Turn back edges of all exposed flashing to form ¼" (6mm) stiffeners.

.9 Form all flashings on a bending brake. Execute all hand trimming, shaping and soldering with appropriate tools. Install with hold down clips.

.10 Allow for expansion and contraction to finished work without deformation.

.11 Install starter strips, backer plates, drip caps, outside custom corners and other trims and flashings, as indicated on the drawings and as required to provide a complete and finished product. Cladding manufacture to supply cap flasings for forming and installation by roofing contractor.

.12 All Flashing in contact with steel preformed metal cladding as herein described shall be steel and by this trade.

3.9 SEALANT

.1 Provide sealant and joint packing to perimeter joints at metal roofing and at all penetrations through roofing and as required for performance. Comply with sealant manufacturer's instructions for installation and curing.

3.10 CLEANUP

.1 Before removing scaffolding, clean off any marks on metal roofing. Repair any defects to any

other work caused by this work; leave panels free of oil, grease and dirt.

.2 This subcontractor shall leave all metal roofing panels clean and free of all grime and dirt.

.3 At the completion of the work of this Section, remove any excess materials, debris and equipment, pertaining to the work of this Section from the site.

END OF SECTION 07 61 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Air Barriers Descriptive or Proprietary	Section 07 27 00.01
.2	Metal Wall Panels	Section 07 42 13
.3	Standing Seam Sheet Metal Roofing	Section 07 61 13

1.2 REFERENCES

.1 The Aluminum Association Inc. (AAI)
- .1 AAI-Aluminum Sheet Metal Work in Building Construction-2002.
- .2 AAI DAF45-03, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 653/A 653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A 792/A 792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.3 Roofing Contractors Association of B.C. (RCABC)
- .1 RGC Roofing Practice Manual.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.5 Canadian Standards Association (CSA International)
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.7 Green Seal Environmental Standards
- .1 Standard GS-03-93, Anti-Corrosive Paints.
- .2 Standard GS-11-97, Architectural Paints.
- .3 Standard GS-36-00, Commercial Adhesives.

.8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.9 British Columbia Sheet Metal Association (SMACNA-BC)
- .1 Architectural Sheet Metal Manual- 6th Edition 2003.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33- - Health and Safety Requirements.

.3 Samples:

.1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.4 QUALITY ASSURANCE
.1 Pre-Installation Meetings: convene pre-installation meeting [one] week prior to beginning work of this Section and, with contractor's representative , Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart to:
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building sub trades.
.4 Review manufacturer's installation instructions and warranty requirements.

.2 Upon completion of work, this Contractor shall furnish Owners with a 5 year R.C.A.B.C. guarantee work of this section.

.3 Provide for inspection in accordance with specifications and Consultant's Standards. Include inspection fees in this contract. Inspection agency to be selected from R.C.A.B.C. approved list of roofing inspectors.

1.5 DELIVERY, STORAGE AND HANDLING
.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:
.1 Separate waste materials for and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2.0 PRODUCTS

2.1 PRE-FINISHED SHEET METAL
.1 Zinc coated steel sheet: 24ga thickness thickness, commercial quality to ASTM A 792, with Z275 designation zinc coating, finish enamel coated factory applied coating to CGSB 93-GP-3m Class F29, color to match profiled metal panels as shown on drawing.

2.2 PREFINISHED ALUMINUM SHEET
.1 Prefinished aluminum sheet: 0.81mm (20 gauge).

2.3 ACCESSORIES
.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.
.1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.

.3 Underlay for metal flashing: asphalt laminated 3.6 to 4.5 kg kraft paper.

.4 Sealants.
.1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.

.5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

.6 Fasteners: stainless steel, flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.8 Touch-up paint: as recommended by prefinished material manufacturer.
.1 Maximum VOC limit 50 g/L to SCAQMD Rule 1113.

2.4 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable RCABC and SMACNA Standards. Guarantee standard as specified in 1.4 Quality Assurance.

.2 Form pieces in 2400 mm maximum lengths.
.1 Make allowance for expansion at joints.

.3 Hem exposed edges on underside 12 mm.
.1 Mitre and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 METAL FLASHINGS

.1 Form flashings, copings and fascias to profiles indicated of galvanized steel as indicated on drawings.

.2 Caulk perimeter flashings with specified sealant where necessary to make a proper seal.

.3 'S' Lock and caulk end joints in flashing. Provide standing seams with concealed clips at corners. Hem exposed edges of flashing a minimum of 12.5 mm for rigidity.

.4 Provide flashings with edges turned to form a drip. Make proper allowance for expansion and contraction. Face clip flashings with concealed clips (600 mm) on centres.

.5 Provide flashings at vents, chimneys and control joints.

.6 Carry face metal down exterior face a minimum of 100 mm or as indicated on drawings.

.7 Provide metal base and cap flashings to extend to within 25 mm of roof surface.

.8 At vent stacks, install aluminum vent stacks and include for aluminum metal caps.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install sheet metal work in accordance with R.C.A.B.C standards. Guarantee standard as per 1.4 Quality Assurance.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal.
.1 Secure in place and lap joints 100 mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
.1 Flash joints using S-lock forming tight fit over hook strips.

.5 Lock end joints and caulk with sealant.

.6 Install pans, where shown around items projecting through roof membrane.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION 07 62 00

1 .0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Finish Carpentry	Section 06 20 00
.2	Metal Doors and Frames	Section 08 11 00
.3	Gypsum Board Assemblies	Section 09 21 16
.4	Interior Painting	Section 09 91 13
.5	Mechanical	Divisions 21-25
.6	Electrical Communications/Electronics/Security	Divisions 26-28

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 919- 12, Standard Practice for Use of Sealants in Acoustical Applications.

.2 ASTM C920-11 Standard Specification for Elastomeric Joint Sealants

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Manufacturer's product to describe.
- .1 Caulking compound.
- .2 Primers.
- .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each color where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Instructions to include installation instructions for each product used.

1.4 QUALITY ASSURANCE / MOCK-UPS

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.

.3 Mock-up will be used:
- .1 To judge workmanship, substrate preparation, operation of equipment and material application.

.4 Location to be decided with Departmental Representative.

.5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sealant work.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.5 DELIVERY, STORAGE & HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

.3 Upon completion of Work, after cleaning is carried out.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

.4 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

.5 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.6 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

2.0 PRODUCTS

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.

.3 Where sealants are qualified with primers use only these primers.

.4 Standard: For interior and exterior work unless otherwise specified, ensure compatibility of sealants being used and other materials in contact with them, meet VOC level of 250 g/L for architectural sealant.

2.2 SEALANT TYPE

.1 S-1:
- .1 ASTM C920, polyurethane or polysulfide.
- .2 Type M.
- .3 Class 25.
- .4 Grade NS.
- .5 Shore A hardness of 20-40.

.2 S-2:
- .1 ASTM C920, polyurethane or polysulfide.
- .2 Type M.
- .3 Class 25.
- .4 Grade P.
- .5 Shore A hardness of 25-40.

.3 S-3:
- .1 ASTM C920, polyurethane or polysulfide.
- .2 Type S.
- .3 Class 25, joint movement range of plus or minus 50 percent.
- .4 Grade NS.
- .5 Shore A hardness of 15-25.
- .6 Minimum elongation of 700 percent.

.4 S-4:
- .1 ASTM C920, polyurethane or polysulfide.
- .2 Type M.
- .3 Class 25,
- .4 Grade NS.
- .5 Shore A hardness of 25-40.

.5 S-5:
- .1 ASTM C920, polyurethane or polysulfide.
- .2 Type M.
- .3 Class 25.
- .4 Grade P.
- .5 Shore A hardness of 25-40.

.6 S-6:
- .1 ASTM C920, silicone, neutral cure.
- .2 Type S.
- .3 Class: Joint movement range of plus 100 percent to minus 50 percent.
- .4 Grade NS.
- .5 Shore A hardness of 15-20.
- .6 Minimum elongation of 1200 percent.

.7 S-7:
- .1 ASTM C920, silicone, neutral cure.
- .2 Type S.

.3 Class 25.
.4 Grade NS.
.5 Shore A hardness of 25-30.
.6 Structural glazing application.

.8 S-8:
.1 ASTM C920, silicone, acetoxy cure.
.2 Type S.
.3 Class 25.
.4 Grade NS.
.5 Shore A hardness of 25-30.
.6 Structural glazing application.

.9 S-9:
.1 ASTM C920, silicone.
.2 Type S.
.3 Class 25.
.4 Grade NS.
.5 Shore A hardness of 25-30.
.6 Non-yellowing, mildew resistant.

.10 S-10:
.1 ASTM C920, coal tar extended fuel resistance polyurethane.
.2 Type M/S.
.3 Class 25.
.4 Grade P/NS.
.5 Shore A hardness of 15-20.

.11 S-11:
.1 ASTM C920, polyurethane.
.2 Type M/S.
.3 Class 25.
.4 Grade P/NS.
.5 Shore A hardness of 35-50.
.6 Structural glazing application.

.12 S-12:
.1 ASTM C920, polyurethane.
.2 Type M/S.
.3 Class 25, joint movement range of plus or minus 50 percent.
.4 Grade P/NS.
.5 Shore A hardness of 25-50.

2.3 CAULKING COMPOUND

.1 C-1: ASTM C834, acrylic latex.

.2 C-2: One component acoustical caulking, non-drying, non hardening, synthetic rubber.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

3.0 EXECUTION

3.1 PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 APPLICATION

.1 Sealant

.1 Apply sealant in accordance with manufacturer's written instructions and ASTM C919.
.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
.3 Apply sealant in continuous beads.
.4 Apply sealant using gun with proper size nozzle.
.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
.7 Tool exposed surfaces before skinning begins to give slightly concave shape.
.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing
.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup
.1 Clean adjacent surfaces immediately and leave Work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set of sealant.

3.7 CLEANING

.1 Clean adjacent surfaces immediately and leave work clean and neat. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after tooling of joints.

3.8 LOCATIONS

.1 Sanitary Joints:
.1 Pipe Penetrations: Type S-12.

.2 Interior Caulking:
.1 Typical Narrow Joint 6mm, (1/4 inch) or less at Walls and Adjacent Components: Type C-1 and C-2.
.2 Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Exterior Walls: Types C-1 and C-2.
.3 Joints at Masonry Walls and Columns, Piers, Concrete Walls or Exterior Walls: Types C-1 and C-2.
.4 Expose Isolation Joints at Top of Full Height Walls: Types C-1 and C-2.

.3 Exposed Acoustical Joint at Sound Rated Partitions Type C-2.

.4 Concealed Acoustic Sealant Types S-4, C-1 and C-2.

END OF SECTION 07 92 00

DOOR							FRAME				RATING	REMARKS	LOCATION
No.	**Door W (mm)**	**Opening H (mm)**	**Type**	**Mat'l**	**Finish**	**Glass Type**	**Type**	**Mat'l**	**Finish**	**Glass Type**			
LONG BEACH NORTH & SOUTH WASHROOM, WICKANINNISH BEACH WASHROOMS (DOOR & FRAME TYPE FOR EACH WASHROOM)													
D1	915	2134	D1	AL	-	-	F1	AL	-	ITF	-	#1	MALE VANITY
D3	1070	2134	D2	HM	PTD	-	F2	PSS	PTD	-	-	#1, #3	SERVICE ROOM
D4	915	2134	D1	AL	-	-	F1	AL	-	ITF	-	#1	FEMALE VANITY
D6	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	CHANGE CUBICLE #1
D7	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	CHANGE CUBICLE #2
D8	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	FAMILY CHANGE CUBICLE #1
D9	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	FAMILY CHANGE CUBICLE #2
INCINERATOR BAY WASHROOM													
D1	915	2134	D1	AL	-	-	F1	AL	-	ITF	-	#1	MALE VANITY
D3	1070	2134	D2	HM	PTD	-	F2	PSS	PTD	-	-	#1, #3	SERVICE ROOM
D4	915	2134	D1	AL	-	-	F1	AL	-	ITF	-	#1	FEMALE VANITY
D6	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	CHANGE CUBICLE #1
D7	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	CHANGE CUBICLE #2
D8	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	FAMILY CHANGE CUBICLE #1
D9	915	1525	D3	WD	FCB	-	F3	WD	PTD	-	-	#2	FAMILY CHANGE CUBICLE #2
GREEN POINT WASHROOM #1 & 34 (DOOR & FRAME TYPE FOR EACH WASHROOM)													
D1	915	2134	D1	AL	-	-	F1	AL	-	ITF	-	#1	MALE VANITY
D3	765	2134	D3	HM	PTD	-	F2	PSS	PTD	-	-	#4	MALE SHOWER
D4	915	2134	D1	HM	PTD	-	F2	PSS	PTD	-	-	#1	SERVICE ROOM

DOOR							FRAME				RATING	REMARKS	LOCATION
No.	**Door W (mm)**	**Opening H (mm)**	**Type**	**Mat'l**	**Finish**	**Glass Type**	**Type**	**Mat'l**	**Finish**	**Glass Type**			
D6	915	2134	D1	AL	-	-	F1	AL	-	ITF	-	#1	FEMALE VANITY
D8	765	2134	D3	HM	PTD	-	F2	PSS	PTD	-	-	#4	FEMALE SHOWER

LEGEND

AL	ALUMINUM
FCB	FIBRE CEMENT BOARD
HM	HOLLOW METAL
HWD	HOLLOW CORE WOOD
ITF	INSULATED TEMPERED FROSTED GLASS UNIT
PSS	PRESSED STEEL FRAME
PTD	PAINT FINISH
SCD	SOLID CORE WOOD
TG	6 mm TEMPERED GLASS
WD	WOOD

Remarks

#1	Refer Exterior Elevation drawings
#2	Refer Exterior Elevation and Detail
#3	Insulated Exterior Door
#4	Provide 40 mm undercut
#5	Hollow Core Wood Pocket Door
#6	Double Sliding Door

END OF SECTION 08 06 10

END OF SECTION 08 06 10

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Finish Carpentry	Section 06 20 00
.3	Door Hardware	Section 08 71 00
.4	Glazing	Section 08 80 50
.5	Exterior Painting	Section 09 91 13
.6	Interior Painting	Section 09 91 23

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.2 Canadian Standards Association (CSA International)
- .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.3 Canadian Steel Door Manufacturers' Association (CSDMA)
- .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
- .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

.4 National Fire Protection Association (NFPA)
- .1 NFPA 80-2007, Standard for Fire Doors and Fire Windows.
- .2 NFPA 252-2012, Standard Methods of Fire Tests of Door Assemblies.

.5 South Coast Air Quality Management District (SCAQMD), California State
- .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.6 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .2 CAN/ULC-S702-09, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
- .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
- .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.3 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Provide fire labeled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104, and listed by nationally recognized agency having factory inspection services and to ULC fire protection rating.

1.4 SUBMITTALS

.1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.

.2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A 653M, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.1 Interior Door and Frame: galvanized with ZF75 designation

.2 Exterior Door and Frame: galvanized with Z275 designation with zinc coating

.2 Reinforcement to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

.3 Exterior and Interior Door and Frames: 16ga typical, 12ga for oversized door frame

2.2 DOOR CORE MATERIALS

.1 Honeycomb construction:

.1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m^3 minimum sanded to required thickness.

.2 Stiffened: doors to be reinforced with 0.8mm (20 gauge) hat shaped steel stiffeners welded to inside of face sheets. Stiffeners to be located a maximum 152mm (6”) on center and welded to face sheet on 100mm(4”) centers. Areas between stiffeners to be filled with fiberglass insulation.

.3 All exterior doors are to be insulated.

2.3 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.1 Adhesive: maximum VOC content 50 g/L to SCAQMD Rule 1168.

.2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, and sealant/adhesive.

2.4 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.

.1 Maximum VOC limit 50 g/L to GC-03.

2.5 PAINT

.1 Field paint steel doors and frames in accordance with Sections 09 91 13 – Exterior Painting and 09 91 23 - Interior Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

.1 Maximum VOC emission level 50 g/L to GS-11 to SCAQMD Rule 1113.

2.6 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior and interior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41- GP-19Ma.

.3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.4 Metallic paste filler: to manufacturer's standard.

.5 Fire labels: metal riveted.

.6 Sealant:

.1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.7 Glazing: Refer to Section 08 80 50.

2.7 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Interior and exterior frames: 1.2 mm welded type construction.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Prepare frame for door silencers, 3 for single door, 2 at head for double door.

.6 Manufacturer's nameplates on frames and screens are not permitted.

.7 Conceal fastenings except where exposed fastenings are indicated.

.8 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.8 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

2.9 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 DOOR FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

.3 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.

.4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.7 Provide ULC OR WHI fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with and list by nationally

recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.8 Manufacturer's nameplates on doors are not permitted.

2.11 DOORS: HONEYCOMB CORE CONSTRUCTION

.1 Form face sheets for exterior and interior doors from 1.2 mm sheet steel with honeycomb or laminated under pressure to face sheets.

2.12 HOLLOW STEEL CONSTRUCTION

.1 Form face sheets for interior doors from 1.2mm sheet steel.

.2 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.

.3 Fill voids between stiffeners of interior doors with honeycomb core.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION GENERAL

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier and vapour retarder.

3.4 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.3 Finished floor: 13 mm.

.3 Adjust operable parts for correct function.

3.5 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION 08 11 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Joint Sealants	Section 07 92 00
.2	Glazed Aluminum Curtain Walls	Section 08 44 13
.3	Door Hardware	Section 08 71 00
.4	Glazing	Section 08 80 50

1.2 REFERENCES

.1 American Architectural Manufacturers Association (AAMA)
- .1 AAMA 609/610-09, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.

.2 ASTM International
- .1 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.3 Canada Green Building Council (CaGBC)
- .1 LEED Canada-CI 1.0 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For Commercial Interiors.

.4 Canadian General Standards Board (CGSB)
- .1 CGSB 1.40-97, Anticorrosive Structural Steel Alkyd Primer.
- .2 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .3 CAN/CGSB-12.20-M89, Structural Design of Glass for Buildings.

.5 CSA International
- .1 CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 Environmental Choice Program (ECP)
- .1 CCD-045-95, Sealants and Caulking Compounds.

.7 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.8 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for doors and frames and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in

Province of British Columbia, Canada. NBCC Schedule B1, B2 and C-B as per Appendix of this specification.

.2 Indicate materials and profiles and provide full-size, scaled details of components for each type of door and frame. Indicate:
- .1 Interior trim and exterior junctions with adjacent construction.
- .2 Junctions between combination units.
- .3 Elevations of units.
- .4 Core thicknesses of components.
- .5 Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, and accessories.
- .6 Location of caulking.
- .7 Each type of door system including location.
- .8 Arrangement of reinforcing for hardware and joints.
- .9 Arrangement of hardware and required clearances.

.4 Samples:
- .1 Submit for review and acceptance of each unit.
- .2 Submit one 300 x 300 mm corner sample of each type door and frame.
- .3 Submit sample showing glazing detail, reinforcement, finish and location of manufacturer's nameplates.
- .4 Frame sample to show glazing stop, door stop, jointing detail, finish.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of aluminum finishes for incorporation into manual.

1.5 QUALITY ASSURANCE

.1 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect aluminum doors and frames from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section

.5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

2.0 PRODUCTS

2.1 DESIGN CRITERIA

.1 Size glass thickness and glass unit dimensions to limits in accordance with CAN/CGSB-12.20.

.2 Air infiltration to ASTM E283 – 0.06ctm/ft2 at a static differential of 6.24 psf

.3 No leakage to ASTM E331- no leakage at 8 psf static differential as AAMA 501.

.4 Uniform Load: A static air design load of 20 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of l/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

2.2 MATERIALS

.1 Aluminum extrusions: to Aluminum Association alloy AA 6063-T5 anodizing quality.

.2 Fasteners: aluminum finished to match adjacent material.

.3 Door bumpers: black neoprene.

.4 Isolation coating: bituminous paint.

.5 Glazing materials: double glazed unit, refer to section 08 80 50 Glazing.

.6 Sealants: colour selected by Departmental Representative in accordance with Section 07 92 00 - Joint Sealants.

.1 Maximum VOC limit: 250 g/L 5% by weight to SCAQMD Rule 1168.

2.3 EXTERIOR ALUMINUM DOORS

.1 Construct doors with minimum wall thickness of 1.6 mm, door thickness to be 44 mm deep flush with door.

.2 Door stiles nominal 61.9 mm wide plus or minus 6 mm.

.3 Top rail nominal 58.7 mm wide plus or minus 6 mm.

.4 Bottom rail nominal 58.7 mm wide plus or minus 6 mm.

.5 Reinforce mechanically-joined corners of doors to produce sturdy door unit.

.6 Polyurethane core minimum 5 lb/sf, meet GEI indoor quality certification standard.

.7 Finishing: Plain (no pattern), clear anodized.

.8 Other hardware: Refer to 08 71 00

2.4 ALUMINUM FRAMES

.1 Construct frames of aluminum extrusions with minimum wall thickness to meet specified performance requirements.

.2 Frame members 114.3 x 44.5 mm nominal size, installed as sub-frame to curtain wall section type window.

2.5 ALUMINUM FINISHES

.1 Clear anodic finish: to designation AA- M12C22A41.

2.6 FABRICATION

.1 Doors and framing to be by same manufacturer.

.2 Fabricate doors and frames to profiles and maximum face sizes as indicated.

.3 Provide structural steel reinforcement as required.

.4 Fit joints tightly and secure mechanically.

.5 Conceal fastenings.

.6 Mortise, reinforce, drill and tap doors, frames and reinforcements to receive hardware using templates provided under Section 08 71 00 - Door Hardware.

.7 Isolate aluminum from direct contact with dissimilar metals, concrete and masonry.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for aluminum doors and frames installation in accordance with manufacturer's written instructions.
  .1 Visually inspect substrate in presence of Departmental Representative.
  .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Set frames plumb, square, level at correct elevation in alignment with adjacent work.

.3 Anchor securely.

.4 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.

.5 Adjust door components to ensure smooth operation.

.6 Make allowances for deflection of structure to ensure that structural loads are not transmitted to frames.

.7 Glaze aluminum doors and frames in accordance with Section 08 80 50 - Glazing.

.8 Seal joints to provide weathertight seal at outside and air, vapour seal at inside.

.9 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within the aluminum work except where exposed use is permitted by Departmental Representative.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Perform cleaning of aluminum components in accordance with AAMA 609.1 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
- .3 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .4 Clean aluminum with damp rag and approved non-abrasive cleaner.
- .5 Remove traces of primer, caulking, epoxy and filler materials; clean doors and frames.
- .6 Clean glass and glazing materials with approved non-abrasive cleaner.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by aluminum door and frame installation.

END OF SECTION 08 11 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Air Barriers – Descriptive or Proprietary	Section 07 27 00.01
.3	Fiber-Cement Vertical Panel System	Section 07 46 46
.4	Sheet Metal Flashing and Trim	Section 07 62 00
.5	Joint Sealants	Section 07 92 00
.6	Aluminum Doors and Frames	Section 08 11 16
.7	Glazing	Section 08 80 50
.8	Cementitous Backing Board	Section 09 28 13

1.2 REFERENCES

.1 Aluminum Association (AA)
- .1 AA DAF 45-03 (R2009), Designation System for Aluminum Finishes.

.2 American Architectural Manufacturers Association (AAMA)
- .1 AAMA CW-10-04, Care and Handling of Architectural Aluminum From Shop to Site.
- .2 AAMA CW-11-85, Design Wind Loads and Boundary Layer Wind Tunnel Testing.
- .3 AAMA T1R-A1-04, Sound Control for Fenestration Products.
- .4 AAMA 501-05, Methods of Test for Exterior Walls.
- .5 AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.
- .6 AAMA 612-02, Voluntary Specifications, Performance Requirements, and Test Procedures for Combined Coatings of Anode Oxide and Transparent Organic Coatings on Architectural Aluminum.
- .7 AAMA 2603-02, Voluntary Specification Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
- .8 AAMA 2605-05,Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- .9 AAMA 501.1-05 Standard Test Method for Water Penetration of Windows , Curtain Walls and Doors using Dynamic Pressure.

.3 ASTM International
- .1 ASTM A 36/A 36M-08, Specification for Carbon Structural Steel.
- .2 ASTM A 123/A 123M-09, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A 167-99 (2009), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .4 ASTM A 653/A 653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 ASTM B 209-07, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .6 ASTM B 221-08, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .7 ASTM E 283-04, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.8 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.
.9 ASTM E 331-00 (2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.
.10 ASTM E 413-04, Classification for Rating Sound Insulation.
.11 ASTM E 1105-00 (2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
.12 ASTM E783-02 (2010), Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.
.13 ASTM E1186-03 (2009) Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

.4 Canada Green Building Council (CaGBC)
.1 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Guide For Commercial Interiors.

.5 Canadian General Standards Board (CGSB)
.1 CAN/CGSB 1.108-M89, Bituminous Solvent Type Paint.
.2 CAN/CGSB-12.20-M89, Structural Design of Glass for Buildings.

.6 CSA International
.1 CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.
.3 CAN/CSA-S157/S157.1-05, Strength Design in Aluminum/Commentary on CAN/CSA-S157, Strength Design in Aluminum.
.4 CSA W59.2-M1991 (R2008), Welded Aluminum Construction.

.7 Environmental Choice Program (ECP)
.1 CCD-045-95 (R2005), Sealants and Caulking Compounds.
.2 CCD-047-98 (R2005), Architectural Surface Coatings.
.3 CCD-048-98 (R2006), Surface Coatings - Recycled Water-borne.

.8 Green Seal Environmental Standards (GS)
.1 GS-11-2008, 2nd Edition, Paints and Coatings.

.9 Society for Protective Coatings (SSPC)
.1 SSPC - Paint 20-02 (R2004), Zinc Rich Coating, Type I - Inorganic and Type II - Organic.
.2 SSPC - Paint 25 – 97 (R2004) BCS, Zinc Oxide, Alkyd, Linseed Oil and Primer for Use Over Hand Cleaned Steel Type 1 and Type 2.

.10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1113-A2007, Architectural Coatings.
.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.11 American Society of Heating, Refrigeration, and Air Conditioning Engineers Inc. (ASHRAE)
.1 ASHRAE 90.1-2010, Energy Standard for Buildings except Low-Rise Residential Buildings

.12 BC Energy Efficiency Act
.1 Regulations for Windows, Glazing, Doors and Skylights.

.13 National Fenestration Rating Council (NFRC)
.1 All rating of Glazing system to be NFRC certified.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Co-ordination: co-ordinate work of this Section with installation of air barrier placement, vapour retarder placement, flashing placement, components or materials.

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for curtain wall components, anchorage and fasteners, glass and infill, and internal drainage details and include product characteristics, performance criteria, physical size, finish and limitations and water flow diagrams.
.2 Report showing system meets performance requirements.
.3 Thermal model report showing compliance with effective U-value requirement.

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. Submit NBCC Schedule B1, B2 and C-B as per attached Appendix in this specification.
.2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

.4 Sample:
.1 Submit for review and acceptance each color and finish.
.2 Submit one 300 x 300 corner sample.
.3 Submit sample showing glazing detail, reinforcement, and finish.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for glazed aluminum curtain wall for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Handle work of this Section in accordance with AAMA CW-10.
.2 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.3 Store and protect aluminum glazed curtain wall components from nicks, scratches, and blemishes.
.4 Protect prefinished aluminum surfaces with strippable coating. Do not use adhesive

papers or sprayed coatings which bond when exposed to sunlight or weather.

.5 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal

1.7 AMBIENT CONDITIONS

.1 Install sealants when ambient and surface temperature is above 5 degrees C minimum.

.2 Maintain this minimum temperature during and for 48 hours minimum after installation of sealants.

1.8 WARRANTY

.1 Refer Section 01 77 00- Closeout Procedures:

2.0 PRODUCTS

2.1 SYSTEMS

.1 Description:

.1 Vertical and horizontal, four-sided capture, stick built glazed aluminum curtain wall system includes thermally broken tubular aluminum sections with self-supporting framing, shop fabricated, factory prefinished, vision glass; related flashings, anchorage and attachment devices.

.2 Assembled system to permit re-glazing of individual glass (and infill panel) units from exterior without requiring removal of structural mullion sections.

.2 Performance Requirements:

.1 Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with NBC

.2 Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable codes.

.3 Limit mullion deflection to L/240 with full recovery of glazing materials.

.4 Size glass units and glass dimensions to limits established in CAN/CGSB-12.20.

.5 Ensure system is designed to accommodate the following without damage to components or deterioration of seals:

.1 Movement within system.

.2 Movement between system and perimeter framing components.

.3 Dynamic loading and release of loads.

.4 Deflection of structural support framing.

.5 Shortening of building concrete structural columns.

.6 Creep of concrete structural members.

.6 Limit air infiltration through assembly to 0.0003 m^3 /s/m^2 of wall area, measured at a reference differential pressure across assembly of 300 Pa as measured in accordance with ASTM E 283.

.7 Vapour seal with interior atmospheric pressure of 25 mm sp, 22 degrees C, 40% RH: no failure.

.8 Water leakage: none at minimum differential pressure of 700pa, when measured to ASTM E 331.

.9 Ensure system allows for expansion and contraction within system components when temperature range is 95 degrees C over 12 hour period without causing detrimental affect to system components.

.10 Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior by weep drainage network.
.11 Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
.1 Position thermal insulation on exterior surface of air barrier and vapour retarder.
.12 Ensure no vibration harmonics, wind whistles, noises caused by thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.
.13 Reinforce curtain wall system to accommodate window washing guide rails.
.1 Supply sufficiently rigid anchors to resist loads caused by equipment platform, without damage to wall system.
.14 Air infiltration to CSA-A 440 A3 fixed, A3 operable
.15 Water Leakage to CSA-A 440: B7 fixed , B5 operable.
.16 Wind load to CSA-A440 C5.

2.2 MATERIALS

.1 Extruded aluminum: to ASTM B 221.

.2 Sheet aluminum: to ASTM B 209.

.3 Anchors: 3-way adjustable hot-dip galvanized cast iron.

.4 Fasteners: stainless or aluminum, finish to match curtain wall.

.5 Bituminous paint: CAN/CGSB 1.108, Type 1 2, without thinner.

.6 Vertical and horizontal glass units:
.1 Glass in exterior lights: Refer to Section 08 80 50.

.7 Fire Safety Materials: see Section 07 84 00 - Fire Stopping.

.8 Sealant:
.1 Perimeter sealant: as per Section 07 92 00
.2 Sealant used within system (not used for Glazing).
.1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.

2.3 COMPONENTS

.1 Mullion profile:
.1 Vertical members: 50.8 x 153.9 mm nominal minimum dimension.
.2 Horizontal members: 50.8 x 153.9 mm nominal minimum dimension.
.3 Thermally broken with interior tubular section insulated from exterior pressure plate.
.4 Matching stops and pressure plate of sufficient size and strength to ensure adequate bite on glass.
.5 Drainage holes, deflector plates and internal flashings to accommodate internal weep drainage system.
.6 Internal mullion baffles to eliminate "stack effect" air movement within internal spaces.

.2 Flashings: aluminum, finish to match curtain wall mullion sections where exposed, secured with concealed fastening method.

.3 Air barrier: specified in Section 07 27 00.01 - Air Barriers - Descriptive or Proprietary.

.4 Entrance Door: Aluminum Clear Anodized Finish, refer section 08 11 16

.5 Openable window
- .1 Thermally broken double glazed, Same material and finishes as curtain wall framing.
- .2 Profile and section to suit curtain wall system.
- .3 Complete weather seal and water tightness.

.6 Anti-rotation block
- .1 Anti-rotation block to be rigid PVC (or acceptable alternative) noting that Styrofoam will not be accepted

2.4 FABRICATION

.1 Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

.2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof

.3 Prepare components to receive anchor devices. Install anchors.

.4 Arrange fasteners and attachments to ensure concealment from view.

.5 Prepare system components to receive exterior doors, in Section 08 11 16.

.6 Reinforce interior horizontal head rail to receive window covering track brackets and attachments.

.7 Reinforce framing members for external imposed loads.

.8 Visible manufacturer's identification labels not permitted.

.9 Finishes:
- .1 Clear anodic finish: to designation AA-M12 CZZA41

2.5 SOURCE QUALITY CONTROL

.1 Perform work in accordance with AAMA GSM-1

.2 Manufacturer qualifications: company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.

.3 Perform welding Work in accordance with CSA W59.2.

.4 Ensure compatibility between components.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for aluminum curtain wall installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Verify dimensions, tolerances, and method of attachment with other work.
- .3 Verify wall openings and adjoining air barrier and vapour retarder materials are ready to receive work of this Section.
- .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Install curtain wall system in accordance with manufacturer's instructions.

.2 Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

.3 Use alignment attachments and shims to permanently fasten system to building structure. Clean weld surfaces; apply protective primer to field welds and adjacent surfaces.

.4 Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.

.5 Use thermal isolation where components penetrate or disrupt building insulation.

.6 Install sill flashings.

.7 Install eave edge flashings at sloped glazing system.

.8 Co-ordinate attachment and seal of perimeter air barrier and vapour retarder materials.

.9 Provide spray-applied polyurethane thermal insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

.10 Install fire-safing in areas as indicated.

.11 Install operating sash in accordance with Section 08 80 50 - Glazing, to glazing method required to achieve performance criteria.

.12 Install glass in accordance with Section 08 80 50 - Glazing, to glazing method required to achieve performance criteria Cover caps to conceal screws and ensure continuous sightline.

3.3 SITE TOLERANCES

.1 Maximum variation from plumb: 1.5 mm/m non-cumulative or 12 mm/30 m, whichever is less.

.2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.

.3 Maximum sealant space between curtain wall and adjacent construction: 13 mm.

3.4 ADJUSTING

.1 Adjust operating sash for smooth operation.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Remove protective material from prefinished aluminum surfaces.

.3 Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

.4 Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

.5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by glazed aluminum curtain wall installation.

END OF SECTION 08 44 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Finish Carpentry	Section 06 20 00
.2	Metal Doors & Frames	Section 08 11 00
.3	Aluminum Doors & Frames	Section 08 11 16
.4	Glazed Aluminum Curtain Walls	Section 08 44 13

1.2 REFERENCES

.1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)

- .1 ANSI/BHMA A156.1- 2000 , American National Standard for Butts and Hinges.
- .2 ANSI/BHMA A156.2- 2003 , Bored and Preassembled Locks and Latches.
- .3 ANSI/BHMA A156.3- 2001 , Exit Devices.
- .4 ANSI/BHMA A156.4- 2000 , Door Controls - Closers.
- .5 ANSI/BHMA A156.5- 2001 , Auxiliary Locks and Associated Products.
- .6 ANSI/BHMA A156.6- 2005 , Architectural Door Trim.
- .7 ANSI/BHMA A156.8- 2005 , Door Controls - Overhead Stops and Holders.
- .8 ANSI/BHMA A156.10- 1999 , Power Operated Pedestrian Doors.
- .9 ANSI/BHMA A156.12- 2005 , Interconnected Locks and Latches.
- .10 ANSI/BHMA A156.13- 2002 , Mortise Locks and Latches Series 1000.
- .11 ANSI/BHMA A156.14- 2002 , Sliding and Folding Door Hardware.
- .12 ANSI/BHMA A156.15- 2006 , Release Devices - Closer Holder, Electromagnetic and Electromechanical.
- .13 ANSI/BHMA A156.16- 2002 , Auxiliary Hardware.
- .14 ANSI/BHMA A156.17- 2004 , Self-closing Hinges and Pivots.
- .15 ANSI/BHMA A156.18- 2006 , Materials and Finishes.
- .16 ANSI/BHMA A156.19- 2002 , Power Assist and Low Energy Power - Operated Doors.
- .17 ANSI/BHMA A156.20- 2006 , Strap and Tee Hinges and Hasps.

.2 Canada Green Building Council (CaGBC)

- .1 LEED Canada-CI Version 1.0- 2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Guide For Commercial Interiors.

.3 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)

- .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.3 HARDWARE/SECURITY COORDINATION

.1 Prior to preparation and submittal of hardware list, door hardware supplier’s hardware consultant shall arrange a coordination meeting with the following attendees:

- .1 Hardware supplier’s hardware consultant.
- .2 Facility’s Building Maintenance Manager.
- .3 Departmental Representative.
- .4 General Contractor.

.2 The final door hardware lists shall reflect all decisions made at said coordination meeting.

1.4 ACTION & INFORMAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit for review and acceptance of each unit.

.2 Samples will be returned for inclusion into work.

.3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.4 After approval samples will be returned for incorporation in Work.

.4 Hardware List:

.1 Submit contract hardware list.

.2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

.5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions: submit manufacturer's installation instructions.

.7 Sustainable Design Submittals:

.1 LEED Canada CI Version 1.0. Submittals: in accordance with Section 01 35 21 - LEED Requirements.

.2 Construction Waste Management:

.1 Submit project Construction Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

.3 Recycled Content:

.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

.4 Regional Materials: submit evidence that project incorporates required percentage 20 % of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.6 MAINTENANCE MATERIALS SUBMITTALS

.1 Extra Stock Materials:

.1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Tools:
.1 Supply 2 sets of wrenches for door closers, locksets, and fire exit hardware.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements:
.1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.8 DELIVERY, STORAGE & HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect door hardware from nicks, scratches, and blemishes.
.3 Protect prefinished surfaces with wrapping strippable coating.
.4 Replace defective or damaged materials with new.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal and Section 01 35 21 - LEED Requirements.

1.9 REBUNDENT LOCKSETS

.1 Where existing and other lock-bearing devices are to be removed and disposed of: turn-over to Departmental Representative and obtain receipt. In order to maintain building keying security, no existing locksets are to be removed from building.

1.10 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 30-Closeout Submittals.
.2 Supply two sets of wrenches for door closers.

2.0 PRODUCTS

2.1 HARDWARE ITEMS

.1 Use one manufacturer's products only for similar items.

2.2 DOOR HARDWARE

.1 Locks and latches:
.1 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as stated in Hardware Schedule.

.2 Lever handles: plain 64mm x 114mm x 51mm design.
.3 Roses: round
.4 Normal strikes: box type, lip projection not beyond jamb.
.5 Cylinders: key into keying system as noted as directed.
.6 Finished to 652, 626 & 630
.7 6 pin (or 7) tumbler keying to Maintenance's Master System.
.8 Dead bolt equivalent to BEST lock 83T series.

.2 Butts and hinges:
.1 Butts and hinges: to CAN/CGSB-69.18 / ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.

.3 Exit devices: to ANSI/BHMA A156.3, type & function as listed, grade (1)
.1 Auxiliary items: door coordinator.

.4 Door Closers and Accessories:
.1 Door controls (closers): to CAN/CGSB-69.20 / ANSI/BHMA A156.4, listed in Hardware Schedule, multi-sized sized 1 to though 6 in accordance with ANSI/BHMA A156.4, table A1, finished to 689.
.2 Door controls - overhead holders: to CAN/CGSB-69.24 / ANSI/BHMA A156.8, designated by letter C and numeral identifiers listed in Hardware Schedule, finished to 626.
.3 Closer/holder release devices: to CAN/CGSB/ANSI / ANSI/BHMA listed in hardware schedule, finished to 689.
.4 Door co-ordinator: surface for pairs of doors with overlapping astragal.
.5 Magnetic holder floor or wall mounted release on fire alarm: finished to 689.

.5 Auxiliary locks and associated products: to ANSI/BHMA A156.5, numeral identifiers listed in Hardware Schedule, finished to 626.
.1 Cylinders: type as listed, finished to 626, for installation in deadlocks provided with special doors as listed in Hardware Schedule. Key into keying system [as noted] [as directed].

.6 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and numeral identifiers listed in Hardware Schedule as listed below, finished to 626 or 630.
.1 Architectural door trim: to ANSI/BHMA A156.6, listed in Hardware Schedule as listed below, finished to 626 or 630
.1 Door protection plates: kick plate type as listed, 1.27 mm thick stainless steel 1 edges, finished to 630.
.2 Push plates: type as listed, 1.27 mm thick stainless steel 1 edge, as listed, finished to 630.
.3 Push/Pull units: type as listed, finished to 630.

.7 Auxiliary hardware: to ANSI/BHMA A156.16, listed in Hardware Schedule finished to 626 or 630.

.8 Door bottom seal: heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene weather seal, recessed in door bottom surface mounted recessed in door face, closed ends, adjustable automatic retract mechanism when door is open, clear anodized finish.

.9 Thresholds: 127mm wide x full width of door opening, extruded aluminum mill finish, serrated surface, with lip and vinyl door seal insert.

.10 Weatherstripping:
- .1 Head and jamb seal:
  - .1 Adhesive backed neoprene vinyl covered foam material.
- .2 Door bottom seal:
  - .1 Extruded aluminum frame and [closed cell neoprene vinyl sweep, clear anodized finish.

.11 Astragal: overlapping, Primed steel meeting stiles Pile

.12 Barrier Free Electric Door Operator:
- .1 Power-operated pedestrian doors: to ANSI/BHMA A156.10.
- .2 Power assist and low energy power operated doors: to ANSI/BHMA A156.19.
- .3 Heavy duty pneumatically assisted door closer, capable of multi-door operation, complete with actuators, control boxes, and electric motor.
- .4 Self-contained control box/compressor combination for independent operation of two door leaves.
- .5 Control boxes: complete with electric strike relay.
- .6 Mount operators on either push or pull sides of doors as required to place them inside rooms.
- .7 Actuation of operators by push button.
- .8 Electrical box and actuator: Hardwired low voltage actuator with stainless steel 114 mm round plate, engraved blue filled with handicap symbol. Box 51 mm wide x 102 mm high x 50 mm deep single gang electrical box, flush mounted in wall, locations indicated.
- .9 Supply switched line voltage to control box. Locate switch adjacent to box.

.13 Electric Strikes
- .1 Weatherproof type includes all accessories, transformer and housing. Conduit by Division 26, connection by Division 28.

2.3 MISCELLANEOUS HARDWARE

.1 Indexed key control system: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers, wall mounted, type 50% expandable colour enamel paint finish.

2.4 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

2.5 KEYING

.1 Doors, padlocks and cabinet locks to be keyed to grand master keyed as directed and as noted in Hardware Schedule. Prepare detailed keying schedule in conjunction with Departmental Representative.

.2 Supply keys in duplicate for every lock in this Contract.

.3 Supply (five) 5 master keys for each master key or grand master key group.

.4 Supply 5 keys for each lock.

.5 Stamp keying code numbers on keys and cylinders.

.6 Supply construction cores.

.7 Hand over permanent cores and keys to Departmental Representative.

.8 All core to be high security interchangeable core.

2.6 KEYS

.1 Use standard construction cylinders for locks for Contractor's use during the construction period.

.2 Issue instructions to employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.

.3 Upon completion of each phase of the construction, the Departmental Representative will, in conjunction with the lock manager:
- .1 Prepare an operational keying schedule.
- .2 Accept the operational keys and cylinders directly from the lock manufacturer.
- .3 Arrange for removal and return of the construction cores and install the operational core in all locks.

2.7 ADDITIONAL DOOR HARDWARE SCHEDULED ELSEWHERE

.1 Refer to Division 28- Electronic Safety and Security, for additional door items including, but not limited to the following:
- .1 Access and intrusion control panels.
- .2 Card readers.
- .3 Door Contracts.
- .4 Intrusion detection.

.2 Refer to Division 26-Electrical for all wiring and conduit for above items.

3.0 EXECUTION

3.1 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Supply manufacturers' instructions for proper installation of each hardware component.

.4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction.

.5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.6 Install key control cabinet.

.7 Use only manufacturer's supplied fasteners.
.1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.8 Remove construction cores locks when directed by Departmental Representative.
.1 Install permanent cores and ensure locks operate correctly.

3.2 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to ensure tight fit at contact points with frames.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.
.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
.3 Remove protective material from hardware items where present.
.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal 01 35 21 - LEED Requirements.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 DEMONSTRATION

.1 Keying System Setup and Cabinet:
.1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
.2 Place file keys and duplicate keys in key cabinet on their respective hooks.
.3 Lock key cabinet and turn over key to Departmental Representative.

.2 Maintenance Staff Briefing:
.1 Brief maintenance staff regarding:
.1 Proper care, cleaning, and general maintenance of projects complete hardware.
.2 Description, use, handling, and storage of keys.
.3 Use, application and storage of wrenches for door closers locksets and fireexit hardware.

.3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by door hardware installation.

3.6 FINISH HARDWARE SCHEDULE

.1 Single Door Long Beach North & South, Wickaninnish Beach & Incinerator Bay – D1, D4:
- .1 3 Ea. Hinges A1
- .2 1 Ea. Leadbolt B2 (installed above pull handle)
- .3 1 Ea. Cylinder B1
- .5 1 Ea. Closer C1
- .6 1 Ea. Threshold M1
- .7 1 Set Seals M3
- .8 1 Ea. Door Bottom (by Door Supplier)
- .9 1 Ea. Kick Plate J1
- .10 1 Ea. Push Plate J3 (installed at accessible height)
- .11 1 Ea. Pull Handle, J2 (installed at accessible height)

.2 Single Door: Wickaninnish Beach & Incinerator Bay D3
- .1 3 Ea. Hinges A1
- .2 1 Ea. Lock Set B3
- .3 1 Ea. Cylinder B1
- .4 1 Ea. Overhead Stop F2
- .5 1 Ea. Door Sweep M2
- .6 1 Set Seals M3
- .7 1 Ea. Threshold M1
- .8 1 Ea. Kick Plate J1
- .9 1 Ea. Door Holder M4

.3 Single Door Long Beach North & South, Wickaninnish Beach & Incinerator Bay - D6, D7, D8, D9
- .1 1 Ea self-closing Barrel Hinges A3
- .2 2 Ea Barrel Hinges A4
- .2 2 Ea Pull Handle, J2 (one on each side of the door)
- .3 1 Ea. Lock Set B4

.4 Single Door Greenpoint WR #1 & #4 – D1, D6
- .1 3 Ea. Hinges A1
- .2 1 Ea. Leadbolt B2 (installed above pull handle)
- .3 1 Ea. Cylinder B1
- .5 1 Ea. Closer C1
- .6 1 Ea. Threshold M1
- .7 1 Set Seals M3
- .8 1 Ea. Door Bottom (by Door Supplier)
- .9 1 Ea. Kick Plate J1
- .10 1 Ea. Push Plate J3 (installed at accessible height)
- .11 1 Ea. Pull Handle, J2 (installed at accessible height)

.5 Single Door Greenpoint: D4
- .1 3 Ea. Hinges A1
- .2 1 Ea. Lock Set B3
- .3 1 Ea. Cylinder B1
- .4 1 Ea. Overhead Stop F2
- .5 1 Ea. Door Sweep M2

.6 1 Set Seals M3
.7 1 Ea. Threshold M1
.8 1 Ea. Kick Plate J1

.6 Single Door Greenpoint D3, D8
.1 3 Ea. Hinges A2
.2 1 Ea. Lock Set B4
.3 1 Ea. Cylinder B1
.4 1 Ea. Wall Stop F1
.5 1 Ea. Kick Plate J1

3.7 DOOR HARDWARE TYPE

.1 HINGES:
A1 – Heavy Duty Hinge 5 Knuckle-.180gauge-114mm x 101mm x Non Removable Pin x 630
A2 – Hinge 5 Knuckle-.134 gauge- 114mm x 101mm x Non Removable Pin x 652
A3 – self-closing, 5 tension adjustments, stainless steel hinge, round or Flat post compatibility, Adjustable yoke, Load Rating: 2,000 lbs
A4 - Four sealed bearings (no greasing) , stainless Steel hinge, Bolt-on installations, Load Rating: 3,000+ lbs

.2 LOCKS

B1 - CYLINDER	TYPE X LENGTH X CAM TO SUIT	626
B2 – DEADBOLT	ANSI E06091	626
B3 - LOCK SET	ANSI F07	626
B4 - LOCK SET	ANSI F19 WITH OCCUPANCY INDICATOR ROSE	626

.3 CLOSERS:
Note: Include thru-bolts and grommet nuts fasteners.
C1 – Closer Institutional, non sized, rigid parallel with fixed door stop arm x delayed action x 689

.4 AUXILIARY HARDWARE:
F1 - Wall stop Cast concealed mount, concave bumper with back plate x 626
F2 - Heavy duty surface mount over-head door hold & stop x 689

.5 ARCHITECTURAL DOOR TRIM:
J1 - Kick Plate 254mm x width less 38mm x 630
J2 - Pull 25mm dia x 305mm x 630
J3 - Push Plate 101mm x 406mm x 630

.6 THRESHOLDS, SEALS, DOOR BOTTOMS, ASTRAGAL:
M1 – Threshold Barrier free Saddle 127 mm x 13.7 mm x width x stainless steal
M2 –Door Sweep Similar to Pemko 345AV-width
M3 – Seals Adjustable jamb type x silicone insert x 2/height x 1 width
M4 – Stainless Steel heavy duty door holder 101.6 mm kick-down style holder with rubber tip

END OF SECTION 08 71 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Aluminum Doors and Frames Section 08 11 16

.2 Glazed Aluminum Curtain Walls Section 08 44 13

1.2 REFERENCES

.1 ASTM International

.1 ASTM C 542-05 (2011), Standard Specification for Lock-Strip Gaskets.

.2 ASTM D 2240-05 (2010), Standard Test Method for Rubber Property - Duromete Hardness.

.3 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.

.2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.

.3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.

.4 CAN/CGSB-12.8-97, Insulating Glass Units.

.5 CAN/CGSB-12.8-97, (Amendment), Insulating Glass Units.

.6 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.

.7 CAN/CGSB-12.11-M90, Wired Safety Glass.

.3 Glass Association of North American (GANA)

.1 GANA Glazing Manual – 50th Anniversary Edition.

.2 GANA Laminated Glazing Reference Manual - 2009.

.4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Low-Emitting Materials:

.1 Submit listing of adhesives and sealants used in building, showing compliance with VOC and chemical component limits or restrictions requirements.

.4 Samples: Provide 1 glazed units samples, 300 x 300, in accordance with Section 01 33 00- Submittal Procedures.

.5 Shop Drawings:

.1 Provide shop drawings in accordance with Section 01 33 00- Submittal Procedures:

.1 Shop drawing consist of aluminum framing installation details. Indicate sizes, spacing, location and quantities.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product 'Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect glazing and frames from nicks, scratches, and blemishes.

.3 Protect prefinished aluminum surfaces with wrapping.

.4 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal

1.6 AMBIENT CONDITIONS

.1 Ambient Requirements:

.1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.

.2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.7 WARRANTY

.1 Provide manufacturer's warranty in writing for insulating glass units against failure of seal of enclosed air space and deposits on inner faces of glass detrimental to vision for a period of 2 years from date of Substantial Performance of Work.

2.0 PRODUCTS

2.1 MATERIALS

.1 Design Criteria:

.1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:

.1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.2 Size glass to withstand wind loads, dead loads and positive and negative live loads to National Building Code 2010 and BCBC 2012.

.3 Limit glass deflection to 1/200 with full recovery of glazing materials.

.2 Flat Glass:

.1 Float Glass: to CAN/CGSB-12.3, glazing quality, minimum 6 mm thick.

.3 Exterior Insulated glass unit GL1: performance requirements for insulated glass units with 13 mm air space and two 6 mm lites, Exterior light clear with low-E coating on surface #2, interior lite frosted, outer and inner lite both tempered, shall be as follows:

.1 Transmittance: UV-18%, Visible-70%, Solar-32%.

.2 Outdoor reflectance: Visible-11%, Total Solar Energy-29%.
.3 U-Value W/m²/°C: Winter 1.6466 (029 BTU/Hr/Ft/°F) Summer 1.5898 (028 BTU/HR/Ft/°F)
.4 Solar heat gain coefficient: 0.38
.5 Shading coefficient: 0.43
.6 Warm edge spacer bar and argon gas filled cavity

.3 Exterior insulated glass unit GL2: same as GL-1 except both lites clear.

2.2 ACCESSORIES

.1 Setting blocks: neoprene Shore A durometer hardness to ASTM D 2240, minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height.

.2 Spacer shims: neoprene Shore A durometer hardness to ASTM D 2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self-adhesive on one face.

.3 Glazing tape:
.1 Preformed butyl compound Shore A durometer hardness to ASTM D 2240; coiled on release paper; black colour. Width x thickness recommended by manufacturer to suit installation.

.4 Glazing splines: resilient neoprene, extruded shape to suit glazing channel retaining slot, black colour as selected.

.5 Glazing clips: manufacturer's standard type.

.6 Lock-strip gaskets: to ASTM C 542.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
.1 Verify that openings for glazing are correctly sized and within tolerance.
.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
.3 Visually inspect substrate in presence of Departmental Representative.
.4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

.1 All glass shall be cushioned and rattle free. Draw marks shall be installed horizontally unless prohibited by the size of the sheet.

.2 Install all glass on glazing blocks with spacer blocks, of sizes required to ensure shim spaces as recommended by the glass manufacturer with adequate space for glazing compounds and sealants.

.3 Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass but not more than 10 mm below sightline.

.4 Apply sealant to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.1 Remove traces of primer, caulking.

.2 Remove glazing materials from finish surfaces.

.3 Remove labels.

.4 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.

.1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION 08 80 50

				WALLS					REMARKS
NO.	**ROOM NAME**	**FLOORS**	**BASE**	**WEST WALL**	**NORTH WALL**	**EAST WALL**	**SOUTH WALL**	**CEILING**	
LONG BEACH NORTH & SOUTH, WICKANINNISH BEACH									
RS1	MALE VANITY	PRT	CT	CT	CT	CT	CT	GWB	
RS2	MALE TOILET STALLS	PRT	CT	CT	CT	CT	CT	GWB	
RS3	SERVICE ROOM	CONC.	-	PTD	PTD	PTD	PTD	EXP.	
RS4	FEMALE VANITY	PRT	CT	CT	CT	CT	CT	GWB	
RS5	FEMALE TOILET STALLS	PRT	CT	CT	CT	CT	CT	GWB	
RS6	CHANGE CUBICLE #1	SSG	-	FCB	FCB	FCB	FCB	FCB	#1
RS7	CHANGE CUBICLE #2	SSG	-	FCB	FCB	FCB	FCB	FCB	#1
RS8	FAMILY CHANGE CUBICLE #1	SSG	-	FCB	FCB	FCB	FCB	FCB	#1
RS9	FAMILY CHANGE CUBICLE #2	SSG	-	FCB	FCB	FCB	FCB	FCB	#1
INCINERATOR ROCK									
RS1	MALE VANITY	PRT	CT	CT	CT	CT	CT	GWB	
RS2	MALE TOILET STALLS	PRT	CT	CT	CT	CT	CT	GWB	
RS3	SERVICE ROOM	CONC.	-	PTD	PTD	PTD	PTD	EXP.	
RS4	FEMALE VANITY	PRT	CT	CT	CT	CT	CT	GWB	
RS5	FEMALE TOILET STALLS	PRT	CT	CT	CT	CT	CT	GWB	
RS6	CHANGE CUBICLE #1	SSG	-	FCB	FCB	FCB	FCB	MTL	#1
RS7	CHANGE CUBICLE #2	SSG	-	FCB	FCB	FCB	FCB	MTL	#1
RS8	FAMILY CHANGE CUBICLE #1	SSG	-	FCB	FCB	FCB	FCB	MTL	#1
RS9	FAMILY CHANGE CUBICLE #2	SSG	-	FCB	FCB	FCB	FCB	MTL	#1
GREENPOINT #1 AND 2									
RS1	MALE VANITY	PRT	CT	CT	CT	CT	CT	GWB	
RS2	MALE TOILET STALLS	PRT	CT	CT	CT	CT	CT	GWB	
RS3	MALE SHOWER	PRT	CT	CT	CT	CT	CT	GWB	
RS4	SERVICE ROOM	CONC.	-	PTD	PTD	PTD	PTD	EXP.	
RS5	SERVICE CORRIDOR	CONC.	-	PTD	PTD	PTD	PTD	EXP.	
RS6	FEMALE VANITY	PRT	CT	CT	CT	CT	CT	GWB	
RS7	FEMALE TOILET STALLS	PRT	CT	CT	CT	CT	CT	GWB	
RS8	FEMALE SHOWER	PRT	CT	CT	CT	CT	CT	GWB	
RS9	DISH WASH AREA	PRT	-	FCB	FCB	FCB	FCB	FCB	#1

LEGENDS

FLOOR		BASE		WALLS		CEILINGS	
CONC	Sealed Concrete	CT	Ceramic Tile	CT	Ceramic Tile	EXP	Exposed Ceiling
PRT	Porcelain Tile			FCB	Fibre Cement Board	FCB	Fibre Cement Board
SSG	Stainless Steel Grating			PT	Painted	GWB	GWB Ceiling Paint Finish
						MTL	Metal Soffit Panel

GENERAL NOTES

.1 All wall finishes and wall base to be continuous behind all wall fixtures.
.2 Vertical bulkheads/down drops to be finished same as horizontal U.O.N.
.3 Return wall finishes into window frames at jambs and head U.O.N.
.4 Wall finishes to extend down to floor with applied base over.
.5 All backer board for ceramic tiles wall to be fiber cement board.
.6 All ceiling GWB to be water resistant GWB.

REMARKS

.1 Refer Exterior Elevation and Ceiling Plan

END OF SECTION 09 06 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Joint Sealants	Section 07 92 00
.3	Non-Structural Metal Framing	Section 09 22 16
.4	Interior Painting	Section 09 91 23

1.2 REFERENCES

.1 Aluminum Association (AA)
- .1 AA DAF 45-03 (R2009), Designation System for Aluminum Finishes.

.2 ASTM International
- .1 ASTM C 475-12 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 514-04 (2009e1), Standard Specification for Nails for the Application of Gypsum Board.
- .3 ASTM C 557-03 (2009) e1,Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .4 ASTM C 840-11, Standard Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- .6 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .7 ASTM C 1047-10a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .8 ASTM C 1280-13, Standard Specification for Application of Gypsum Sheathing.
- .9 ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .10 ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .11 ASTM C 1396/C 1396M-06a, Standard Specification for Gypsum Wallboard.

.3 Association of the Wall and Ceiling Contractors (AWCC)
- .1 Specifications Standards Manual 2012

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.5 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1113-A2007, Architectural Coatings.
.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.7 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals.
.1 Low-Emitting Materials:
.1 Submit listing of adhesives and sealants and used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store gypsum board assemblies materials level off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
.3 Protect from weather, elements and damage from construction operations.
.4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
.5 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
.6 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

1.5 AMBIENT CONDITIONS

.1 Maintain temperature 10 degrees C minimum (21 degrees C maximum) for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

2.0 PRODUCTS

2.1 MATERIALS

.1 Standard board: to ASTM C 1396/C 1396M regular, 12.7mm and 15.9 mm thick Type X, 12.7 mm and 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges tapered.

.2 Water-resistant board: to ASTM C 1396/C 1396M regular, 12.7mm and 15.9 mm thick and Type X, 12.7mm and 15.9mm thick, 1220 mm wide x maximum practical length.

.3 Glass mat water-resistant gypsum backing board: to ASTM C 1178/C 1178M, 12.7 and 15.9 mm thick, 1200 mm wide x maximum practical length.

.4 Glass mat gypsum substrate sheathing: to ASTM C 1177/C 1177M, 15.9 mm thick, 1200 mm wide x maximum practical length.

.5 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.6 Resilient clips and drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

.7 Nails: to ASTM C 514.

.8 Steel drill screws: to ASTM C 1002.

.9 Laminating compound: as recommended by manufacturer, asbestos-free.

.10 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.

.11 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
- .2 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.

.12 Joint compound: to ASTM C 475, asbestos-free.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

.1 Do application and finishing of gypsum board to ASTM C 840 except where specified otherwise.

.2 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840 except where specified otherwise.

.3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.4 Install work level to tolerance of 1:1200.

.5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.6 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.9 Install wall furring for gypsum board wall finishes to ASTM C 840, except where specified otherwise.

.10 Furr openings and around built-in equipment, cabinets, access panels on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.11 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.3 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking as specified in Section 06 08 99, sound attenuation, electrical and mechanical work have been approved by Departmental Representative.

.2 Apply single or double layer gypsum board to wood furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.

.1 Single-Layer Application:

.1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840.

.2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.

.2 Double-Layer Application:

.1 Install gypsum board for base layer and exposed gypsum board for face layer.

.2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.

.3 Apply base layers at right angles to supports unless otherwise indicated.

.4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.

.3 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, and ducts, in partitions where perimeter sealed with acoustic sealant.

.4 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire- rated assemblies require vertical application.

.5 Install gypsum board with face side out.

.6 Do not install damaged or damp boards.

.7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.6 Provide continuous polyethylene dust barrier behind and across control joints.

.7 Locate control joints at changes in substrate construction at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.

.8 Install control joints straight and true.

.9 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.10 Install expansion joint straight and true.

.11 Install cornice cap where gypsum board partitions do not extend to ceiling.

.12 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.

.13 Splice corners and intersections together and secure to each member with 3 screws.

.14 Install access doors to electrical and mechanical fixtures specified in respective sections.
.1 Rigidly secure frames to furring or framing systems.

.15 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.16 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
.1 Levels of finish:
.1 At typical wall and ceiling locations. Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and edges.

.17 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.18 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of
gypsum board so as to be invisible after surface finish is completed.

.19 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.20 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.5 CLEANING
.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.6 PROTECTION
.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

END OF SECTION 09 21 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Thermal Insulation	Section 07 21 00
.3	Gypsum Board Assemblies	Section 09 21 16
.4	Cementitous Backing Boards	Section 09 28 13

1.2 REFERENCES

.1 ASTM International
- .1 ASTM C 645- 13, Specification for Nonstructural Steel Framing Members.
- .2 ASTM C 754- 11 , Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

.2 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.3 Association of Wall and Ceiling Contractors of BC (AWCC)
- .1 Specification Standards Manual, 2012 Edition.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. Submit NBCC Letter of Assurance Schedule B1, B2 and C-B as per Appendix in specification.
- .2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1. 5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management And Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Steel Studs & Steel Stud Furring:

.1 Conform to ASTM C645, non-loadbearing; C-shape, hot dipped galvanized steel studs with Z180 (G60) zinc coating.
Studs to have knurled face and pre-punched pass-through holes for horizontal runs of wiring and piping. Length to suit, no splicing allowed.

.2 Flange: Depth not less than 32mm, edges bent back 90 deg. and edges hemmed 5mm minimum.

.3 Widths: As scheduled and indicated.

.4 Gauges: Interior steel stud to be a minimum of 0.88mm (20 gauge). Interior door jamb studs: 0.88 mm (20 gauge), two (2) studs each side of opening. Increase gauge of steel studs at over-height locations to suit stud manufacturer's design tables, in order to maintain overall partition dimension as detailed in wall schedule and in accordance with the BC Building Code. Exterior steel stud to be minimum1.23 mm (18 gauge).

.5 Colour code steel studs for gauge in accordance with AWCC colour code chart.

.2 Stud Tracks:

.1 Top and bottom runner tracks fabricated from same materials as studs; leg design min. 32mm high, slightly bent in to hold studs; widths to equal stud width.

.2 Use extended leg top track to partitions as required for deflection.

.3 Stud Fasteners: Manufacturer's standard, suitable for intended application.

.4 Shaft Wall Framing Supports: Stud and track metal components fabricated from hot-dipped zinc coated steel meeting ASTM C645. Zinc coating shall be Z180 (G60). Steel I-studs, J-tracks, T-splines, L-runners, fasteners shall be of design gauge as used within appropriate shaft wall system tested under design numbers indicated in wall schedule.

.5 Furring Channels: Hat section; roll formed from 0.53mm hot dipped galvanized steel having a Z180 (G60) coating, dimensions 68.2 mm or 66.7mm overall width, face width 35 mm by 22.2mm deep, face knurled.

.6 "Z-bar" Furring: Roll formed from 0.46mm (26 ga.) hot dipped galvanized steel having a Z180 (G60) coating, 32mm face dimension x depth to suit rigid insulation thickness, see drawings and wall schedule.

.7 Gypsum Board Ceiling Framing: Conform to Section 9.7, Part 2, Item 4 of the A.W.C.C. Standards which are minimum and as otherwise described below to exceed that minimum.

.1 Tie Wire: 1.62mm (16 ga.) galvanized steel tie wire.

.2 Hangers: 3.6mm (9 ga.) diameter galvanized soft annealed steel wire, or 4.8mm diameter zinc coated or cadmium plated steel rods. Ceiling area supported:

Area	Size of Hangers
Up to 1.15m^2	3.6 mm (9 ga.) diameter galvanized wire.
Up to 1.48 m^2	4.8mm diameter rods

.3 Inserts: Able to develop full strength of supported hangers.

.4 Main Carrying Channels: Cold formed steel channels of dimension and weight as follows and protected with rust inhibitive coating. Main carrying channels shall not be less than 38mm x 12.7mm x 1.37mm cold formed channels.

Maximum Spacing of Hangers	Maximum Spacing of Main Runners
900mm	1200mm
1000mm	1000mm
1200mm	900mm

.5 Cross Furring/Ceilings: Cross furring members shall be hat-shaped furring

channels as specified in Clause 2.5, above. Max. spacing between furring channels shall conform to the following requirements, based on gypsum board thicknesses and layers.

.8 Metal Backing Plates: Flat sheet from 0.91mm (20ga.) thick galvanized steel of same type as are the studs as blocking to support work of other sections.

Gypsum Board Thickness	Maximum Furring Spacing
Single 12.7mm board	400 mm
Single 15.9mm board	600 mm
Double layer	400 mm

3.0 EXECUTION

3.1 ERECTION

.1 Fire Resistance Rated Walls: Comply with requirements of testing agency approved by the Consultant for wall systems detailed on Drawings.

.2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.

.3 Place studs vertically at on centre as detailed and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Attach studs to bottom and ceiling track using pop rivets.

.6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.9 Install heavy gauge single jamb studs at openings.

.10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.12 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.13 Extend partitions to ceiling height except where noted otherwise on drawings.

.14 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to

studs. Use 50 mm leg ceiling tracks.

.15 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.16 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

.17 Provide clearances and isolation felt to ensure no contact between steel stud system and adjacent metal components to eliminate electrolytic action.

3.2 CHASE WALLS

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.3 SHAFT WALL ERECTION

.1 At shaft wall partitions, use the methods of assembly as used in the fire test specimen to maintain fire and sound ratings. Coordinate with Section 09 21 16, Gypsum Board Assemblies.

.2 Coordinate construction of shaft walls to suit installation of services.

3.4 CEILING AND SOFFIT SUSPENSION

.1 Hangers:

.1 Ensure hangers for suspended gypsum board ceilings support independent of walls, columns, pipes, ducts, and are erected plumb and securely anchored to structural frame or imbedded in concrete slabs. Do not use powder actuated fasteners/anchors.

.2 Space hangers at 1200mm maximum centers along runner channels and not more than 150mm from boundary walls, interruptions of continuity and change in direction.

.3 Provide at least 25mm clearance at walls.

.2 Runner Channels:

.1 Space channels at max. 900mm centers and not more than 150mm from boundary walls, interruptions of continuity and change in direction. Provide clearance of at least 25mm at walls.

.2 Run the channels transversely to structural framing members.

.3 Where splices are necessary, lap members at least 200mm and wire each end with 2 loops. Avoid clustering or lining up splices.

.4 Attach to rod hangers by bending hanger sharply under bottom flange of runner and securely wire in place with a saddle tie.

.3 Cross Furring:

.1 Erect furring channels transversely across runner channels, or other supports.

.2 Space furring channels at 400mm centers and not more than 150mm from boundary walls, openings, interruptions in ceiling continuity and change in direction. Provide a clearance of at least 25mm at walls.

.3 Secure furring channels to each support with clips or double 1.62 mm (16 ga.) dia. wire ties. Splice joints by nesting and tying channels together.

.4 Level furring channels to a maximum tolerance of 1:1000.

.4 At openings, including ceiling access panels, in ceiling suspension system that interrupts the main carrying channels of furring channels, reinforce grillage with 19mm cold rolled channels, wire tie to top and parallel to main runner channels, extend 19mm channels minimum 300mm past each end of openings.

3.5 WALL FURRING

.1 Place furring channels attached to masonry or concrete surfaces at 400mm o.c. and not more than 100mm from corners and openings.

.2 Secure flanges to wall with hardened nails, power actuated fasteners or equivalent fastenings. Maximum spacing 600 mm alternating to opposite flanges.

3.6 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION 09 22 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Thermal Insulation	Section 07 21 00
.3	Gypsum Board Assemblies	Section 09 21 16
.4	Cementitous Backing Boards	Section 09 28 13

1.2 REFERENCES

.1 ASTM International
- .1 ASTM C 645- 13, Specification for Nonstructural Steel Framing Members.
- .2 ASTM C 754- 11 , Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

.2 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.3 Association of Wall and Ceiling Contractors of BC (AWCC)
- .1 Specification Standards Manual, 2012 Edition.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. Submit NBCC Letter of Assurance Schedule B1, B2 and C-B as per Appendix in specification.
- .2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1. 5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management And Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Steel Studs & Steel Stud Furring:

.1 Conform to ASTM C645, non-loadbearing; C-shape, hot dipped galvanized steel studs with Z180 (G60) zinc coating.
Studs to have knurled face and pre-punched pass-through holes for horizontal runs of wiring and piping. Length to suit, no splicing allowed.

.2 Flange: Depth not less than 32mm, edges bent back 90 deg. and edges hemmed 5mm minimum.

.3 Widths: As scheduled and indicated.

.4 Gauges: Interior steel stud to be a minimum of 0.88mm (20 gauge). Interior door jamb studs: 0.88 mm (20 gauge), two (2) studs each side of opening. Increase gauge of steel studs at over-height locations to suit stud manufacturer's design tables, in order to maintain overall partition dimension as detailed in wall schedule and in accordance with the BC Building Code. Exterior steel stud to be minimum1.23 mm (18 gauge).

.5 Colour code steel studs for gauge in accordance with AWCC colour code chart.

.2 Stud Tracks:

.1 Top and bottom runner tracks fabricated from same materials as studs; leg design min. 32mm high, slightly bent in to hold studs; widths to equal stud width.

.2 Use extended leg top track to partitions as required for deflection.

.3 Stud Fasteners: Manufacturer's standard, suitable for intended application.

.4 Shaft Wall Framing Supports: Stud and track metal components fabricated from hot-dipped zinc coated steel meeting ASTM C645. Zinc coating shall be Z180 (G60). Steel I-studs, J-tracks, T-splines, L-runners, fasteners shall be of design gauge as used within appropriate shaft wall system tested under design numbers indicated in wall schedule.

.5 Furring Channels: Hat section; roll formed from 0.53mm hot dipped galvanized steel having a Z180 (G60) coating, dimensions 68.2 mm or 66.7mm overall width, face width 35 mm by 22.2mm deep, face knurled.

.6 "Z-bar" Furring: Roll formed from 0.46mm (26 ga.) hot dipped galvanized steel having a Z180 (G60) coating, 32mm face dimension x depth to suit rigid insulation thickness, see drawings and wall schedule.

.7 Gypsum Board Ceiling Framing: Conform to Section 9.7, Part 2, Item 4 of the A.W.C.C. Standards which are minimum and as otherwise described below to exceed that minimum.

.1 Tie Wire: 1.62mm (16 ga.) galvanized steel tie wire.

.2 Hangers: 3.6mm (9 ga.) diameter galvanized soft annealed steel wire, or 4.8mm diameter zinc coated or cadmium plated steel rods. Ceiling area supported:

Area	Size of Hangers
Up to 1.15m^2	3.6 mm (9 ga.) diameter galvanized wire.
Up to 1.48 m^2	4.8mm diameter rods

.3 Inserts: Able to develop full strength of supported hangers.

.4 Main Carrying Channels: Cold formed steel channels of dimension and weight as follows and protected with rust inhibitive coating. Main carrying channels shall not be less than 38mm x 12.7mm x 1.37mm cold formed channels.

Maximum Spacing of Hangers	Maximum Spacing of Main Runners
900mm	1200mm
1000mm	1000mm
1200mm	900mm

.5 Cross Furring/Ceilings: Cross furring members shall be hat-shaped furring

channels as specified in Clause 2.5, above. Max. spacing between furring channels shall conform to the following requirements, based on gypsum board thicknesses and layers.

.8 Metal Backing Plates: Flat sheet from 0.91mm (20ga.) thick galvanized steel of same type as are the studs as blocking to support work of other sections.

Gypsum Board Thickness	Maximum Furring Spacing
Single 12.7mm board	400 mm
Single 15.9mm board	600 mm
Double layer	400 mm

3.0 EXECUTION

3.1 ERECTION

.1 Fire Resistance Rated Walls: Comply with requirements of testing agency approved by the Consultant for wall systems detailed on Drawings.

.2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.

.3 Place studs vertically at on centre as detailed and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Attach studs to bottom and ceiling track using pop rivets.

.6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.9 Install heavy gauge single jamb studs at openings.

.10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.12 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.13 Extend partitions to ceiling height except where noted otherwise on drawings.

.14 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to

studs. Use 50 mm leg ceiling tracks.

.15 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.16 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

.17 Provide clearances and isolation felt to ensure no contact between steel stud system and adjacent metal components to eliminate electrolytic action.

3.2 CHASE WALLS

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.3 SHAFT WALL ERECTION

.1 At shaft wall partitions, use the methods of assembly as used in the fire test specimen to maintain fire and sound ratings. Coordinate with Section 09 21 16, Gypsum Board Assemblies.

.2 Coordinate construction of shaft walls to suit installation of services.

3.4 CEILING AND SOFFIT SUSPENSION

.1 Hangers:

.1 Ensure hangers for suspended gypsum board ceilings support independent of walls, columns, pipes, ducts, and are erected plumb and securely anchored to structural frame or imbedded in concrete slabs. Do not use powder actuated fasteners/anchors.

.2 Space hangers at 1200mm maximum centers along runner channels and not more than 150mm from boundary walls, interruptions of continuity and change in direction.

.3 Provide at least 25mm clearance at walls.

.2 Runner Channels:

.1 Space channels at max. 900mm centers and not more than 150mm from boundary walls, interruptions of continuity and change in direction. Provide clearance of at least 25mm at walls.

.2 Run the channels transversely to structural framing members.

.3 Where splices are necessary, lap members at least 200mm and wire each end with 2 loops. Avoid clustering or lining up splices.

.4 Attach to rod hangers by bending hanger sharply under bottom flange of runner and securely wire in place with a saddle tie.

.3 Cross Furring:

.1 Erect furring channels transversely across runner channels, or other supports.

.2 Space furring channels at 400mm centers and not more than 150mm from boundary walls, openings, interruptions in ceiling continuity and change in direction. Provide a clearance of at least 25mm at walls.

.3 Secure furring channels to each support with clips or double 1.62 mm (16 ga.) dia. wire ties. Splice joints by nesting and tying channels together.

.4 Level furring channels to a maximum tolerance of 1:1000.

.4 At openings, including ceiling access panels, in ceiling suspension system that interrupts the main carrying channels of furring channels, reinforce grillage with 19mm cold rolled channels, wire tie to top and parallel to main runner channels, extend 19mm channels minimum 300mm past each end of openings.

3.5 WALL FURRING

.1 Place furring channels attached to masonry or concrete surfaces at 400mm o.c. and not more than 100mm from corners and openings.

.2 Secure flanges to wall with hardened nails, power actuated fasteners or equivalent fastenings. Maximum spacing 600 mm alternating to opposite flanges.

3.6 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION 09 22 16

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Thermal Insulation	Section 07 21 00
.3	Joint Sealants	Section 07 92 00
.4	Gypsum Board Assemblies	Section 09 21 16
.5	Non-structural Metal Framing	Section 09 22 16
.6	Ceramic Tiling	Section 09 30 13
.7	Metal Toilet Compartments	Section 10 21 13.13

1.2 REFERENCES

.1 ANSI 108/A118/A136 – American National Standards for the Installation of Ceramic Tile.

.2 ANSI A108.11 – Installation of Cementitious Backer Units.

.3 ANSI A118.4 – Specifications for Latex Portland Cement Mortar.

.4 ANSI A118.9 – Cementitious Baker Units.

.5 ANSIA136.1 – Organic Adhesives for Installation of Ceramic Tile.

.6 ASTM C1288 – Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.

1.3 SUBMITTALS

.1 Submit under provisions of Section 01 33 00 Submittal Procedures.

.2 Product Data: Manufacturer's data sheets on each product to be used, including:
- .1 Preparation instructions and recommensations.
- .2 Storage and handling requirements and recommendations.
- .3 Installation methods.

.3 Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm) square, representing actual product, colour, and patterns.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Minimum of 2 years' experience with installation of similar products.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Store products in manufacturer's unopened packaging until ready for installation.

.2 Store boards flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

1.6 PROJECT CONDITIONS

.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WASTE MANAGEMENT & DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

1.8 WARRANTY

.1 Product Warranty: limited product warranty against manufacturing defects:

.2 Workmanship Warranty: application limited warranty for 2 years.

2.0 PRODUCTS

2.1 BACKERBOARD

.1 Type: 1/2 inch (13 mm) nominal cement board.

.2 Material shall meet the following building code compliance:
- .1 Non-asbestos fiber-cement to comply with ASTM C1288 and ANSI A118.9
- .2 Board shall meet the building code compliance National Evaluation Report No. NER 405.
- .3 US Department of Housing and Urban Development Materials Release 1268C.
- .4 California DSA PA-019.
- .5 City of Los Angeles, Research Report No. 24862.

2.2 FASTENERS

.1 Wood Framing fasteners
- .1 Wood framing: 1-1/2 inches (32 mm) corrosion resistant (galvanized or stainless steel) roofing nails.
- .2 Wood framing: 1-1/2 inches (32 mm) No. 8 by 0.375 inch (9.5 mm) HD self-drilling, corrosion resistant ribbed wafer head screws.

.2 Metal Framing:
- .1 Metal framing: 1-1/2 inches (32 mm) No. 8 by 0.375 inch (9.5 mm) HD self-drilling, corrosion resistant ribbed wafer head screws.

3.0 EXECUTION

3.1 EXAMINATION

.1 Do not installation until substrates have been properly prepared.

.2 If framing preparation is the responsibility of another installer; notify Architect of unsatisfactory preparation before proceeding.

3.2 WALL FRAMING

.1 Either vertical or horizontal, nominal 2 inches by 4 inches (51 mm by 102 mm) wood framing spaced a maximum of 24 inches (610 mm) on centre with end joints staggered from adjacent courses in both vertical and horizontal applications.

.2 To comply with ANSI A108.11, either vertical or horizontal, nominal 2 inches by 4 inches (51 mm by 102 mm) wood framing spaced a maximum of 16 inches (406 mm)

on centre with end joints staggered from adjacent courses in both vertical and horizontal applications.

.3 Either vertical or horizontal, minimum 20 gauge 3-5/8 inches (92 mm) or 6 inches (152 mm) C-Stud 24 inches (610 mm) maximum on centre metal framing complying with local building codes with end joints staggered from adjacent courses in both vertical and horizontal applications.

.4 Comply with ANSI A108.11, either vertical or horizontal, minimum 20 gauge 3-5/8 inches (92 mm) or 6 inches (152 mm) C-Stud 16 inches (406 mm) maximum on centre metal framing complying with local building codes with end joints staggered from adjacent courses in both vertical and horizontal applications.

.5 Install a water proofing membrane for all shower stalls:
.1 Repair any punctures or tears in vapour barrier prior to the installation of the board.

3.3 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.4 INSTALLATION

.1 Install in accordance with manufacturer's instructions. Install sheets with 1/8 inch (3 mm) gap between sheets.

.2 Place fasteners 8 inches (152 mm) on centre no closer than 3/8 inch (9.5 mm) from board edges and 2 inches (51 mm) from board corners.

.3 Boards shall be placed with a minimum 1/4 inch (6 mm) clearance from the floor surfaces and other horizontal tile termination locations, including above tub edges. This gap shall be free of adhesive and grout and filled with flexible sealant.

.4 Boards shall be placed with a minimum 1/8 inch (3 mm) clearance from wall and cabinet bases, and other horizontal tile termination locations, including above tub edges. This gab shall be free of adhesive and grout and filled with a flexible sealant.

.5 Joints shall be reinforced with 2 inches (51 mm) wide, high-strength, coated, alkali-resistant, glass fiber reinforcing tape embedded into the wet mastic or modified thinset mortar and allowed to dry thoroughly.

.6 For large tiles areas, movement/control joints shall be provided in accordance with ANSI A108, Section AN-3.7 or as indicated on drawings.

.7 Wall tiles complying with ANSI A137.1 are attached to the board with flexible Type 1 mastic adhesive complying with ANSI A136.1, or acrylic or latex-modified thinset mortars complying with ANSI A118.4, in accordance with ANSI A108.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

END OF SECTION 09 28 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS
.1 Gypsum Board Assemblies Section 09 21 16

1.2 REFERENCES
.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
.1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
.2 CTI A118.3-92, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
.3 CTI A118.4-92, Specification for Latex Cement Mortar (included in ANSI A108.1).
.4 CTI A118.5-92, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
.5 CTI A118.6-92, Specification for Ceramic Tile Grouts (included in ANSI A108.1).

.2 American Society for Testing and Materials International (ASTM)
.1 ASTM C 144-04, Specification for Aggregate for Masonry Mortar.
.2 ASTM C 207-06, Specification for Hydrated Lime for Masonry Purposes.
.3 ASTM C 847-06, Specification for Metal Lath.
.4 ASTM C 979-05, Specification for Pigments for Integrally Coloured Concrete.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-51.34-M86 (R1988), Vapor Barrier, Polyethylene Sheet for Use in Building Construction.
.2 CGSB 71-GP-22M-78 (AMEND.), /Adhesive, Organic, for Installation of Ceramic Wall Tile.
.3 CAN/CGSB-75.1-M88, Tile, Ceramic.
.4 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.4 Canada Green Building Council (CaGBC)
.1 LEED Canada-CI Version 1.0- 2007 LEED (Leadership in Energy and Environmental Design): Green Building Rating System and Reference Package For Commercial Interiors.

.5 Canadian Standards Association (CSA International)
.1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
.2 CAN/CSA-A3000-03(R2006), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.6 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.7 Terrazzo Tile and Marble Association of Canada (TTMAC)
.1 Tile Specification Guide 09 30 00 2009/2010, Tile Installation Manual.
.2 Tile Maintenance Guide 2000.

1.3 SUBMITTALS
.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
.1 Include manufacturer's information on:
.1 Ceramic tile, marked to show each type, size, and shape required.
.2 Chemical resistant mortar and grout (Epoxy and Furan).
.3 Cementitious backer unit.

.4 Dry-set cement mortar and grout.
.5 Divider strip.
.6 Elastomeric membrane and bond coat.
.7 Reinforcing tape.
.8 Levelling compound.
.9 Latex cement mortar and grout.
.10 Commercial cement grout.
.11 Organic adhesive.
.12 Slip resistant tile.
.13 Waterproofing isolation membrane.
.14 Fasteners.

.2 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
.1 Base tile: submit duplicate, full size sample of each colour, texture, size, and pattern of tile.
.2 Floor tile: submit duplicate, full size sample of each colour, texture, size, and pattern of tile.
.3 Wall tile: duplicate, full size sample of each colour, texture, size, and pattern of tile.
.4 All transition strips and edge protections as specified
.5 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.4 QUALITY ASSURANCE
.1 Quality Assurance Submittals:
.1 Manufacturer's Instructions: manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING
.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Waste Management and Disposal:
.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

1.6 AMBIENT CONDITIONS
.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.

.2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.7 MAINTENANCE
.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
.2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
.3 Maintenance material same production run as installed material.

2.0 PRODUCTS

2.1 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

.1 This schedule is attached in the appendix and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.2 FLOOR TILE

.1 Porcelain tile: to CAN/CGSB-75.1, Type 4, Class MR1, V2 or less variation.

.1 PRT-1

.1 Size: 300mm x 600mm x 10mm or 300mm x 300mm x 10mm
.2 Water Absorption: Conform to ISO 0545-3, 0.1%
.3 Stain Resistance: Yes
.4 Frost Resistance: Yes
.5 Colour & Pattern: Refer to Interior Finish Material and Colour Schedule.

2.3 WALL TILE

.1 Ceramic tile: to CAN/CGSB-75.1, Type 5 and 7, Class MR 4, V2 or less variation.

.1 CT-1 (Field Tile 1)

.1 Size: 300 mm x 600 mm x 10 mm
.2 Colour: Polished Taupe
.3 Style & Pattern: refer to Interior Finish Material and Colour Schedule.

.2 CT-2

.1 Size: 100 mm x 400 mm x 6mm
.2 Colour: Turquoise Bright
.3 Style & Pattern: Refer to Interior Finish Material and Colour Schedule.

.3 CT-3

.1 Size: 100 mm x 400 mm 6 mm
.2 Colour: Lime Green Bright
.3 Style & Pattern: refer to Interior Finish Material and Colour Schedule.

.4 CT-4 (Field Tile 2)

.1 Size: 300 mm x 600 mm x 10 mm
.2 Colour: Polished Ivory
.3 Style & Pattern: Refer to Interior Finish Material and Colour Schedule.

.5 CT-5

.1 Size: 100 mm x 400 mm x 6mm
.2 Colour: Dark Blue Bright
.3 Style & Pattern: Refer to Interior Finish Material and Colour Schedule.

.6 CT-6

.1 Size: 100 mm x 400 mm x 6mm
.2 Colour: Orange Bright
.3 Style & Pattern: Refer to Interior Finish Material and Colour Schedule.

2.4 MORTAR AND ADHESIVE MATERIALS

.1 Cement: to CSA-A5, type 10.

.2 Sand: to ASTM C 144, passing 16 mesh.

.3 Hydrated lime: to ASTM C 207, in accordance with TTMAC Installation Manual.

.4 Latex additive: formulated for use in cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

.6 Adhesives:

.1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.

2.5 BOND COAT

.1 In accordance with TTMAC Installation Manual.

2.6 GROUT

.1 Colouring Pigments:

.1 Pure mineral pigments, lime-proof and non-fading, complying with ASTM C 979.

.2 Colouring pigments to be added to grout by manufacturer.

.3 Job coloured grout are not acceptable.

.4 All grouts: Colour as selected by Departmental Representative (premium grades).

.2 Chemical-Resistant Grout – Epoxy Grout

.1 To ANSI A108.1, having quality colour and characteristics to match epoxy bond coat. Adhesive and grout by same manufacturer.

.2 Epoxy grout to be two-component, 100% solids epoxy grout, non-sagging and non-slumping with colour-coated quartz.

.3 ISO 13007 Classification

Classification Code	Test Characteristics	Classification Requirement
RG (reaction resin grout)	Abrasion resistance Flexural strength Compressive strength Shrinkage Water absorption	≤ 0.015 cu. in. (250 mm^3) > 4,350 psi (30 MPa) > 6,525 psi (45 MPa) < 0.06 in./3.28 ft. (1,5 mm/m) < 0.0002 lb. (0,1 g)
R2 (reaction resin adhesive, improved)	Shear adhesion strength Shear adhesion after water immersion Open time: tensile adhesion strength Shear adhesion strength after thermal shock	≥ 2 N/mm^2 ≥ 2 N/mm^2 ≥ 0,5 N/mm^2 after not less than 20 minutes ≥ 2 N/mm^2

.4 ANSI Specification

Test Method	Specification Standard	Test Results
ANSI A118.3 (5.1) – water cleanability	80 minutes	Pass
ANSI A118.3 (5.2)		
Initial Setting Time	> 2 hours	Pass
Service Setting Time	< 7 days	Pass
ANSI A118.3 (5.3) – shrinkage	< 0.25%	Pass
ANSI A118.3 (5.4) – sag	No change	Pass
ANSI A118.3 (5.5) – quarry sheer bond	> 1,000 psi (6,90 MPa)	Pass
ANSI A118.3 (5.6) – compressive strength	> 3,500 psi (24,1 MPa)	Pass
ANSI A118.3 (5.7) – tensile strength	> 1,000 psi (6,90 MPa)	Pass
ANSI A118.3 (5.8) – thermal shock	> 500 psi (3,45 MPa)	Pass

3 All grout: Colour as selected by Departmental Representative (premium grade). Refer to Interior Finish Material and Colour Schedule.

2.7 ACCESSORIES

.1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.

.2 Transition Strips: stainless steel beveled transition, 90mm wide, suitable for wheel chair traffic.

.3 Reducer Strips: purpose made metal extrusion; zinc type; maximum slope of 1:2.

.4 Prefabricated Movement Joints: purpose made, having a Shore A Hardness not less than 60 and elasticity of plus or minus 40 percent when used in accordance to TTMAC Detail 301EJ.

.5 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
.1 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.6 Floor sealer and protective coating: to tile and grout manufacturers' recommendations.

.7 Edge Protection:
.1 For all exterior corners and edges of tile surfaces. L-shaped profile with 3.2 mm wide top section and vertical section forming visible surface, integrated. Trapezoid-perforated anchoring leg and an 87° sloped vertical wall protection, material to be aluminum, in satin – nickel anodized finish. Width to suit tiles thickness.
.2 For all wall and floor tiles transitions. Cove-shaped profile with trapezoid-perforated anchoring legs made of recycled rigid PVC, secured in mortar bond coat. Cove radius to be 18 mm, accommodates movement and prevents surface water penetration. Colour to be Grey.

.8 Waterproof Membrane: Under setting bed in shower stalls (on floor's curb and full height of wall), and all exterior tiled area as shown on drawings. Acceptable manufacturer: Perma-Guard, Laticrete anti-fracture waterproof membrane, or approved alternative; conform to manufacturer's printed installation instructions; coordinate with Plumbing.

2.8 MIXES

.1 Cement:

.1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, and latex additive where required. Adjust water volume depending on water content of sand.

.2 Slurry bond coat: cement and water mixed to creamy paste. Latex additive may be included.

.3 Mortar bed for floors: 1 part cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.

.4 Mortar bed for walls and ceilings: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand.

.5 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.

.6 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.

.7 Measure mortar ingredients by volume.

.2 Dry set mortar: mix to manufacturer's instructions.

.3 Organic adhesive: pre-mixed.

.1 Adhesives: maximum VOC limit to SCAQMD Rule 1168.

.4 Mix bond and levelling coats, and grout to manufacturer's instructions.

.5 Adjust water volumes to suit water content of sand.

2.9 PATCHING AND LEVELLING COMPOUND

.1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:

.1 Compressive strength - 25 MPa.

.2 Tensile strength - 7 MPa.

.3 Flexural strength - 7 MPa.

.4 Density - 1.9.

.3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

2.10 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 WORKMANSHIP

.1 Do tile work in accordance with TTMAC Tile Installation Manual 2009/2010, "Ceramic Tile", except where specified otherwise.

.2 Apply tile or backing coats to clean and sound surfaces.

.3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

.4 Maximum surface tolerance 1:800.

.5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Lay out tiles so perimeter tiles are minimum 1/2 size.

.7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.8 Make internal angles square, external angles rounded.

.9 Use edge protections for all exterior corners and exposed edges.

.10 Install divider strips at junction of tile flooring and dissimilar materials.

.11 Allow minimum 24 hours after installation of tiles, before grouting.

.12 Clean installed tile surfaces after installation and grouting cured.

3.3 WALL TILE

.1 Install in accordance with TTMAC detail, for suitable substrates and applicable conditions.

3.4 FLOOR TILE

.1 Install in accordance with TTMAC details for suitable substrates and applicable conditions.

3.5 BASE TILE

.1 Install in accordance with TTMAC detail for suitable substrates and applicable conditions.

3.6 TILE SEALER AND PROTECTIVE COATING

.1 Apply in accordance with manufacturer's instructions.

3.7 FIELD QUALTIY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

END OF SECTION 09 30 13

1.0 GENERAL

1.1 RELATED REQUIRMENTS

.1 Metal Fabrications Section 05 50 00

.2 Metal Doors and Frames Section 08 11 00

1.2 REFERENCES

.1 Environmental Protection Agency (EPA)
- .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.3 The Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual – November 2007.
- .2 Standard GPS-1- 05, MPI Green Performance Standard for Painting and Coatings.

.4 National Fire Code of Canada 2010.

.5 Society for Protective Coatings (SSPC)
- .1 Systems and Specifications, SSPC Painting Manual 2005.

1.3 QUALITY ASSURANCE

.1 Qualifications:
- .1 Contractor: to have a minimum of five years proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work
- .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.

.2 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

.3 All paint manufacturers and products used shall be as listed under the “Approved Products” section of the MPI Painting Specification manual.

.4 Other paint materials shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.5 Single-Source Responsibility: provide primers and undercoat paint produced by the same manufacturer as the finish coat.

.6 All painting and decorating work shall be inspected by Paint Inspection Agency (inspector) acceptable to the specifying authority and the local MPI Accredited Quality Assurance Association. The painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of the project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish

Schedule.

.7 All surfaces requiring painting or repainting shall be inspected by the inspection agency who shall advise on all aspects of painting work including preparation, notifying the Consultant, the Contractor and the Trade Contractor of any defects or problems prior to commencing painting work or after the prime coat shows defects in the substrate, and as the work progresses.

.8 Standard of Acceptance:
- .1 Wall: No defects visible from a distance of 1000mm at 90° to surface.
- .2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

.9 Mock-Ups:

1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
- .1 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.
- .2 Mock-up will be used:
  - .1 To judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
- .3 Locate where directed.
- .4 Allow 24 hours for inspection of mock-up before proceeding with work.
- .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

.10 Pre-Installation Meeting:
- .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Coordination with other building subtrades.
  - .4 Review manufacturer's installation instructions and warranty requirements.

.11 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.4 PERFORMANCE REQUIREMENTS

.1 Environmental Performance Requirements:
- .1 Provide paint products meeting MPI "Environmentally Friendly”E2 ratings based on VOC (EPA Method 24) content levels.

.2 Green Performance in accordance with MPI Standard GPS-1.

1.5 SCHEDULING

.1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about building.

1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit product data and instructions for each paint and coating product to be used.

.2 Submit product data for the use and application of paint thinner.

.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application.

.3 Samples:

.1 Submit manufacturer's standard range of color choices on each specified color type as listed in Colour Schedule of this section for selection, review and acceptance of each color.

.2 Submit triplicates 200 x 300 mm sample panels of each paint with specified paint in colours, gloss/sheen and textures required, based on selected colors, to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

.1 1 mm plate steel for finishes over metal surfaces.

.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

.4 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Lead, cadmium and chromium: presence of and amounts.

.2 Mercury: presence of and amounts.

.3 Organochlorines and PCBs: presence of and amounts.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.7 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.

.2 Quantity: provide one - 4 litre (1 gallon) can of each type and colour of primer stain finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.8 DELIVERY, STORAGE & HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, supplemented as follows:
- .1 Deliver and store materials in original containers, sealed, with labels intact.
- .2 Labels: to indicate:
  - .1 Manufacturer's name and address.
  - .2 Type of paint or coating.
  - .3 Compliance with applicable standard.
  - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Provide and maintain dry, temperature controlled, secure storage.
- .5 Observe manufacturer's recommendations for storage and handling.
- .6 Store materials and supplies away from heat generating devices.
- .7 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.
- .8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative
- .10 Remove paint materials from storage only in quantities required for same day use.
- .11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .12 Fire Safety Requirements:
  - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

.2 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Dispose of contaminants in an approved legal manner in accordance with

hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.

.8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

1.9 AMBIENT CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 Relative humidity is above 85 % or when dew point is less than 3 degrees C variance between air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it i foggy, misty, raining or snowing at site.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.

.5 Do not apply paint when:

.1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.

.3 Surface to be painted is wet, damp or frosted.

.6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

.9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.10 GUARANTEE

.1 Furnish a 100% two (2) year Maintenance Bond.

.2 Painting and decorating Subcontractors providing a Maintenance Bond shall provide a maintenance bond consent from a reputable surety company licensed to do business in Canada. Cash or certified cheque are not acceptable in lieu of surety consent.

2.0 PRODUCTS

2.1 MATERIALS

.1 Paint materials listed in latest edition of MPI Approved Products List (APL) are acceptable for use on this project.

.2 Paint materials for paint systems: to be products of single manufacturer.

.3 Only qualified products with E2 “Environmentally Friendly" ratings are acceptable for use on this project.

.4 Use only MPI listed materials.

.5 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, to be as follows:
- .1 Be water-based.
- .2 Be non-flammable biodegradable.
- .3 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
- .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
- .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.6 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada.

.7 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

.8 Water-borne surface coatings and recycled water-borne surface coatings must have flash point of 61.0 degrees C or greater.

.9 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
- .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.10 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.

.11 Recycled water-borne surface coatings must not contain:
- .1 Lead in excess of 600.0 ppm weight/weight total solids.
- .2 Mercury in excess of 50.0 ppm weight/weight total product.
- .3 Cadmium in excess of 1.0 ppm weight/weight total product.

.4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.
.5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

.12 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 COLOURS

.1 Departmental Representative will provide Colour Schedule after Contract award. Submit proposed Colour Schedule to Departmental Representative for approval.

.2 Colour schedule will be based upon selection of three base colours and three accent colours. No more than six colors will be selected for entire project and no more than three colours will be selected in each area.

.3 Selection of colours will be from manufacturers full range of colours.

.4 Where specific products are available in restricted range of colours, selection will be based on limited range.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.

.4 Thin paint for spraying according in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative .

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 Matte	Max.5	Max.10
Finish (flat) Gloss Level 2 -Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 -Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 -Satin-Like Finish	20 to 35	Min.35
Gloss Level 5 -Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 -Gloss finish	70 to 85	
Gloss Level 7 -High Gloss Finish	More than 85	

.2 Gloss level ratings of painted surfaces as indicated.

2.5 EXTERIOR PAINTING SYSTEMS

.1 Structural Steel and Metal Fabrications:

.1 EXT 5.1B - Waterborne light industrial, gloss level 6 coating (over inorganic zinc).

.2 Galvanized Metal: doors, frames, not chromate passivated

.1 EXT 5.3G - Waterborne light industrial, gloss level 6 coating.

.3 Dimension Lumber: wood column

.1 EXT 6.2C – Alloyed (gloss level 4) over alloyed primer

.4 All paint systems to be MPI Premium Grade minimum 3 coat system.

.5 Provide additional coat as required to achieve the desired colour output, such as light colour over dark surface or dark accent colour.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 EXISTING CONDITIONS

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

3.3 EXAMINATION

.1 Exterior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.

.2 Exterior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Departmental Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.

.3 Where assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.

3.4 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, building occupants and general public in and about building.

.5 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.

.6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Departmental Representative.

3.5 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative .

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray Application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.

.4 Brush out immediately runs and sags.

.5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative.

.5 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.3 Do not paint over nameplates.

.4 Paint fire protection piping red.

.5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.7 RESTORATION & CLEANING

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

.6 Proceed in accordance with Section 01 74 11 - Cleaning.

.1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

3.8 COLOUR SCHEDULE

.1 Metal doors and frames, and exposed wood columns to match corresponding exterior wall cladding (Fiber cement vertical panels) – FC-2 or FC-3 where applicable.

END OF SECTION 09 91 13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Finish Carpentry Section 06 20 00

.2 Metal Doors & Frames Section 08 11 00

.3 Gypsum Board Assemblies Section 09 21 16

1.2 REFERENCES

.1 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33

.2 Environmental Protection Agency (EPA)
- .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.4 Master Painters Institute (MPI)
- .1 MPI Architectural Painting Specifications Manual, November 2007.
- .2 MPI Maintenance Repainting Manual, latest edition.

.5 National Fire Code of Canada - 2010

.6 Society for Protective Coatings (SSPC)
- .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.3 QUALITY ASSURANCE

.1 Qualifications:
- .1 Contractor: minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.
- .3 Apprentices: working under direct supervision of qualified trade's person in accordance with trade regulations.

.2 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

.3 All paint manufacturers and products used shall be as listed under the "Approved Products" section of the MPI Painting Specification manual.

.4 Other paint materials shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.5 Single-Source Responsibility: provide primers and undercoat paint produced by the same manufacturer as the finish coat.

.6 All painting and decorating work shall be inspected by Paint Inspection Agency (inspector) acceptable to the specifying authority and the local MPI Accredited Quality Assurance Association. The painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of the project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.7 All surfaces requiring painting or repainting shall be inspected by the inspection agency who shall advise on all aspects of painting work including preparation, notifying the Consultant, the Contractor and the Trade Contractor of any defects or problems prior to commencing painting work or after the prime coat shows defects in the substrate, and as the work progresses.

.8 Mock-Ups:

1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.

.1 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.

.2 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.

.3 Locate where directed.

.4 Allow 24 hours for inspection of mock-up before proceeding with work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

.9 Pre-Installation Meeting:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.10 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.4 PERFORMANCE REQUIREMENTS

.1 Environmental Performance Requirements:

.1 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.

.2 Green Performance in accordance with MPI Standard GPS-1.

1.5 SCHEDULING

.1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants.

1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit product data and instructions for each paint and coating product to be used.

.2 Submit product data for the use and application of paint thinner.

.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 35 33 - Health and Safety Requirements.

.3 Samples:

.1 Submit manufacturer's standard range of color choices on each specified color type as listed in Colour Schedule of this section for selection, review and acceptance of each color.

.2 Submit triplicates 200 x 300 mm sample panels of each paint with specified paint in colours, gloss/sheen and textures required, based on selected colors, to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface. 50mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Lead, cadmium and chromium: presence of and amounts.

.2 Mercury: presence of and amounts.

.3 Organochlorines and PCBs: presence of and amounts.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.7 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.

.2 Quantity: provide one - 4 litre (1 gallon) can of each type and colour of primer stain finish

coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.

.2 Store materials and supplies away from heat generating devices.

.3 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:

.1 Provide one Type ABC fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

.9 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene corrugated cardboard and packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan (WMP).

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal, regulations.

.7 Ensure emptied containers are sealed and stored safely.

.8 Unused paint, coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.

.9 Paint, stain and wood preservative finishes and related materials (thinners and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.10 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.11 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.12 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.13 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.14 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.

1.9 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.

.2 Provide continuous ventilation for seven days after completion of application of paint.

.3 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.

.4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.5 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless pre-approved written approval by Paint Inspection Agency Authority and product manufacturer, perform no painting when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is

foggy, misty, raining or snowing at site.

.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

.2 Perform painting work when maximum moisture content of the substrate is below:
- .1 Allow new concrete and masonry to cure minimum of 28 days.
- .2 15% for wood.
- .3 12% for plaster and gypsum board.

.3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:
- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
- .3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Additional interior application requirements:
- .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
- .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.10 GUARANTEE

.1 Furnish a 100% two (2) year Maintenance Bond.

.2 Painting and decorating Subcontractors providing a Maintenance Bond shall provide a maintenance bond consent from a reputable surety company licensed to do business in Canada. Cash or certified cheque are not acceptable in lieu of surety consent.

2.0 PRODUCTS

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Provide paint materials for paint systems from single manufacturer.

.3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.

.4 Conform to latest MPI requirements for interior painting work including preparation and priming.

.5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

.7 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
- .1 Water-based.
- .2 Non-flammable.
- .3 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
- .4 Manufactured without compounds which contribute to smog in the lower atmosphere.
- .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.8 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.9 Flash point: 61.0 degrees C or greater for water-borne surface coatings and recycled water-borne surface coatings.

.10 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:
- .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.
- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.

.11 Recycled water-borne surface coatings must not contain:
- .1 Lead in excess of 600.0 ppm weight/weight total solids.
- .2 Mercury in excess of 50.0ppm weight/weight total product.
- .3 Cadmium in excess of 1.0ppm weight/weight total product.
- .4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.
- .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

2.2 INTERIOR FINISH MATERIAL AND COLOUR SCHEDULE

.1 This schedule is attached in the appendix and may list specific manufacturers related to patterns and colours upon which the colour scheme for the project is based.

.2 The following material specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.3 COLOURS

.1 Departmental Representative will provide Colour Schedule after Contract award. Submit proposed Colour Schedule to Departmental Representative for approval.

.2 Colour schedule refer to Section 3.10 Paint Colour Schedule.

.3 Selection of colours will be from manufacturers full range of colours.

.4 Where specific products are available in restricted range of colours, selection will be based on limited range.

.5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

.6 Refer to Colour Schedule of this Section, and Section 09 06 00 Finish Schedule and drawings for identification and location of colours.

2.4 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations.Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.5 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 Matte	Max.5	Max.10
Finish (flat) Gloss Level 2 -Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 -Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 -Satin-Like Finish	20 to 35	Min.35
Gloss Level 5 -Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 -Gloss finish	70 to 85	
Gloss Level 7 -High Gloss Finish	More than 85	

.2 Gloss level ratings of painted surfaces as indicated.

2.6 INTERIOR PAINTING SYSTEMS – NEW CONSTRUCTION

.1 Steel - high heat: (boilers, furnaces, heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted):

.1 INT 5.2C - Inorganic zinc rich coating, maximum 400 degrees C.

.2 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.

.1 INT 5.3M – High Performance Architectural Latex gloss level 5 coating (over waterborne primer).

.3 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
.1 INT 9.2B – High Performance Architectural latex gloss level 3 finish (over latex sealer) for wall typical.

.4 All paint systems to be MPI Premium Grade 3 coat systems.

2.7 SOURCE QUALITY CONTROL
.1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.
.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS
.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 GENERAL
.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION
.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:
.1 Stucco, plaster and gypsum board: 12%.
.2 Concrete: 12%.
.3 Clay and Concrete Block/Brick: 12%.
.4 Wood: 15%.

3.4 PREPARATION
.1 Protection:
.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
.2 Protect items that are permanently attached such as Fire Labels on doors and frames.
.3 Protect factory finished products and equipment.
.4 Protect passing pedestrians, building occupants and general public in and about the

building.

.2 Surface Preparation in accordance with MPI Repainting Manual:
- .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
- .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
- .1 Remove dust, dirt, and other surface debris by wiping with dry, clean cloths or compressed air.
- .2 Wash surfaces with a biodegradable detergent and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
- .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
- .4 Allow surfaces to drain completely and allow to dry thoroughly.
- .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
- .6 Use trigger operated spray nozzles for water hoses.
- .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
- .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
- .2 Apply wood filler to nail holes and cracks.
- .3 Tint filler to match stains for stained woodwork.

.6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes or vacuum cleaning.

.8 Touch up of shop primers with primer as specified.

.9 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, air or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
- .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
- .5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:
- .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
- .4 Brush out immediately all runs and sags.
- .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish closets and alcoves as specified for adjoining rooms.

.10 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.8 Paint fire protection piping red.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 FIELD QUALITY CONTROL

.1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Departmental Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

.4 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.5 Cooperate with inspection firm and provide access to areas of work.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

3.9 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and patter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

3.10 PAINT COLOUR SCHEDULE

.1 All metal doors / frames: Allow different colour for door and frame.

.2 Ceiling: White.

END OF SECTION 09 91 23

1.0 GENERAL

1.1 DESCRIPTION

.1 Work related to this Section incorporates the complete manufacture and installation of interior and exterior environmental graphics including, but not limited to: directional signage, FIP signage, code-required signs, general identification signage, hoarding graphics, glazing and film.

1.2 RELATED REFERENCES

.1 Fiber-cement Vertical Panel System Section 07 46 46

.2 Ceramic Tiling Section 09 30 13

1.3 SUBMITTALS

.1 Submit in accordance with section 01 33 00 Submittal Procedures:

.2 Samples:

.1 Submit 2 sets of color samples of each color, 300mm x 300mm. Show anticipated range of color and texture. One set of samples will be retained by the Departmental Representative, the other returned to Sign Contractor as control samples.

.2 Submit 2 sets of samples of each naturally finished material 300mm x 300mm. Show anticipated range of texture.

.3 Provide production material and mounting hardware for review.

.4 Duly reviewed and approved sign samples shall be the minimum workmanship and quality standard for reference until completion of the Work.

.5 Duly reviewed sign type samples shall be retained by the Signage Contractor until released by the Departmental Representative, at which time they may be incorporated in the permanent Work.

.6 Adjustments made on samples by the Departmental Representative are not intended to change the Contract Price. If adjustments affect the value of the Work, state such in writing for approval by the Departmental Representative, prior to proceeding with the Work.

.3 Shop Drawings:

.1 Submit shop drawings to illustrate details of Work.

.2 Shop drawings, which are to be provided by the Sign Contractor, will be used as the final construction documents and must include all construction, engineering and installation details for the complete implementation of the designs described herein. This also extends to any required sign bases unless otherwise indicated on the Technical Drawings.

.3 The Signage Contractor shall provide dimensioned shop drawings for all signs clearly showing elevations, sections, dimensions, materials, typographic layouts, fabrication methods, external finishes, anchorage, electrical connections and other details of construction as well as details related to engineering and other construction responsibilities. Signage Contractor shall be responsible for all construction installation and internal supports for a safe and permanent installation of all signs. Furnish location detail drawings. Use metric dimensions throughout.

.4 Shop drawings shall include complete details of fasteners (diameter, length, type, and material).

.5 Clearly identify all shop drawings by title and number and reference to applicable contract drawings. Identify all deviations from contract drawings.

.4 Sustainability Standards Certification:

.1 Construction Waste Management (CWM)

.2 Recycled Content:

.1 Provide listing of recycled content products used, including details of required percentages of recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

1.4 QUALITY ASSURANCE

.1 The intent of the contract documents is to provide everything necessary for a complete contract. All drawings and specifications are mutually dependent. In the event of a discrepancy or an error, neither one rules over the other. Notify Departmental Representative if any discrepancies arise for direction on how to proceed.

.2 The Departmental Representative must be notified of any variations of conditions as shown on these drawings. It shall be the Sign Contractor's responsibility to obtain and utilize the most current and up-to-date plans and specifications for all construction and installation work.

.3 Work done and material furnished shall be of superior quality in every respect.

.4 The Departmental Representative shall reserve the right to reject any shop drawings, samples, or other submittals, as well as any finished product or installation that does not meet or exactly equal the standard of quality established. Any such decision will be considered final and not subject to recourse.

.5 The Sign Contractor must guarantee that only new materials are being used for this work.

.6 Products must be made accessible for quality control inspection at any time.

.7 Any claims for work carried out on instructions by others will not be accepted or honored.

.8 Guarantees and tolerances for both product and installation to be stated by the Contractor upon bidding on this work.

.9 The Departmental Representative must be notified of any variations of conditions as shown on the drawings. It is the responsibility of the Sign Contractor to obtain and utilize the most current and up to date plans and specifications for all construction and installation work.

.10 The Sign Contractor shall be responsible for field measurements as needed to verify or supplement dimensions indicated herein and shall be responsible for accurate fit of signs upon installation.

.11 Details shown on the drawings herein shall be maintained for exterior appearance. The Sign Contractor may change interior construction shown on these details to conform to his shop practices. Engineering for structural integrity and a safe permanent installation shall be the sole responsibility of the Sign Contractor. The Sign Contractor and/or the Engineer will determine which signs will require to be engineered.

.12 Fabrication and Installation’s Pre-qualifications:

.1 Must demonstrate that its main (primary) business is designing and manufacturing signs.
.2 Must have a successful track record of multiple successful installations of signage of similar project scope, complexity and value and of meeting deadlines, and controlling costs.
.3 Must demonstrate it has sufficient resources and a qualified team with a proven record of performing large projects on time, shall have sufficient capacity and resources to manage, manufacture, construct, install and maintain all sign structures.
.4 Must demonstrate through satisfactory references and project examples that it has proven experience and qualifications in the type of work identified for all aspects of the project. References and project examples must show proven and built, including photos and project descriptions.
.5 The Owner reserves the right to reject any tender should the Owner determine insufficient or irregular information exists as to the bidder's qualifications, ability, experience, capacity or financial resources necessary for the performance of the work.
.6 Reference checks may be conducted. A minimum of three (3) references to be provided including contact names and telephone numbers, for which completed work similar to that called to this project within the last five (5) years. Preferably, at least one of the completed projects should be in the city of Vancouver.

.13 Supervision
.1 Work of this Section shall be executed under the continuous supervision and direction of a Site Supervisor with a min. of 5 years signage related field experience relative to the scope of the project.
.2 Sign manufacturer shall provide one foreman per crew with a min. of 5 years installation experience who shall be in charge during installations.

1.5 DELIVERY AND STORAGE

.1 Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.

.2 Deliver signs only when the site and mounting services are ready for installation work to proceed.

.3 Store products in dry condition inside enclosed facilities.

.4 Delivery of materials and/or completed work will be coordinated with the Departmental Representative. All costs for delivery, including labour to load and unload, and trucking, shall be the responsibility of the Contractor; coordinating the delivery timing and building route with the Departmental Representative. As the Facility should be considered a construction site and onsite storage is limited, it will be necessary for the Signage Contractor to store materials offsite and deliver in a "just-in-time" fashion, according to schedule of installation.

.5 All deliveries shall be made during regular work hours and extended or overtime hours shall not be allowed without explicit approval by the Departmental Representative with a minimum of three (3) days advance notice. All deliveries must be scheduled with the Departmental Representative.

.6 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment.

.7 Packaging Waste Management:
.1 Remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 – Waste Management and Disposal.

1.6 APPLICABLE PUBLICATIONS & CODES

.1 Canadian National Building Code 2010

.2 The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

.3 AAMA 2605, High Performance Organic Coatings on Architectural Extrusions and Panels

.4 AAMA CW- 10, Care and Handling of Architectural Aluminum from Shop to Site

.5 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric)

.6 ASTM A653/A653M, Specification for Steel Sheet, Zinc- Coated (Galvanized) or Zinc- Iron Alloy- Coated (Galvanealed) by the Hot- Dip Process

.7 ASTM B209M, Standard Specification for Aluminum and Aluminum- Alloy Sheet and Plate Metric

.8 ASTM B221M, Standard Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes Metric

.9 ASTM D1781, Standard Test Method for Climbing Drum Peel for Adhesives

.10 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

.11 CAN/CGSB- 1.108- M, Bituminous Solvent Type Paint

.12 CAN/CGSB- 12.12- M, Plastic Safety Glazing

.13 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations

.14 CSA 651-12, Accessible Design for the Built Environment

.15 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.16 TAC; MUTCDC.

.17 NAAMM, The National Association of Architectural Metal Manufacturers.

.18 Vancouver Building By-Law 1999 | Vancouver Fire By-Law (VFBL) No. 7004

.19 Treasury Board of Canada Secretariat | Federal Identity Program (FIP)

.20 Canadian Standards Association (CSA)

.21 Ensure the work will meet all applicable codes, legislation and regulations.

.22 The Departmental Representative must have on file the Signage Contractor’s current certificates of insurance covering liability and worker's compensation. These documents must be sent directly from the Contractor's insurance company.

.23 All Contractors, Subcontractors must perform their work in accordance with all local codes and all governing codes, regulations, ordinances and laws that have jurisdiction over such work; and by-

laws having jurisdiction whether or not indicated or noted on the drawings. If the Contractor observes that any portion of the Contract Document is in disagreement therewith in any respect, the Contractor shall promptly notify the Departmental Representative and the Consultant and any necessary changes shall be accomplished by appropriate modification.

.24 The Signage Contractor shall maintain workman's compensation and disability insurance, comprehensive public liability, bodily injury, and property damage insurance, as required by law and the Owner.

1.7 SITE INSPECTION

.1 Signage Contractor shall verify and confirm existing site conditions and secure site measurements affecting the Work of this section at the site before commencing or completing fabrication.

.2 General signage locations are shown on signage plan drawings – exact location to be confirmed with the Departmental Representative. Architectural elevations, floor plans and reflected ceiling plans are to be consulted for specific site, location, and elevation details.

.3 Signage Contractor shall notify the Departmental Representative and the Consultant in writing of unacceptable substrates, detrimental conditions or dimensional discrepancies.

.4 Beginning work indicates acceptance of substrate and subsequent modifications will become the Signage Contractor’s complete responsibility.

1.8 OPERATIONS & MAINTENANCE

.1 The Sign Contractor shall arrange a meeting with the Departmental Representative on site for a final on-site demonstration/review of all electrical and mechanical sign components to ensure all signs are in full functional working order prior to completion of the Project.

.2 The Sign Contractor to provide an Operating and Maintenance Manual including detailed technical information, all as-built documents and records describing operation and maintenance of individual products or systems.

1.9 WARRANTY

.1 The Sign Contractor to warranty materials, fabrication and installation including work by sub-trades.

.2 The Sign Contractor shall submit a written statement that all products supplied shall be unconditionally guaranteed for one year to be free from defects such as cracking, peeling, abnormal fading or discolouration, delaminating, or other adverse conditions due to quality of any materials or workmanship in manufacture or installation.

.3 Electrical components shall have an unconditional warranty period of one-year covering products, materials and installation work.

.4 Conduct an inspection in the presence of the Departmental Representative and the Consultant upon completion of installation and prior to end of warranty period.

.5 During the warranty period, the Sign Contractor agrees to restore defective work to the standard of Performance Specifications without cost to the Departmental Representative, including materials and labor. The Sign Contractor agrees to restore defective work expeditiously and not later than one week after notification.

.6 It shall be the exclusive and sole responsibility of the Sign Contractor to provide compatible attachment and adhesive materials. Any de-lamination, warping, discolouring or disfiguring of graphics caused by mounting adhesives shall require repair and replacement of sign products at no expense to the Departmental Representative.

1.10 PROJECT COMPLETION

.1 Signage Contractor shall arrange a meeting with the Departmental Representative for a final on-site demonstration and review of all electrical and mechanical sign components to ensure signs are in full functioning working order prior to Substantial Performance of the Work.

.2 Following installation, clean all signs ensuring removal of all fingerprints, dirt, shavings, adhesive, dust particles, etc. Prior to leaving the installation location, clean the work area, walls, floor, etc., that may be soiled during the installation process.

.3 Manufacturer is to provide a complete set of as-built drawings prior to Substantial Performance of the work.

2.0 PRODUCTS

2.1 MATERIALS

.1 Aluminum

.1 Sheet and Plate: ASTM B209

.2 Aluminum extrusions, tubes, bars, plates and reinforcements: ASTM B221-96 and ANSI H35.1 AA6063-T5 alloy or as otherwise specified. Sizes, profiles, and shapes as indicated, or as further developed for specified requirements.

Custom extrusion designs provided, enhanced, and/or developed within the scope of this Contract are and will remain the property of the Owner.

.2. Stainless Steel: ASTM A167, Type 304 to ASTM A 167-96, Type 304 alloy in sandblasted finish, mirror polished finish, as specified. Brushed applications to be XL-Blend S finish to allow for on-site repair and touch-ups as required. All dimensional letters and characters to have sandblasted finish on face and returns.

.3 Polycarbonate: MIL-P-46144C; Type I, class 1.

.4 Vinyl: 0.1 mm thick machine cut, with pressure sensitive adhesive and integral colors.

.5 Colour as noted on the drawings.

.6 All structural components including, but not limited to, plate thickness, wall thickness, bolt sizing, spacing, and embedment to be reviewed by P.Eng in the province of installation prior to any construction or shop drawings. Only shop drawings stamped by P.Eng. will be considered.

2.2 GENERAL

.1 The designs contained within the Contract are the property of the Owner and The Consultant and may not be used for any other purpose without express written permission of the Owner.

.2 Sign components presented in this document are for design intent purposes only. Shop drawings shall be provided by the Sign Contractor to be used as the final construction documents, and shall include complete construction, engineering and installation details required for implementing the designs described herein.

.3 Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

.4 Do not scale drawings for dimensions. Sign Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. The Consultant to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.

.5 The Signage Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. The Sign Contractor shall further warrant that all components, specified or required to satisfactorily complete the installation, are compatible with each other and with conditions of installations.

.6 The Signage Contractor shall obtain and pay for all necessary permits and variances

.7 Sign Contractor shall furnish all labor, materials, equipment, tools, supplies and services necessary and reasonably incidental to complete fabrication, installation and delivery of sign(s) as specified. Sign Contractor shall provide all materials, equipment, services, labor tools, and supplies to fulfill completion of this contract. Sign Contractor shall be responsible for a complete and thorough job. Materials not specifically described but required for a complete and proper installation shall be identified and provided for by the Sign Contractor. Sign Contractor shall be responsible for the quality of all materials and workmanship of any firms or individuals who act as his subcontractors. Sign Contractor shall be responsible for providing subcontractors with complete and up-to-date drawings, specifications, sign schedules and other information issued for this project. Sign Contractor shall be responsible for coordinating final review and approval of all copy wording with the Consultant prior to submittal of shop drawings.

.8 Provide complete and comprehensive fabrication/installation liaison with all other trades. Where the Signage Contractor is providing graphics only, it shall be the Signage Contractor's responsibility to schedule his work to coincide with other trades' fabrication, finishing and installation schedules.

.9 The Work shall be done in accordance with the highest standards of workmanship and good practice using top grade materials and all work will be done to the approval of the Owner. The Contractor will employ only appropriately qualified, skilled and experienced workers.
The Contractor will be responsible for checking all dimensions of existing arrangements before putting the work in hand and in verifying the full scope of the work needed. The Contractor at no extra cost to the Owner will replace unsatisfactory work.

.10 "Provide" means supply all labor, materials, equipment etc. necessary to complete the work. Unless otherwise noted the Contractor shall provide all materials, equipment, tools etc. to complete the work and all materials, fittings, equipment etc. provided by the Contractor and intended to remain as part of the work shall be new, in perfect condition, appropriate to the intend use, in good operating condition and otherwise able to contribute to a first class result. The contractor shall be responsible for the receiving, storing and security of all materials, equipment, tools etc. needed for the work and for bringing such to and away from the site of the work. The Contractor may benefit from the existing building services such as lighting, water and power supply, drainage, elevators, heating and cooling but only to the extent these are readily available without having adverse impact on the hospital's activities. If necessary the Contractor shall provide such additional amenities or services needed to implement the work such as temporary power or lighting as part of the work and at no extra cost.

2.3 FABRICATION

.1 Design components to allow for expansion and contraction for a minimum material temperature range of 140 degree F, without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.

.2 Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible unless otherwise indicated on the Contract Documents.

.3 Shop fabricates all products so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.

.4 Contact surfaces of connected members to be true. Assemble so joints will be tight and practically unnoticeable, without use of filling compound.

.5 Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.

.7 Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.

.8 Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.

.9 Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.

.10 Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.

.11 All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

.12 Movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.

.13 Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

.14 A suitable bond-break to be provided between all dissimilar materials to prevent galvanic reaction.

.15 Product must be made accessible for quality control inspection at any time.

.16 In so far as practicable, fabrication, assembly and fitting of the work shall be executed in the shop with the various parts or assembles ready for installation on site; keeping work done on site to a minimal. Work that cannot be shop assembled shall be given a trial fit at the shop to insure a proper and expeditious field assembly

3.0 EXECUTION

.1 The Signage Contractor will schedule the Work, as required to suit the operation of the Facility. All costs for overtime, initially scheduled or not, are deemed to be included in the Signage Contractor's price.

3.1 INSTALLATION

.1 Protect products against damage during field handling and installation. Protect adjacent existing and newly placed construction, landscaping and finishes as necessary to prevent damage during installation. Paint and touch up any exposed fasteners and connecting hardware to match color and finish of surrounding surface.

.2 Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned,

signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact the Project Manager for clarification.

.3 Contractor shall own and be responsible for all signs that are damaged, lost or stolen while materials are on the job site and up until the completion and final acceptance of the job.

.4 Remove or correct signs or installation work the Departmental Representative determines as unsafe or as an unsafe condition.

.5 At completion of sign installation, clean exposed sign surfaces. Clean and repair any adjoining surfaces and landscaping that became soiled or damaged as a result of installation of signs.

.6 Locate signs as shown on the Location Plans.

.7 Certain signs may be installed on glass. A blank vinyl back up is required to be placed on opposite side of glass exactly behind sign being installed. This blank vinyl back up is to be the same size as sign being installed.

.8 Contractor will be responsible for verifying that at each sign location there are no utility lines that will be affected by installation of signs. Any damage to utilities during installation of signs will be the sole responsibility of the Contractor to correct and repair.

.9 Furnish inserts and anchoring devices that must be set in concrete or other material for installation of signs. Provide setting drawings, templates, instructions and directions for installation of anchorage devices which may involve other trades.

.10 Sign Contractor to be responsible for signage internal wiring and electrical and data cable hook-up. Coordinate with General Contractor for all source power which will be supplied.

.11 The Sign Contractor is to protect goods supplied by him from damage during installation with appropriate insurance against fire, theft, or other damage. He shall also protect from injury the property of the Departmental Representative, which may be adjacent, or with which he may come in contact, and he shall make good any such damage occurring through his fault.

.12 The Sign Contractor shall not use any hazardous substances in the manufacture of the signs, nor bring on site any hazardous substances, regulated under any environmental laws, without the express written consent of the Departmental Representative.

.13 All exterior structure to support signage is the responsibility of the signage contractor. Coordinate with General Contractor for necessary blocking, plates or supports within the walls.

.14 When installing signs in the vicinity of building expansion joints, consideration to be given to the movement created by the joints.

.15 The Contractor shall comply with all building rules of the Departmental Representative including any specific requirements of scheduling or concerning health, safety and construction, including the wearing of appropriate personal protection such as safety shoes, hard hats, eye protection and gloves in the work area. The Contractor shall be responsible for knowing all of these rules prior to the commencement of work. The Contractor shall arrange the delivery and removal of equipment and material with the Departmental Representative so as to minimize interference with the building's normal operation.

.16 Any interaction with any existing building condition that is deemed necessary for the proper construction, fabrication or installation of the work under this contract must be brought to the attention of the Departmental Representative immediately and prior to the commencement of any work. This includes, but is not limited to, any demolition, patching of existing conditions and any disruption or modification of any building mechanical, electrical or other system.

.17 The Contractor will control and confine odors, dust and debris to the work area at all times. Daily clean up on a continual basis is required. The Contractor must protect the facility including people and equipment, surrounding finishes etc. from odors, dust, damage or injury etc. Any claims for damages to such areas shall be charged back to signage contractor.

.18 The Contractor will take all necessary precautions including scanning for buried services to avoid any unintended consequences and make good the affected materials and assembles.

.19 The successful Contractor is to protect goods supplied by him from damage during installation and shall also protect from injury the property of the Departmental Representative or others which may be adjacent or with which may come in contact and shall make good any such damage occurring through the contractor fault. It shall remain their property until such time as the installation is completed and accepted by the Departmental Representative and the vendor shall protect his goods with appropriate insurance against fire, theft, or other damage.

.20 Sign locations as shown on location drawings are for general information only. Sign Contractor is to co-ordinate with the Consultant for the final onsite locations. All signs are to be located with the use of numbered tags corresponding to the sign numbers.

3.2 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Leave signs clean.
- .3 Remove debris from interior of sign boxes.
- .4 Touch up damaged finishes.

.2 Waste Management: separate waste materials for reuse] and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION 10 14 00

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1 Rough Carpentry Section 06 10 11

.2 Toilet & Bath Accessories Section 10 28 10

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 240, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .2 ASTM A 480, Specification for General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
- .3 ASTM A 653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian Standards Association (CSA International).
- .1 CAN/CSA-B651-12, Accessible design for the built environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit two copies of WHMIS MSDS – Material Safety Data Sheets in accordance with Section 01 33 00 – Submittal Procedures. Indicate VOC's:
  - .1 For caulking materials during application and curing.

.2 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Indicate fabrication details, plans, elevations, hardware, and installation details.

.3 Samples:
- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit duplicate 300 mm x 300 mm samples of panel showing finished edge and corner construction and core construction.
- .3 Submit duplicate representative samples of hardware items, including brackets, fastenings and trim.

.4 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Mock-ups:
.1 Construct mock-ups in accordance with Section 01 45 00 – Quality Control
.1 Provide one full compartment including all fastening and accessories.
.2 Mock-up will be used:
.1 To judge workmanship, substrate preparation, and material application.
.3 Locate where directed.
.4 Allow 24 hours for inspection of mock-up before proceeding with work.
.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

.4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 31 19 Project Meetings.

1.5 WASTE AND MANAGEMENT DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal and with Waste Reduction Workplan.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2.0 PRODUCTS

2.1 MATERIALS

.1 Ceiling – hung maximum privacy metal toilet partitions and wall-hung urinal screen.

.2 Stainless steel: commercial quality to ASTM A480.

.3 Minimum base steel thickness:
.1 Panel and doors: .9 mm.
.2 Pilasters: .9 mm.
.3 Reinforcement: 2.78 mm.

.4 Stainless steel sheet metal: to ASTM A240, Type 304, with #4 finish.

.5 Pilaster ceiling trim: .9 mm stainless steel, 100 mm high minimum, and varies to suit sloped ceiling.

.6 Attachment: stainless steel tamperproof type screws and bolts.

2.2 COMPONENTS

.1 Hinges:
.1 Heavy duty.
.2 Material/Finish: stainless steel casting.
.3 Swing: refer to drawings, interchangeable by reversing door latch.
.4 Return movement: gravity.
.5 Adjustable to hold door open at any angle.
.6 Emergency access feature.
.7 Continuous hinge filler.

.2 Latch set: surface mounted combination latch, door-stop, keeper and bumper, stainless steel, emergency access feature, occupancy indicator.

.3 Wall and connecting brackets: stainless steel extrusion or casting, continuous T-brackets to eliminate any visible space between components. “F” or “U” brackets are not acceptable.

.4 Coat hook: combination hook and rubber door bumper, stainless steel.

.5 Door pull: Barrier-free type suited for out swinging doors, stainless steel.

2.3 FABRICATION

.1 Doors, panels and screens: minimum 25 mm thick, two steel sheets faces pressure bonded to honeycomb core.

.2 Sizes:

.1 Doors: 1626 mm high width as shown on drawings.
.2 Urinal screens: 1067 mm high x 610 mm wide.
.3 Pilasters: 32 mm thick, constructed same as door, to sizes indicated and matching doors.
.4 Provide formed and closed edges for doors, panels and pilasters. Miter and weld corners and grind smooth.
.5 Provide internal reinforcement at areas of attached hardware and fittings. Temporarily mark location of reinforcement for tissue holders, and grab bars.

2.4 FINISHES

.1 Finish: #4 – 5 - WL Rigidized Stainless Steel.

3.0 EXECUTION

3.1 MANUFACTURER’S INSTRUCTION

.1 Compliance: comply with manufacturer’s written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

.1 Ensure supplementary anchorage, if required, is in place.

.2 Do work in accordance with CAN/CSA – B651.

3.3 ERECTION

.1 Partition erection.

.1 Install partitions secure, plumb and square.
.2 Leave 12 mm space between wall and panel or end pilaster.
.3 Anchor mounting brackets to masonry/concrete surfaces using screws and shields: blocking/backing must be provided to hollow walls using bolts and toggle type anchors, (to steel supports with threaded rods, nuts, and washers), (bolts in threaded holes).
.4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.
.5 Provide for adjustment of ceiling variations with screw jack through steel saddles made integral with pilaster. Conceal ceiling fixings with stainless steel shoes.
.6 Provide templates, drilling dimensions for locating threaded studs through finished ceilings.

.7 Equip doors with hinges, latch set, and each stall with coat hook/door bumper. Adjust and align hardware for easy, proper function. Set door open position at full open.

.8 Install hardware grab bars.

.2 Ceiling hung partition erection.

.1 Secure pilasters to supporting structural framing using pilaster hangers.

.2 Ensure pilaster hangers do not transmit load to finished ceiling.

.3 Secure pilaster shoe in position

.4 Set bottoms of doors level with bottom of pilasters when doors are in close position.

3.4 ADJUSTING

.1 Adjust doors and locks for optimum, smooth operating condition.

.2 Lubricate hardware and other moving parts.

3.5 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.

.3 Clean aluminum with damp rag and approved non-abrasive cleaner.

.4 Clean and polish hardware and stainless steel components.

.5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION 10 21 13.13

1.0 GENERAL

1.1 RELATED REQUIREMENTS

.1	Rough Carpentry	Section 06 10 11
.2	Finish Carpentry	Section 06 20 00
.3	Metal Toilet Compartments	Section 10 21 13.13

1.2 REFERENCES

.1 ASTM International
- .1 ASTM A 167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM B 456-03, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .3 ASTM A 653/A 653M-09, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM A 924/A 924M-09, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
- .2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
- .3 CGSB 31-GP-107MA-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.3 CSA International
- .1 CAN/CSA-B651-04, Accessible Design for the Built Environment.
- .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

.4 Sustainable Standards Certification:
- .1 Low-Emitting Materials: submit listing of laminate adhesives used in building, verifying that they contain no urea-formaldehyde.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Tools:
- .1 Provide special tools required for assembly, disassembly or removal for toilet and bath

accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.

.2 Deliver special tools to Departmental Representative. Provide the following extra number of spare accessories for maintenance use in addition to what is shown on drawings as indicated in Appendix of this specification. Hand over to Departmental Representative in their original unopened packages. Refer to Appendix 5 – Extra Parts, Material and Equipment List.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect toilet and bathroom accessories from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

2.0 PRODUCTS

2.1 MATERIALS

.1 Sheet steel: to ASTM A 653/A 653M with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A 167, Type 304, with satin finish.

.3 Sustainability Characteristics:

.1 Laminate Adhesives.

.1 Urea Formaldehyde Free.

.4 Stainless steel tubing: Type 304, commercial grade, seamless welded 1.2 mm wall thickness.

.5 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 INTERIOR FINISH MATERIAL & COLOUR SCHEDULE

.1 This schedule is included in the appendix of this specification and list specific manufacturers related to style and quality upon which the scheme for the project is based.

.2 The following component specifications, which are prescriptive in nature, are presented in order to establish a quality of product upon which a price can be tendered.

.3 The Departmental Representative will consider substitute Products which meet or exceed the properties of the specified Product and are similar in material, construction, thickness, colour, texture, and overall quality, provided that proposals are submitted to the Departmental Representative complete with samples and whatever other data the Departmental Representative may require in order to evaluate the proposed substitute Product. If the Departmental Representative

approves the proposed substitute Product, the Contractor will have the option of providing Product listed in the Finish schedule or an approved alternative.

2.3 COMPONENTS

.1 Toilet Tissue Dispenser (TTD): Side by side double roll type with utility shelf, surface mounted, type 304 stainless steel with satin-finish. Theft-resistant spindles with heavy-duty internal spring, hold standard core tissue rolls up to 140mm diameter (1800 sheets).

.2 Toilet Tissue Dispenser – Disabled Stalls (TTD-DS): Side by side double roll type, surface mounted, type 304 stainless steel with satin-finish. Theft-resistant spindles with heavy-duty internal spring, hold standard core tissue rolls up to 140mm diameter (1800 sheets).

.3 Soap Dispenser (SD): Lavatory-mounted soap dispenser, Type 304 stainless steel with bright polished finish piston and spout assembly. 360° spout rotation. Concealed locking mechanism escutcheon ABS cylinder value with stainless steel spring, u-packing seal and duckbills. Translucent, shatter-resistant polyethylene container with 1.0-L capacity.

.4 Grab Bars (GB): 30/32 mm dia x 1.6 mm wall tubing of stainless steel, peened gripping surface, 38 mm diameter wall flanges, concealed screw attachment, flanges welded to tubular bar, provided steel back plates and all accessories. Knurl bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2kN. Configurations and sizes as indicated.

.1 GB1 (Toilet Side Wall Grab Bar): 915mm L.
.2 GB2 (Toilet Back Wall Grab Bar): 610 mm L, horizontal installation.
.3 GB3 (Urinal Side Grab Bars, 2 nos.): 610 mm L, vertical installation.
.4 GB4 (Shower Grab Bars): L-shaped horizontal installation – 1470mm x 1005mm

.5 Sanitary Napkin Disposal (ND): Type 304 stainless steel surface-mounted sanitary napkin disposal with all-welded construction; satin-finish for all exposed surfaces. Drawn, one-piece, seamless construction cover, secured to container with a full-length stainless steel piano-hinge. Integral finger depression on container for opening cover.

.6 Mirror (MR): One-piece roll-formed construction Type 304 stainless steel channel frame is 13 x 13 x 9.5 mm with vertical-grain satin finish and mitred corners. No.1 quality, 6mm glass mirror electrolytically copper plated; guaranteed against silver spoilage for 10 years. Mirror corners and back protected by shock absorbing material. Back is galvanized steel, secured to concealed wall hanger with two theft-resistant locking screws. Mirror size to be 460mm wide x 760 mm high.

.7 Baby Changing Station (BCS): Recess-mounted wall unit brushed 20 gauge stainless steel exterior with bacterial-resistant polyethylene body. To support static load of 250 lbs minimum. To ASTM F2285. Liner dispenser, cam-buckle safety belt, pneumatic gas shock mechanism for smooth, safe open and close motion. Safety instructions in both official languages, graphic illustration, labeled with universally accepted symbol.

.8 Shelf-Disabled Stalls (SH-DS): Type 304, 18 gauge stainless steel satin-finish shelf. Stainless steel mounting brackets welded to shelf. Size to be 405 mm long by 125 mm wide with minimum 19 mm return edges, front edge to be hemmed for safe handling.

.9 Shower Curtains (SC): Opaque white vinyl 0.2 mm thick shower curtains, containing anti-bacterial and flame-retardant agents with nickel-plated brass grommets along top. Hemmed bottom and sides minimum 2134 mm high width to suit shower opening. Complete with type 304 stainless steel satin-finish heavy duty shower curtain rod, 30 mm outside diameter, length to suit, and hooks from same manufacturer.

.10 Hook – Single (HC-1): All construction Type 304 stainless steel satin finish surface-mounted hook. Hook to be 12 gauge (2.8 mm), welded to the support arm. 22 gauge flange and support arm with 16 gauge concealed mounting bracket and wall plate.

.11 Hook-Strip: Type 304 stainless steel satin finish surface-mounted hook strip. Back plate to be 22 gauge and hooks 14 gauge.
.1 (HK-3) – 3 hooks strip for individual shower.
.2 (HK-6) – 6 hooks strip for family shower.

.12 Waste Receptacle (WR): 22 gauge (0.8 mm) satin-finish stainless steel floor-standing waste receptacle, equipped with vinyl bumper strip and rubber feet. Open top, no cover, 79.5 litre capacity, with hooks for removable liner at upper interior corners. Size to be 760 mm high x 355 mm wide x 355 mm deep.

.13 Bench (BH): Wall-mounted mixed hardwood bench. Custom seat width and, length as per drawings, thickness 32 mm. Two-coats clear catalyzed lacquer finish on wood, radius edge on all sides and corners. Complete with Type 304 12 gauge stainless steel brackets, size 380 mm x 530 mm minimum by same manufacturer.

.14 Hand-dryer (HD): Touch-free infra-red activation operation. Polycarbonate – ABS casing with antimicrobial coating. Colour to be sprayed nickel. Hepa filter. Hand dry time 12 seconds. 30 seconds operation lock-out period. 675 km/h airspeed at apertures. Up to 28 L/s operating airflow. 81 db(A) rated operating noise power, 5 year parts, 1 year labour warranty.

.15 Garbage Container (GC): Capacity: 256 Litre; 1220 mm H x 710 mm W x 735 mm L x 915 mm load height. Construction: 14 ga galvanneal steel housing, 12 ga galvanneal steel floor, 14 ga galvanneal steel user door, 12 ga galvanneal side hinged front access unloading door, stainless steel hinges and latches, powder coat finish with decorative recycled plastic siding. 125 mm diameter restriction plate for recycling collection. Weight: approximately 132 kg with siding kit.

2.4 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CAN/CSA-G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 FINISHES

.1 Chrome and nickel plating: to ASTM B 456, satin finish, U.O.N.

.2 Manufacturer's or brand names on face of units not acceptable.

3.0 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Departmental Representative.

3.2 INSTALLATION

.1 Install and secure accessories rigidly in place as follows:

.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.

.2 Hollow masonry units, existing plaster or drywall: use toggle bolts drilled into cell or wall cavity.

.3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.

.4 Toilet and shower compartments: use male to female through bolts.

.2 Install grab bars on built-in anchors provided by bar manufacturer.

.3 Use tamper proof screws/bolts for fasteners.

.4 Fill units with necessary supplies shortly before final acceptance of building.

3.3 ADJUSTING

.1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.

.2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by toilet and bathroom accessories installation.

3.6 SCHEDULE

.1 Locate accessories where indicated on drawings. Exact locations to be confirmed by Departmental Representative.

END OF SECTION 10 28 10

1.0 GENERAL

1.1 SECTIONS INCLUDED

.1 Supply and installation of floor hatch.

1.2 RELATED SECTIONS

.1 Rough Carpentry Section 06 10 00

.2 Finish Carpentry Section 06 20 00

1.3 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittals.

1.4 MAINTENANCE DATA

.1 Submit maintenance data for maintenance materials in accordance with Section 01 33 00.

1.5 WARRANTY

.1 Contractor to provide two-year manufacturer's warranty for each item.

1.6 PROTECTION

.1 Protect finished surfaces during shipment and installation by approved means. Do not remove until immediately prior to final completion.

2.0 PRODUCTS

.1 Floor Hatch:
Material: Aluminum door and frame, stainless steel hinges and hardware
Door: ¼" aluminum diamond plate reinforced for live load of 300 pounds/sq ft.
Frame: Angle frame fabricated from aluminum extrusion with an integral 1" anchor flange
Hinge: Stainless steel butt hinges with tamperproof stainless steel bolts and nuts
Opening Device: Automatic hold open arm with red vinyl grip allows door panel to open to 90 degrees, locking door in open position, and allowing for easy control when closing door panel. Provide stainless steel compression springs to add lift assistance.
Standard Latch: Flush aluminum drop handle with staple for padlock.
Finish: Mill finish.

3.0 EXECUTION

3.1 INSTALLATION

.1 Install manufactured specialty items in locations shown and in accordance with manufacturer's recommended details, reviewed shop drawings and manufacturer's instructions.

.2 Inspect the work of other sections upon which the work of this section depends. Proceed only after deficiencies, if any, in the work of other sections have been corrected.

.3 Exposed fastenings unless otherwise approved, are to be of the same materials, colour and finish as the base metal on which they occur.

.4 Finish work is to be plumb and level, free from distortion and defects detrimental to appearance or performance.

3.2 PROTECTION AND CLEAN-UP

.1 Protect adjacent surfaces from damage during installation.

.2 Protect from damage resulting from the work of other Sections.

.3 Promptly, as the work proceeds, and on completion, remove all crating, wrapping and surplus materials and equipment.

3.3 DEMONSTRATION

.1 Demonstrate proper operation to Owner's Representative.

.2 Instruct Owner's Representative in maintenance procedures.

END OF SECTION 10 80 00

PART 1 GENERAL

1.1 Summary

.1 Section Includes:

.1 Materials and installation for plumbing pumps.

1.2 Related Section

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 74 11	Cleaning
.4	Section 01 74 19	Waste Management and Disposal
.5	Section 01 78 00	Closeout Submittals
.6	Section 01 91 13	General Commissioning (Cx) Requirements
.7	Section 22 42 01	Plumbing Specialties and Accessories
.8	Section 23 05 00	Common Work Results for Mechanical
.9	Section 23 08 00	Commissioning of Mechanical Systems
.10	Section 23 08 01	Performance Verification Mechanical Piping Systems

1.3 References

.1 Electrical Equipment Manufacturers Advisory Council (EEMAC).

.2 National Electrical Manufacturers Association (NEMA).

.1 NEMA MG 1-2011, Motors and Generators.

.3 National Sanitation Foundation (NSF) / American National Standards Institute (ANSI).

.1 NSF/ANSI 61, Drinking Water System Components.

1.4 Submittals

.1 Submittals in accordance with Section 01 33 00– Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet for equipment.

.3 Shop Drawings.

.1 Submit shop drawings to indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.

.2 Wiring and schematic diagrams.

.3 Dimensions and recommended installation.

.4 Pump performance and efficiency curves.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 78 00 – Closeout Submittals.

.2 Include:

.1 Shop drawings.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.6 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.7 Delivery Storage and Disposal

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.3 Fold up metal banding, flatten and place in designated area for recycling.

1.8 Quality Assurance

.1 All potable water system components shall conform to NSF/ANSI Standard 61.

PART 2 PRODUCTS

2.1 Domestic Hot Water Re-circulating Pumps

.1 Capacity: as indicated.

.2 Construction: closed-coupled, in-line centrifugal, all bronze or stainless steel construction conforming to NSF 61, stainless steel shaft, stainless steel or bronze shaft sleeve, two oil lubricated bronze sleeves or ball bearings. Design for 860 kPa (125 psi).

.3 Speed: 3-stop speed selector.

2.2 Domestic Water Booster System

.1 Packaged simplex system, factory assembled, tested and adjusted, ready for site piping and electrical connections.

.2 Total Capacity:

.1 Flow rate: 5.4 L/s. [86GPM].

.2 System pressure: 461 kPa. [67psi]. Multistage

.3 Available pressure at meter outlet: 206 kPa. [30psi].

.3 Construction: vertical, in-line, closed coupled centrifugal, cast-iron casing, bronze impeller, [stainless steel] [non-ferrous] shaft sleeve, mechanical shaft seal, designed for [850] kPa suction pressure.

.4 Valves: to Section 22 11 16 - Domestic Water Piping. Suction and discharge valves and pressure reducing, and check valve pump and 50NTP pipe connection.

.5 Motor: 7.5 HP, 240/1/60.

.6 Supports: install complete package on factory fabricated structural steelwork designed to withstand seismic zone and velocity forces.

.7 Anchor Bolts and Templates:

.1 Supply for installation by other Divisions.

.2 Size anchor bolts to withstand seismic zone [four] acceleration and velocity forces].

.8 Control Panel: CSA 1 enclosure complete with:

.1 Externally operated disconnect switch.

.2 Magnetic [across-the-line] fused starters.

.3 Overload protection for each phase.

.4 Adjustable pressure switch.

.5 Low pressure safety cut-out.

.6 Control circuit transformer with fused secondary.

.7 Adjustable time delay relay.

.8 Hand-off-automatic selector switch for pumps.

.9 Pressure and suction gauges, [90] mm nominal dia., range 0 to 1035 kPa. [0-150psi].

.10 Pilot lights; power on, low suction pressure.

.11 Lead/lag selector switch.

.12 Alarm: visual and audible with silencing switch for abnormal conditions.

.13 Remote Controller and controller and wall mounted VFD.

.9 Operation:

.1 Lead pump to operate continuously during demand.

.2 Adjustable time delay to maintain starting pump operation and avoid "on-off " cycling.

.3 Constant pressure control, pressure switch to cycle pump.

.4 Low suction pressure switch to stop pumps.

.5 Temperature control for low or no system demand to bleed to drain.

.6 Constant pressure control valves on pumps to control pressure within 551kPa [80psi] from design maximum to zero flow.

.10 Provide stainless steel flex connections.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with National Plumbing Code and local authority having jurisdiction.

.2 Install in accordance with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

.3 Make piping and electrical connections to pump and motor assembly and controls as indicated.

.4 Ensure pump and motor assembly do not support piping.

.5 For domestic hot water re-circulating pumps, install a hose bibb drain with chain and cap upstream of the pump for bleed the air from system.

3.2 Field Quality Assurance

.1 Site Tests/Inspection:

.1 Check power supply.

.2 Check starter protective devices.

.2 Start-up, check for proper and safe operation.

.3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

.4 Adjust flow from water-cooled bearings.

3.3 Start-up

.1 General:

.1 In accordance with Section 01 91 00 - Commissioning.

3.4 Performance Verification:

.1 General:

.1 In accordance with Section 23 08 01 – Performance Verification Mechanical Piping Systems.

.2 PV procedures:

.1 Circulating pumps: operation under all conditions.

3.5 Balancing of Domestic Hot Water Recirculation Systems

.1 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.5 Reports

.1 In accordance with Section 01 91 13 – General Commissioning (Cx) Requirements, and Section 23 08 00 – Commissioning of Mechanical Systems, and supplemented as specified.

.2 Include:

.1 PV results on approved PV Report Forms.

.2 Product Information report forms.

.3 Pump performance curves (family of curves) with final point of actual performance.

3.6 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 74 19	Waste Management and Disposal
.4	Section 01 78 00	Closeout Submittals
.5	Section 23 05 05	Installation of Pipework
.6	Section 23 05 29	Hangers & Supports for Piping & Equipment
.7	Section 23 05 48	Vibration & Seismic Controls for Ductwork, Piping & Equipment
.6	Section 23 05 93	Testing, Adjusting and Balancing
.8	Section 23 07 19	Thermal Insulation for Piping

1.2 References

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).

- .1 ANSI/ASME B16.15-2011, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24-2011, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 American Society for Testing and Materials International, (ASTM).

- .1 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM A536-09, Standard Specification for Ductile Iron Castings
- .3 ASTM B88M-13, Standard Specification for Seamless Copper Water Tube (Metric).

.3 Canadian Standards Association (CSA International).

- .1 CSA B242-05 (R2011), Groove and Shoulder Type Mechanical Pipe Couplings.

.4 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

- .1 MSS-SP-70-2006, Gray Iron Gate Valves, Flanged and Threaded Ends.
- .2 MSS-SP-71-2005, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
- .3 MSS-SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.

.5 National Sanitation Foundation (NSF) / American National Standards Institute (ANSI).

.1 NSF/ANSI 61, Drinking Water System Components.

1.3 Submittals

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.5 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.6 Fold up metal banding, flatten and place in designated area for recycling.

1.6 Quality Assurance

.1 All potable water system components shall conform to NSF/ANSI Standard 61.

PART 2 PRODUCTS

2.1 Piping

.1 Domestic hot, cold and hot recirculation water systems, within building.

.1 Above ground:

.1 Copper tube, hard drawn, type L: to ASTM B88M to NPS 4 size.

.2 Buried or embedded: 50mm or smaller copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

.3 Buried or embedded (75mm): Schedule 80 PVC pipe and Schedule 80 PVC fittings: to ASTM D2466 and ASTM D2467, between connection to HDPE water service (1 meter from building) and service room. Provide flange type coupling (a robar coupling) to make transition between HDPE and PVC buried piping. Run PVC pipe into the building up through the floor or foundation wall in PVC sleeve. PVC must meet the flame spread rating.

.1 Provide flanged transition to hard copper 150mm A.F.F. Follow manufacturer's handling and installation procedures. Provide clamps, restraints or thrust block as required by pipe's manufacturer.

2.2 Fittings

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 Roll grooved: to CSA B242.

2.3 Joints

.1 Rubber gaskets, 1.6mm thick: to ANSI/AWWA C111/A21.11.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 tin copper alloy or brazing.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gaskets suitable for temperature range of -34°C to 120°C [-30°F to 250°F] .

.6 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.

2.4 Gate Valves

.1 NPS2 and under, soldered:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc.

.2 NPS2 and under, screwed:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc.

.3 NPS2-1/2 and over, in mechanical rooms, flanged:

.1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS & Y bronze trim.

.4 NPS2-1/2 and over, other than mechanical rooms, flanged:

.1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet.

2.5 Globe Valves

.1 NPS2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet.

.2 Lockshield handles: as indicated.

.2 NPS2 and under, screwed:

.1 To MSS-SP-80, Class 150, 1MPa, bronze body, screwed over bonnet, renewable composition disc.

.2 Lockshield handles: as indicated.

2.6 Swing Check Valves

.1 NPS 2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

.2 NPS2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, re-grindable seat.

.3 NPS2-1/2 and over, flanged:

.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap.

2.7 Ball Valves

.1 NPS2 and under, screwed:

.1 Class150.

.2 Bronze body, chrome plated brass ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon seat, steel lever handle.

.2 NPS2 and under, soldered:

.1 To ANSI B16.18, Class 150.

.2 Bronze body, chrome plated brass ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon seat, steel lever handle, with NPT to copper adaptors.

2.8 Drain Valves

.1 Drain valves shall be provided with cap and chain.

.2 Drain and hose valves 20mm (3/4”) and smaller:

.1 Sediment Faucets.

.2 Ball valves.

2.9 Plumbing Piping

.1 Water supply piping under concrete slabs or in walls shall be encased in standard weight flexible polyethylene pipe one size larger than copper tubing. All joints to be wrapped in plastic wrapping tape.

2.10 Dielectric Unions

.1 Insulating dielectric unions and flange unions shall be installed when adapting between dissimilar metallic pipe for domestic water supply piping, and domestic

water storage tanks. Elsewhere, unions and adaptors for copper piping shall be cast brass pressure fittings.

2.11 Expansion Joints

.1 Domestic and industrial water: Annular close pitch corrugated metal hose with Type 316L stainless steel butt welded tube. Type 304 single stainless steel outer brain, flanged, welded or screwed ends. Suitable for 1034 kPa (150 psi) working pressure and 50mm traverse.

2.12 Strainers

.1 NPS 2 and under: Full pipeline size, 1,034 kPa (150 psi) SWP bronze, with screwed ends and a removable plug type screen retainer.

.2 NPS 2-1/2 and over: Full pipeline size, 860 kPa (125 psi) SWP cast iron, with flanged ends and a bolted screen retainer.

2.13 Balancing Fittings:

.1 Sizes: Calibrated balancing valves, as specified this section.

.2 NPS 2 and under: Globe type, Y-pattern, bronze body, EPDM O-ring and NPT connections.

.3 Flow measuring valve shall be fitted with meter readout ports with check valves and caps, digital handwheel with memory stop indicator, NPS 20 hose connection, and a nameplate bearing manufacturer's name and calibrated nameplate.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with Section 23 05 05 - Installation of Pipework, Section 23 05 29 – Hangers & Supports for Piping & Equipment, and Section 23 05 48 – Vibration & Seismic Controls for Ductwork Piping & Equipment.

.2 Install in accordance with National Plumbing Code and local authority having jurisdiction.

.3 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.

.4 Assemble all piping using fittings manufactured to ANSI standards.

.5 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.

.6 Install CWS piping below and away from HWS and HWR and all other hot piping so as to maintain temperature of cold water as low as possible.

.7 Connect to fixtures and equipment in accordance with manufacturer's instructions unless otherwise indicated.

.8 Buried tubing:

.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.

.2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.2 Valves

.1 Isolate equipment, fixtures and branches with gate or ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 Pressure Tests

.1 Test pressure: 1.5 times maximum system operating pressure, and not less than 860 kPa.

3.4 Balancing

.1 Balance domestic hot water recirculation system shall be balanced by TAB Contractor under Division 23. Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.5 Pre- Start-Up Inspections

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.6 Disinfection

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of Departmental Representative.

.2 Upon completion, provide a “Chlorination Certificate” at project closeout and provide a copy in the O&M Manual.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 74 19	Waste Management and Disposal
.4	Section 01 78 00	Closeout Submittals
.5	Section 23 05 00	Common Work Results for Mechanical
.6	Section 23 05 05	Installation of Pipework
.7	Section 23 05 29	Hangers & Supports for Piping & Equipment
.8	Section 23 05 48	Vibration & Seismic Controls for Ductwork Piping & Equipment
.9	Section 23 07 19	Thermal Insulation for Piping

1.2 References

.1 American Society for Testing and Materials International, (ASTM).

- .1 ASTM B32-08, Standard Specification for Solder Metal.
- .2 ASTM B306-13, Standard Specification for Copper Drainage Tube (DWV).
- .3 ASTM C564-12, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).

- .1 CAN/CSA-B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .2 CSA-B125-12, Plumbing Fittings.

1.3 Submittals

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.5 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.6 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 Copper Tube and Fittings

.1 Above ground sanitary storm and vent, Copper Type DWV to: ASTM B 306.

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.

.2 Wrought copper: to CAN/CSA-B125.

.2 Solder: tin-lead, 50:50, type 50A or lead free, tin-copper alloy 95:5, type TA to ASTM B 32.

2.2 Cast Iron Piping and Fittings

.1 Buried sanitary, storm and vent, cast iron (minimum NPS 2) to: CAN/CSA-B70.

.1 Joints.

.1 Mechanical joints.

.1 Neoprene or butyl rubber compression gaskets: to ASTM C 564 or CAN/CSA-B70.

.2 Stainless steel clamps.

.2 Above ground sanitary, storm and vent: Cast iron to CAN/CSA-B70.

.1 Joints.

.1 Mechanical joints.

.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

2.3 ABS Piping

.1 Drainage piping under the building, provided that such piping does not pass through any fire separations, may be as follows, at the contractor's option:

.1 Underground sanitary drainage piping under building, 150mm in diameter and smaller, certified to the current version of CSA B181.1, ABS Drain, Waste and Vent Pipe and Fittings. Piping shall be solid wall in construction. Cell core piping is not acceptable.

.2 The use of ABS piping inside building is not permitted.

2.4 PVC Piping

.1 Drainage piping under the building may be as follows, at the contractor's option:

.1 Underground sanitary drainage piping under building, 100mm in diameter or larger, certified to the current version of CSA B181.2, PVC Drain, Waste and Vent Pipe and Fittings.

.2 The use of PVC drain pipe inside building is not permitted.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with Section 23 05 05 - Installation of Pipework, Section 23 05 29 – Hangers & Supports for Piping & Equipment, and Section 23 05 48 – Vibration & Seismic Controls for Ductwork Piping & Equipment.

.2 Install in accordance with National Plumbing Code and local authority having jurisdiction.

.3 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with 150 mm of clean washed sand.

.4 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

3.2 Testing

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 Performance Verification

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 33 00 Submittal Procedures

.2 Section 01 35 33 Health and Safety Requirements

.3 Section 01 74 11 Cleaning

.4 Section 01 74 19 Waste Management and Disposal

.5 Section 01 78 00 Closeout Submittals

.6 Section 01 91 13 General Commissioning (Cx) Requirements

.7 Section 22 42 01 Plumbing Specialties and Accessories

.8 Section 23 05 00 Common Work Results for Mechanical

.9 Section 23 05 48Vibration & Seismic Controls for Ductwork, Piping and Equipment

1.2 References

.1 Canadian Standards Association (CSA International)

.1 CSA B51-2014, Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CAN/CSA C22.2 No.110-94 (R2004), Construction and Test of Electric Storage Tank Water Heaters.

.3 CAN/CSA-C191-04, Performance of Electric Storage Tank Water Heaters for Household Service.

.4 CAN/CSA-C309-M90 (R2009), Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

.2 National Sanitation Foundation (NSF) / American National Standards Institute (ANSI).

.1 NSF/ANSI 61, Drinking Water System Components.

1.3 Submittals

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.5 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.6 Fold up metal banding, flatten and place in designated area for recycling.

1.6 Quality Assurance

.1 All potable water system components shall conform to NSF/ANSI Standard 61.

1.7 Spare Materials

.1 Provide the following spare materials:

.1 1@ domestic water heater, DHWH-1: [Green Point #1 (36 kW, 240V, 1PH, 120 gal.)]

.2 1@ domestic water heater, DHWH-1: [Wickininnish Beach (12 kW, 240V, 1 PH, 50 gal.)]

PART 2 PRODUCTS

2.1 Electric Domestic Hot Water Heaters

.1 General: Automatic, electric, tank-type domestic hot water heater. To CAN/CSA C22.2 No.110, CAN/CSA-C191.

.2 Electric potable water heater with an input exceeding 29.29 kW [100,000 Btuh] or an inside diameter over 610mm [24"] shall be designed and constructed to ANSI/ASME Boiler and Pressure vessel Code and require a CRN issued by the Boiler and Pressure Vessel Safety Branch.

.3 Tanks: heavy blanket insulation with baked enamel finish sheet metal lagging, 450 L [120 gallon] and 180L (50 gallon).

.4 Heaters: bronze immersion, 240/1/60.

.1 Green Point (DHWH-1): 36 kW, 120 gal.

.2 Green Point (DHWH-1): 36 kW, 120 gal.

.3 Wickininnish Beach (DHWH-1): 12 kW, 50 gal.

.4 Incinerator Rock (DHWH-1): 12 kW, 50 gal.

.5 Long Beach North (DHWH-1): 12 kW, 50 gal.

.6 Long Beach South (DHWH-1): 12 kW, 50 gal.

.5 Features:

.1 Anti-siphon inlet.

.2 Anodic corrosion protection.

.3 Pressure and temperature relief valve. Pipe valve to drain. Install sensing bulb in tank water.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

.2 Pipe relief valve to floor drain.

.3 Install unions to permit removal or replacement of equipment.

.4 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.

.5 Provide vacuum breaker to CSA B64-01 as specified in Section 22 42 01 – Plumbing Specialties and Accessories.

3.2 Field Quality Control

.1 Commissioning:

.1 In accordance with Section 01 91 13 – General Commissioning (Cx) Requirements, and Section 23 08 00 – Commissioning of Mechanical Systems.

.2 Manufacturer to:

.1 Certify installation.

.2 Start up and commission installation.

.3 Carry out on-site performance verification tests.

.4 Demonstrate operation and maintenance.

.3 Provide Departmental Representative at least 48 hours notice prior to inspections, tests, and demonstrations. Submit written report of inspections and test results.

3.3 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning, and Section 23 08 02 – Cleaning & Startup of Mechanical Piping Systems.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Summary

.1 Section Includes:

.1 The supply and installation of Plumbing Fixtures and Trim.

.2 Products Installed but not Supplied Under this Section:

.1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.

.2 Equipment installed by others.

.1 Connect with unions.

.3 Equipment not installed.

.1 Capped for future connection by others.

1.2 Related Section

.1	Section 01 11 55	General Instructions
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 23 05 00	Common Work Results for Mechanical

1.3 References

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA-B45 Series 02 (R2013) Plumbing Fixtures.

.2 CSA-B125.3-12, Plumbing Fittings.

.3 CSA-B651-12, Accessible Design for Built Environment.

.2 National Sanitation Foundation (NSF) / American National Standards Institute (ANSI).

.1 NSF/ANSI 61, Drinking Water System Components.

1.4 Submittals

.1 Submittals in accordance with Section 01 01 50 – General Instructions.

.2 Indicate, for all fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

1.5 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 01 50 – General Instructions.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.6 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.7 Delivery Storage and Disposal

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 01 50 – General Instructions.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.3 Fold up metal banding, flatten and place in designated area for recycling.

1.6 Quality Assurance

.1 All potable water system components shall conform to NSF/ANSI Standard 61.

1.7 Spare Materials

.1 Provide the following spare materials:

.1 2@ WC-1 (toilet only)

.2 2@ WC-2 (toilet only)

.3 2@ UR-1 (urinal only)

.4 6@ WC-1 flush valves

.5 2@ WC-2 flush valves

.6 6@ urinal flush valves

.7 3@ SH-1 (shower valves and shower heads only)

.8 2@ SH-2 (less drain)

.9 12@ L-1 (faucet and TMV-1 only)

.10 6@ KS-1 (faucet only)

.11 4@ TMV-1 (Lavatories and Shower)

.12 1@ TMV-2 (Kitchen Faucets)

PART 2 PRODUCTS

2.1 Manufactured Units

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass shall be chrome plated finish. Water supply piping exposed in finished areas shall be chrome plated brass pipe and fittings.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

.7 Fixture Schedule:

WC-1 Water Closet

Toilet: Wall hung, vitreous china, antimicrobial surface, elongated syphon jet flush action bowl, 2-1/8" (54mm) fully glazed internal trapway, 10" x 12" (254mm x 305mm) large water surface, high efficiency 4.2 LPF (1.1 GPF) to low consumption 6 LPF (1.6 GPF), 1-1/2" (38mm) back spud and bolt caps, for use with concealed flush valve. (Minimum MaP Test Rating: 1000 grams.)
Flush Valve: 4.8 LPF (1.28 GPF) factory set flow, concealed quiet action, chloramine resistant diaphragm with brass diaphragm retainer, 16mm diameter push button, non-hold open feature, vacuum breaker, back-check angle stop, trap seal prime tee, adjustable tailpiece, exposed parts chrome plated.
Toilet seat: elongated heavy duty solid plastic open front less cover, reinforced stainless steel check hinge, posts, washers and nuts.
Carrier: Single horizontal adjustable, epoxy coated, with block base feet, bolts (4 bolts siphon jet), cap nuts, adjustable nipple, gasket, test plug and protection cap, MJ couplings, constructed of extra wide 4 to 6 band corrugated type 304 stainless steel bands, with heavy duty worm drive clamps. Coordinate left or right hand carrier orientation.

WC-2 Water Closet (Accessible)

Toilet: Wall hung, vitreous china, antimicrobial surface, elongated syphon jet flush action bowl, 2-1/8" (54mm) fully glazed internal trapway, 10" x 12" (254mm x 305mm) large water surface, high efficiency 4.2 LPF (1.1 GPF) to low consumption 6 LPF (1.6 GPF), 1-1/2" (38mm) back spud and bolt caps, for use with concealed flush valve. (Minimum MaP Test Rating: 1000 grams.)
Flush valve: 4.8 LPF (1.28 GPF) factory set flow, concealed quiet action, chloramine resistant diaphragm with brass diaphragm retainer, vandal-resistant ADA compliant oscillating handle, non-hold open feature, vacuum breaker, back-check angle stop, adjustable tailpiece, exposed parts chrome plated.
Toilet seat: elongated heavy duty solid plastic open front with cover, reinforced stainless steel check hinge, posts, washers and nuts.
Carrier: Single horizontal adjustable, epoxy coated, with block base feet, bolts (4 bolts siphon jet), cap nuts, adjustable nipple, gasket, test plug and protection cap, MJ couplings, constructed of extra wide 4 to 6 band corrugated type 304 stainless steel bands, with heavy duty worm drive clamps. Coordinate left or right hand carrier orientation.

UR-1 Urinal

Urinal: low consumption, wall hung for concealed flush valve, vitreous china, wash out flush action 1.9 LPF (0.5 GPF) per flush, extended sides for privacy, integral flush spreader, 3/4" (19mm) back spud, wall hangers, open trap. Strainer, removable stainless steel.
Flush valve: C.P. low consumption, 1.9 LPF (0.5 GPF) factory set flow, concealed quiet action, chloramine resistant diaphragm with brass diaphragm retainer, vandal-resistant oscillating handle, high pressure v.b. smooth design V.P. stop cap, 3.8 LPF (1.0 GPF) factory set flow, 'PERMEX' diaphragm type with non-hold open feature, vacuum breaker, back-check angle stop.
Urinal Carrier, with bearing plates and steel pipe legs, welded to block base feet supports.
Provide 'p' Trap, cast brass 1-1/2" (38mm) with cleanout, union and escutcheon.

L-1 Lavatory (basin by others) – Public with tempered water

Faucet: Single-handle metering, C.P. solid cast brass body, vandal resistant, ADA compliant lever style handle, adjustable cartridge set to max. 0.95 Lpc (0.25 gpc) per push flow with vandal-resistant 1.9 LPM (0.5 GPM) flow P.C. spray outlet, 5 to 60 seconds time selection,
Drain: C.P., cast brass 1 pc. top, offset open grid less overflow holes and 17ga. (1.5mm), 1-1/4" (32mm) tailpiece with double gasket.
Tempered water from thermostatic mixing valve, TMV-1, serving group faucets.
Supplies: C.P. Polished Brass Sink Supplies, rigid horizontal nipples 3/8" (10mm) x 5" (127mm) long, I.P.S. heavy all brass angle stops with V.P. loose key and escutcheons, less flexible risers.
'P' trap: C.P., polished, cast brass adjustable body, 1-1/4" (32mm) with cleanout plug, seamless brass wall bend and escutcheon.

SH-1 Shower Valve (metering, tempered water)

Shower valve (manual), integral service stop for shutting water off when servicing water cartridge, 12mm sweat connection, vandal resistant mounting fasteners [recessed hex socket type], polished chrome finish, standard ASME A112.18.1-2005/CSA B125.1, vandal resistant, tempered water only, push button type, delayed automatic closing with integral stop [operating for 10 to 50 seconds].
Tempered water from thermostatic mixing valve, TMV-1, serving individual or group shower.
Shower head: institutional, C.P. shower head with adjustable flood or mist spray and external volume control, polished chrome finish, 7.6 LPM (2.0 GPM) flow with mounting bracket and vandal resistant screws [standard ASMW A112.18.1 CSA B125.1].
Drain: all duco coated cast iron body, reversible flashing clamp with seepage openings and adjustable 5" (127mm) diameter nickel bronze 1/4" (6.35mm) thick strainer, secured with tamperproof S.S. screws, 4" (102mm) throat on strainer. Provide cast iron 'p' trap.

SH-2 Shower Valve (metering, cold water) – Custom Column Shower – By Architect

Shower valve: metering type, C.P. vandal resistant, cold water only, push button type, delayed automatic closing with integral stop, operating for 10 to 50 seconds, for exterior use only.
Shower head: institutional, C.P. cast brass one piece with 7.6 LPM (2.0 GPM) flow with mounting bracket, vandal resistant screws, self-cleaning, adjustable spray direction, integral flow control.
Drain: all duco coated cast iron body, reversible flashing clamp with seepage openings and adjustable 5" (127mm) diameter nickel bronze ¼" (6.35mm) thick strainer, secured with tamperproof S.S. screws, 4" (102mm) throat on strainer. Provide cast iron 'p' trap.

TMV-1 Thermostatic Mixing Valve (ASSE 1069 and ASSE 1070) – Group Lav. Faucets and Individual Shower

Thermostatic mixing valve: for shower/ group faucets to ASSE 1069 at 1.9 LPM (0.5 GPM) and ASSE 1070 at 1.9 LPM (0.5 GPM). Lead free brass to NSF61 with corrosion resistant internal components, integral screens and checks, allen wrench set point adjustment and lock nuts, 1/2 NPT connections. Pre-piped with inlet and outlet ball valves, inlet and outlet temperature gauges. 8 LPM (2.1 GPM) at 69 kPa differential, accommodate up to 1 single temperature shower 7.6 LPM (2 GPM) or up to 2 hand washing stations 1.9 LPM (0.5 GPM) flow rate. Outlet temperature range: 32°C to 46°C (90°F to 115°F).

TMV-2 Thermostatic Mixing Valve (ASSE 1069 and ASSE 1070) – Group Kitchen Faucets

Thermostatic mixing valve: for group kitchen/faucets to ASSE 1069 at 1.9 LPM (0.5 GPM) and ASSE 1070 at 1.9 LPM (0.5 GPM). Lead free brass to NSF61 with corrosion resistant internal components, integral screens and checks, allen wrench set point adjustment and lock nuts, 1/2 NPT connections, inlet ball valves. 21.4 LPM (5.7 GPM) at 69 kPa, accommodate up to 3 single kitchen sinks 5.7 LPM (1.5 GPM) flow rate. Outlet temperature range: 32°C to 46°C (90°F to 115°F).

KS-1 Kitchen Sink (basin by others)

Faucet: C.P., deck mounted, all metal construction lead-free brass waterways body, deck plate, ceramic disc valve cartridge, 9-1/4" (235mm) long swing spout with vandal-resistant, 5.7 LPM (1.5 GPM) flow pressure compensating aerator outlet, and single control metal lever handle. Tempered water from TMV-2 serve group kitchen faucets.
Supplies, C.P. with metal angle stops, adaptors, escutcheons and metal flexible risers.
Provide 'p' Trap, cast brass 1-1/2" (38mm) with cleanout, union and escutcheon.
Sanitary Covering: PVC construction, vandal-resistant flexible seamless construction, anti-microbial, to exposed piping (to protect against heat/contusions) as per local codes. Provide covering to exposed piping per local codes.

SS-1 Service Sink

Corner Mop Sink, 24" x 24" x 12" (610mm x 610 mm x 305mm) deep, floor mounted, Precast Terrazzo. One-piece stainless steel cast integral cap on all sides.

Integral Cast Brass Drain with S.S. strainer, 3" (75mm) outlet.

Hose faucet, C.P. 8" (203mm) C.C., wall mounted, solid cast brass lead free body, 1/4 turn ceramic disc valve cartridges, cast brass lever handles, body mounted vacuum breaker, wall brace, integral stops, 36" (915mm) hose and hanger.

Mop Hanger, triple. Mop Sink Drain Gasket, connection for 3" (75mm) pipe. S.S. Back Splash Panels, number of panels to suit installation. Provide 'p' Trap.

FD-1 Floor Drain (Washrooms)

Floor Drain, all duco coated, 9" (220mm) dia. cast iron body, reversible flashing clamp with seepage openings, no-hub outlet round strainer, nickel bronze, vandal-proof screws, trap primer connection 1/2" (13mm), sediment bucket, hinged grate.

FD-2 Floor Drain (Service Room)

Floor Drain, all duco coated, 9" (220mm) dia. cast iron body, reversible flashing clamp with seepage openings, no-hub outlet square strainer nickel bronze, trap primer connection 1/2" (13mm).

FD-3 Floor Drain (Service Room with Funnel)

Floor Drain, all duco coated, 9" (220mm) dia. cast iron body, reversible flashing clamp with seepage openings, no-hub outlet round Funnel 4" (102mm) dia. nickel bronze, trap primer connection 1/2" (13mm) , 5" Nickel Bronze Round Strainer.

FD-4 Floor Drain (Crawl Space)

Floor Drain, all duco coated, 9" (220mm) dia. cast iron body, reversible flashing clamp with seepage openings, backwater valve, no-hub outlet square strainer nickel bronze, trap primer connection 1/2" (13mm).

TD-1 Sloped Trench Drain System

Modular, interconnecting, trench drain systems with a 200mm internal width, 250mm deep and 1500mm long.
Grates are supplied with a locking stud which push fits into a stainless steel spring clip in the locking bar. To remove grate, put removal hook into grate opening and pull upwards.
General: The surface drainage system shall be complete with gratings secured with locking device.
Materials: The trench system bodies shall be manufactured from polyester polymer concrete with minimum properties as follows:

Compressive strength:	14,000 psi
Flexural strength:	4,000 psi
Water absorption	0.07%

Frost proof, Salt proof, Dilute acid and alkali resistant.

The nominal clear opening shall be 8.00" (200mm). Pre-cast units shall be manufactured with either an invert slope of 0.6% or with neutral invert and have a wall thickness of at least 0.50" (13mm). Each unit will feature a full radius in the trench bottom and a male to female interconnecting end profile. Units shall have horizontal cast in anchoring features on the outside wall to ensure maximum mechanical bond to the surrounding bedding material and pavement surface. The galvanized/stainless* steel edge rail will be integrally cast in by the manufacturer to ensure maximum homogeneity between polymer concrete body and edge rail. Each edge rail shall be at least 1/8" (3mm) thick.
Installation: The trench drain system shall be installed in accordance with the manufacturer's installation instructions and recommendations.
Perforated Stainless Steel Grate: The surface drainage system shall be drain with channels complete with perforated stainless steel grate with locking.

The covers shall be manufactured from perforated stainless steel grate and have *minimum* properties as follows:

- *Independently certified to meet Load Class C.*
- *Grade 304 stainless steel*
- *Intake area of 22.3 sq. in. (144 cm²) per half meter of grate*
-

The overall width of 9.41" (239mm) and overall length of 39.37" (1000mm).
The trench drain system and grates shall be installed in accordance with the manufacturer's installation instructions and recommendations.
The finished level of the concrete surround must be approx. 1/8" above the top of the channel edge.
The system shall be installed in accordance with the manufacturer's instructions and recommendations.

TP Trap Primer

Automatic Trap Seal Primer Valve, cast brass body, serving individual or remote area drains (primer automatically activated when there is a pressure drop in the system) with 1/2" (12.7mm) NPT (MtoF) connections with strainer and integral back flow preventer & vacuum breaker. (For 2, 3 or 4 drains provide primer unit with distribution unit assembly)

WH-1 Wall Hydrant

Box Type Wall Hydrant, 1/4 turn non-drip, ceramic cartridge, 3/4" (19mm) non freeze wall type with bronze nickel face and stainless steel box with full 180 deg hinged locking. Cover opening box, self-draining integral vacuum breaker. Operating keys, cylinder lock.

HB-1 Hose Bibb - Interior

Concealed anti-siphon narrow hose bibb with chrome plated face (108mm h x 64mm w), with nickel bronze box (163mm h x 138mm w), integral vacuum breaker, 20mm hose connection, 360 degree swivel pipe connection with 20mm female / 25mm male threads, bronze head, seat casting, internal working parts and loose key. Install in minimum 150mm wall thickness.

PART 3 EXECUTION

3.1 Installation

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Wall-hung fixtures: as indicated measured from finished floor.

.3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.

.2 For all areas, all gaps between fixtures, wall and floors are to be sealed with silicone-based, mildew-resistant and low-VOC caulking compound, conforming to ASTM C920 Type S Grade NS Class 25.

.3 Caulking shall be made tight and beaded smooth in a neat and workmanlike manner

.4 Utilize security hardware and mounting plates provided with all security fixtures in areas accessible to public.

3.2 Supplies

.1 Provide isolation valves or stops for every fixture or appliance connection.

.2 Provide water hammer arrestors for flush valves and solenoid controlled appliances.

3.3 Adjusting

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

3.4 Performance Verification:

.1 PV procedures:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls: Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

PART 1 GENERAL

1.1 Summary

.1 Section Includes:

.1 The supply and installation of Plumbing Specialties and Accessories.

.2 Products Installed but not Supplied Under this Section:

.1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.

.2 Equipment installed by others.

.1 Connect with unions.

.3 Equipment not installed.

.1 Capped for future connection by others.

1.2 Related Section

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 74 19	Waste Management and Disposal
.4	Section 01 78 00	Closeout Submittals
.5	Section 23 05 00	Common Work Results for Mechanical
.6	Section 23 08 01	Performance Verification Mechanical Piping Systems

1.3 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A126-04(2009), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA)

.3 Canadian Standards Association (CSA)

.1 CAN/CSA-B64 Series-01 (2007), Backflow Preventers and Vacuum Breakers.

.2 CAN/CSA-C22.2 No. 130-03 (R2013), Requirements for Electrical Resistance Heating Cables and Heating Device Sets.

.3 CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Plumbing and Drainage Institute (PDI)

.1 PDI-WH201-2010, Water Hammer Arresters Standard.

.5 National Sanitation Foundation (NSF) / American National Standards Institute (ANSI).

.1 NSF/ANSI 61, Drinking Water System Components.

1.4 Submittals

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Indicate, for all plumbing specialties and accessories:

.1 Dimensions, construction details, roughing-in dimensions.

1.5 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 78 00 – Closeout Submittals.

.2 Include:

.1 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.6 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.7 Delivery Storage and Disposal

.1 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.3 Fold up metal banding, flatten and place in designated area for recycling.

1.8 Quality Assurance

.1 All potable water system components shall conform to NSF/ANSI Standard 61.

PART 2 PRODUCTS

2.1 Cleanouts

.1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Access covers:

.1 Wall access: face or wall type, polished nickel bronze or stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.2 Floor access: round cast iron body and frame with adjustable secured nickel bronze top cast box with anchor lugs and:

.1 Plugs: bolted bronze with neoprene gasket.
.2 Cover for unfinished concrete floors: cast iron round gasket, vandal-proof screws.

.3 Cover for terrazzo finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws

.4 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

.5 Cover for carpeted floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.2 Water Hammer Arrestor

.1 Copper construction, bellows type: to PDI-WH201.

2.3 Vacuum Breaker

.1 To CSA-B64 Series.

2.4 Pressure Regulator

.1 Capacity and performance:

.2 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62.

.3 NPS2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.

.4 Semi-steel spring chambers with bronze trim.

2.5 Trap Seals Primer

.1 Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection. Activates upon 21 kPa [3 PSI] or less pressure drop.

2.6 Strainers

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 NPS2 and under, bronze body, screwed ends, with brass cap.

.3 NPS2 1/2 and over, cast iron body, flanged ends, with bolted cap.

2.7 Hose Bibbs and Sediment faucets

.1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.8 Balancing Fittings, for TAB:

.1 Sizes: Calibrated balancing valves, as specified this section.

.2 NPS 2 and under: Globe type, Y-pattern, bronze body, EPDM O-ring and NPT connections.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with National Plumbing Code and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.2 Cleanouts

.1 In addition to those required by code, and as indicated, install at base of soil and waste stacks, and rainwater leaders.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.3 Water Hammer Arrestor

.1 Install on branch supplies to each fixture or group of fixtures and where indicated.

3.4 Hose Bibbs and Sediment Faucets

.1 Install at bottom of all risers, at low points to drain systems, and as indicated.

3.5 Trap Seal Primers

.1 Install for all floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Departmental Representative.

.3 Install soft copper or plastic tubing to floor drain.

.4 Provide isolation valve with union connection at trap primer inlet. Provide air gap fitting at trap primer outlet.

.5 Take off to trap primer shall be at the top of water line to prevent debris from entering trap primers.

3.6 Performance Verification:

.1 General:

.1 In accordance with Section 23 08 01 – Performance Verification Mechanical Piping Systems.

.2 PV procedures:

.1 Vacuum breakers, circulating pumps: operation under all conditions.

.2 Thermostatic controls: Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 This Section specifies the common work results for the Mechanical Divisions, including:

.1 Division 22 Plumbing

.2 Division 23 Heating Ventilation & Air Conditioning

.2 Read Division 1 General Requirements in conjunction with the specifications for Mechanical Divisions. Division 1 and this Section shall form a part of and shall apply to all Mechanical Divisions. The most stringent requirements of this and other Mechanical Sections must be adhered to.

.3 The Mechanical work shall consist of demolition of mechanical systems in the existing washroom buildings (see Architectural Drawing), and the supply and installation of complete and operable mechanical systems for the new shower buildings. Mechanical work shall include all necessary labour, plant, materials, and incidentals for the work involved as listed in the Mechanical Divisions. All sections in the Mechanical Divisions specifications are related sections and shall be read in conjunction with each other, whether or not “Related Sections” are explicitly mentioned under each section.

.4 Hazardous building materials under Mechanical Divisions that will be disturbed during construction shall be removed and disposed in accordance to Division 2 and Hazmat Report. Hazardous building materials under Mechanical Divisions include but not limited to asbestos containing duct mastic, pipe elbows, plumbing gaskets.

.5 The following plumbing fixtures in the existing washroom buildings (total of 6 buildings) shall be removed, cleaned, and delivered to the Parks Canada, Technical Services Compound (120 Airport Rd, Tofino, BC) for storage; obtain receipt upon delivery:

.1 22@ water closets, including flush valve assemblies.

.2 1@ water closet (tank type).

.3 6@ urinals, including flush valve assemblies.

.4 20@ lavatory basins including faucet.

1.2 Submittals

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 33 00 – Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.5 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

.2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection. Also see “Mandatory Requirements for O&M Manuals” this in Section.

.3 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment performance verification test results.

.2 Special performance data as specified.

.3 For each fan and pump installed, provide performance data in "Curve" or multi rating table.

.4 For each plumbing fixture, floor and roof drain installed, provide manufacturer's "cut" of that item and "cuts" of associated brass goods.

.6 Approvals:

.1 Submit 1 copy of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of

individual data will not be accepted unless directed by Departmental Representative.

.2 Make changes as required and re-submit as directed by Departmental Representative.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.2 Copies of extended guarantees and warranties for equipment items such as hot water tanks and heat exchangers shall be included in a separate section of the manual.

.8 Site records:

.1 Departmental Representative will provide 1 set of mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to site mechanical drawings. Update drawings to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.5 The drawings shall indicate the inverts and dimensioned locations of all services at the property line and where they penetrate the building perimeter.

.9 As-built drawings:

.1 Departmental Representative will provide CAD drawings to Contractor who will be responsible for producing the as-built drawings. Contractor shall update CAD drawings using CAD drafting procedures, to show all changes made.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit one (1) hard copy for check prints to Departmental Representative for approval, and make corrections as directed. Upon acceptance by Departmental Representative, Contractor shall make multiple copies of as-built drawings (electronic and hard copies), and submit completed as-built drawings with Operating and Maintenance Manuals in accordance with Division 1.

1.3 Regulations

.1 Comply with most stringent requirements of NBC, Provincial and Municipal regulations and by-laws, specified standards, codes and this specification. Practices contained in these standards or standards suggested or recommended by reference organizations, are to be taken as minimum requirements.

.2 Furnish certificates confirming work installed conforms to requirements of authorities having jurisdiction.

.3 Drawings and specifications should not conflict with these Regulations but where there are apparent discrepancies, notify the Departmental Representative in writing and obtain clarifications before proceeding with the work.

1.4 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Guarantee Warranty

.1 Correct promptly at own expense, defects or deficiencies in the work in accordance with the Warranty requirements of the Contract.

.2 The Departmental Representative shall be the judge as to whether the failure is due to defective workmanship, improper usage or ordinary wear and tear.

.3 Make good any damage resulting from defective materials or workmanship.

.4 Rectify any deficiencies or omissions in respect to plans or Specifications which may appear during the guarantee period even though work has been accepted as complete.

1.6 Definitions

.1 Definitions used in this Division will have the following meaning:

.1 "Concealed": pipes, ducts, etc., in trenches, chases, furred spaces, pipe shafts, or hung ceilings.

.2 “Exposed": regarding insulation and painting of piping, ducts, etc., will mean that they are not "concealed", as defined herein.

.3 "Piping": includes, in addition to pipe, all fittings, valves, hangers, other accessories which comprise a system.

.4 "Provide": to supply and install, complete and ready for use.

1.7 Drawings

.1 Drawings:

.1 Are not intended to show structural details or architectural features.

.2 Are not to be scaled.

.3 Except where dimensioned, indicate general mechanical layouts only.

.4 The drawings are mainly schematic and do not attempt to show all offsets. Make such offsets at no additional cost to contract. Offset angles shall be as small as possible.

.5 All figured dimensions shall have precedence over scale. Detail drawings shall have precedence over small scale drawings; any difference between same shall be decided upon by the Departmental Representative.

.2 Provide field (shop) drawings to indicate relative position of various services when required by Departmental Representative and obtain approval before commencing work.

.3 Shop drawing review by Departmental Representative is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for quantities and dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.

1.8 Maintenance

.1 Furnish spare parts in accordance with Section 01 78 00 – Closeout Submittals as indicated in the detailed product specification clauses.

.2 Provide access doors for concealed expansion joints, traps, strainers, cleanouts, balance dampers, fire dampers, other parts requiring accessibility for operating and maintenance.

.3 In suspended panel ceilings, use panel in place of access door; provide in such panel a button or other means of identification and easy removal when necessary.

1.9 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 01 50 – General Instructions.

1.10 Discrepancies and Omissions

.1 Bidders finding discrepancies in, or omissions from, Drawings, Specifications, or other documents, or having any doubt as to the meaning or intent of any part thereof, shall at once notify the Departmental Representative, who will send explanatory written instructions to all bidders. No verbal information will be considered valid.

.2 Should there be conflict(s) within or between the Specifications and/or Drawings, the most stringent or higher quality requirement shall apply.

1.11 Mandatory Requirements for O&M Manuals

.1 Employ an independent firm with minimum five (5) years experience in preparing professional quality O&M manuals.

.2 Hard Copy Requirements:

.1 Hard copies shall be placed in D-ring binders with clear overlay on front and spine with labels inserted on front cover and spine. Labels shall include the following information: Front cover label shall include the project name, project location, owner, architect, mechanical consultant, general contractor, mechanical contractor, firm preparing the manuals, and the month and year that the manuals were prepared. It shall also bear the label “Operating & Maintenance Manual for Mechanical Systems”.

.2 Spine label shall include the project name, project location, and the year that the manuals were prepared. It shall also bear the label “Operating & Maintenance Manual for Mechanical Systems”.

.3 Indicate Volume X of Y if more than one volume is required.

.4 Insert a Title page and Table of Contents in clear plastic covers.

.5 Title page shall include the project name, project location, as well as the name, address, phone number of the owner, architect, mechanical consultant, general contractor, mechanical contractor, firm preparing the manuals, and the month and year that the manuals were prepared. It shall also bear the label “Operating & Maintenance Manual For Mechanical Systems”.

.6 Index the binder according to the following system:

Tab 1.1 Mechanical Drawing Schedule

Tab 1.2 Description of Systems

- Provide a schematic drawing and component description for each major mechanical system including air handling systems, boiler and hot water heating piping distribution systems and (where applicable) water chillers and chilled water distribution systems. The schematic drawing shall identify each component with a letter designation corresponding to a description briefly explaining the purpose of each component and how it relates to the other components, and be presented in a current version of AutoCAD or similar computer aided drafting program.

- The component description shall be clearly written in a language that may be easily understood by the building operators and maintainers who will be using them.

Tab 1.3 Operating Division

Provide the following:

- Specific operating instructions for each major item of equipment.
    - Ventilation requirements, Energy considerations, Automatic temperature control settings, Information regarding air filters and pressure drops for clean and dirty conditions.
    - Trouble Shooting Procedure Guide in spreadsheet form with the most likely causes and recommended actions for all foreseeable problems. Trouble Shooting Procedure guides are required for all the major items of equipment including air handling systems, exhaust fans, circulating pumps, mechanical cooling equipment, etc.
    - Mechanical Equipment Starting Procedures.
    - **Procedures for draining and winterizing the plumbing systems**.

Tab 1.4 Maintenance and Lubrication Division

Tab 1.5 Equipment Supplier and Contractor Schedule

- Provide a list of Equipment Suppliers and Contractors and include their address, telephone number.
- Provide the Equipment Make/Manufacturer

Tab 2.0 Guarantees, Certificates and Reports

- Including assurance letters, balancing and commissioning reports

Tab 2.1 Valve Tag Schedule

Tab 2.2 Labeling and Identification Schedule

- Piping colour code schedules
- Access panel identification schedules

Tab 2.3 Chemical Cleaning and Treatment

- Chemical cleaning shop drawings, water treatment data

Tab 3.0 Equipment Shop Drawings and Maintenance Data

- Organize this section into numbered tabs.
- Insert final shop drawings that have been reviewed and as-built control schematics.
- For each fan and pump installed, provide performance curves indicating the design point of intersection and the actual operating point.
- For each plumbing fixture, floor and roof drain installed, provide manufacturer's "cut" of that item and "cut" of associated brass goods.
- In addition to the shop drawings provided for the various items of mechanical equipment, this section shall also include the Manufacturers' Literature on:
  - Operating and maintenance instructions
  - Spare parts lists
  - Trouble Shooting information

Tab 4.0 Balance Report

The divider tabs shall be custom laminated mylar plastic and shall be in accordance with the following colour scheme:

- Tabs 1.1 to 1.5 – Orange
- Tabs 2.0 to 2.3 – Green
- Tab 3.0 – Yellow

.7 Furnish sufficient copies of equipment manufacturer's literature, a set of drawings, approved shop drawings, and Mechanical Specification to the company preparing the O&M manuals to meet the above requirements.

.2 Digital Manual Requirements

.1 The digital version of the manuals and the hard cover version shall be prepared by the same company.

.2 In addition to the operating and maintenance manuals provided in hard covered binders, two copies of all information shall be provided in digital format as follows:

.3 The information shall be organized into sections in a user-friendly format to make it easy to search for specific information. An indexing system shall be included that remains on an expandable portion of the screen that allows the end user to scroll through the manual information that appears on the main portion of the screen. The digital version content and organization for each manual shall be arranged in a manner identical to the hard copy version. The specific requirements are listed below:

.1 Utilize Adobe Acrobat PDF format.

.2 If there is more than one volume of manual, indicate “Volume X of Y” for each volume.

.3 Include a copy of the latest Adobe Acrobat Reader.

.4 The final Digital copies are to be copied to CDR with a custom CDR label. The custom CDR label shall include: Project Name, Location of Project, Date of Assembly, name of Mechanical Consultant, and shall be titled “Operating & Maintenance Manual for Mechanical Systems”.

.5 The Digital Manual shall be enhanced with the following features: Bookmarks, Thumbnails, Internet Links, Internal Document Links and Optical Character Recognition (OCR). Refer to Scanning Requirements and Organizational Requirements listed below.

.4 Scanning Requirements:

.1 All pages contained within the hard copy manual are to be scanned and/or digitized to Adobe Acrobat PDF format.

.2 Provide a minimum 300 DPI for all scanned pages.

.3 All scanned shop drawings may be searched for text with minimum 75% Optical Character Recognition (OCR).

.4 All shop drawings are to be scanned to a minimum 8.5”X11” size. If the original page size is 11”X17”, the digital copy shall also be 11”X17”. Page sizes exceeding 11”X17” may be shrunk down to 11”X17”.

.5 Rotation of scanned page images/texts shall be displayed within +/- 20 degrees.

.5 Organizational Requirements:

.1 Digital Manual shall be organized in the same manner as the approved Hard Copy Manual. (e.g. Tabs 1.1, 1.2, 1.3, 1.4, 1.5, 2.0, 3.0, 4.0, etc).

.2 Bookmark all major tabs and subsections.

.3 Bookmark each set of shop drawings (Section 3.0).

.4 Link the Table of Contents page to the referenced sections.

.5 Insert an introduction/summary page for Sections 1.2, 1.3, 1.4, and 3.0 indicating major subsections. Link these pages to their referenced sections.

.6 Link the system descriptions to the referenced schematic drawings contained in section 1.2.

.7 Insert Internet Links and Internal Document Links from Section 1.5 to Mechanical Equipment Manufacturers/Suppliers/Contractors official websites.

.8 Mechanical Equipment Shop Drawings located in Section 3.0.

.6 Use the following colour code for links contained in Sections 1.2, 1.3, 1.4, and 1.5.:

.1 Internet Links (light blue with underline).

.2 Internal Document Link (dark blue) (excludes AutoCAD schematic links).

.7 Insert a title page for each major piece of equipment located in Section 3.0. The title page shall include the Shop Drawing name, and a link (dark blue in colour) to Section 1.5.

.8 It is the responsibility of the Mechanical Trade to provide high quality documentation for scanning.

.9 Digital Manual shall be reviewed by the Departmental Representative for content and layout prior to final submission.

1.12 Security Fasteners

.1 Fasteners used in areas accessible by **PUBLIC** shall be TORX with pin, stainless steel screws, which require a special tool to remove the fasteners.

.2 Use fasteners compatible with material through which they pass.

1.13 Firestopping

.1 Apply firestop sealant and systems around all penetrations through openings in fire rated wall, floor and ceiling assemblies.

.2 Seal around conduits penetrating fire separations.

.3 References:

.1 ULC-S115-05 – Standard Method of Fire Tests of Firestop Systems.

.4 Product Data

.1 Submit product data and layout plan in accordance with Section 01 01 50.

.2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

.3 Submit plan showing location of each penetration and product data to indicate type of firestopping being installed at each location.

PART 2 PRODUCTS

2.1 Access Doors

.1 Access door size shall be as indicated and where not indicated, make 305mm x 406mm [12" x 16"] minimum or 610mm x 457mm [24" x 18"] where persons have to enter. For acoustical ceilings, conform to architectural panel pattern.

.2 Unless otherwise indicated, access doors shall be hinged, flush type, steel framed panel, 14 gauge minimum, satin finished galvanized steel or type 304 stainless steel, with anchor straps for wet areas, washrooms, and all walls finished in ceramic tile.

.3 Hinges shall be concealed, spring hinge to allow door to open 175°. Locking devices shall be flush cam type, screwdriver operated, doors and frames shall have prime coated rust inhibiting paint, unless made of stainless steel.

.4 Where doors are required in fire rated walls, access doors shall be uninsulated and for all fire rated ceilings and walls where maximum temperature rise limitation is applicable, shall be insulated. All fire rated access doors shall have Warnock Hersey or ULC listed 2 hour fire rating and shall be installed in accordance with NFPA 80 and manufacturer’s installation instructions.

PART 3 EXECUTION

3.1 Installation

.1 Coordinate work with work of other sections to avoid conflict.

.2 Locate distribution systems, equipment, and materials to provide minimum interferences and maximum usable space.

.3 Where interference occurs, Departmental Representative shall approve relocation of equipment and materials, regardless of installation sequence.

.4 Provide tamperproof screws for new and relocated equipment located in public areas.

3.2 Cleaning

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 Cutting and Patching

.1 Make arrangements with General Contractor for all cutting and patching in this work.

.2 Minimize cutting and patching. Set sleeves and mark openings in concrete or masonry.

.3 Conduct ground penetrating radar (GPR) scans prior to coring or cutting existing concrete structure.

3.4 Waterproofing

.1 Where any work pierces waterproofing including waterproofing concrete, the method of installation shall be as approved by the Departmental Representative before the work is done. Supply and install all necessary sleeves, caulking, roof curbs, and flashing required and make the openings watertight.

3.5 Protection of Work

.1 Protect equipment and material during construction from the weather, moisture, dust, painting, plastering and physical damage. Clean and return to "as new" condition.

.2 Mask or grease and cover machined surfaces. Firmly secure covers over equipment openings and open ends of piping, conduit and ductwork as work progresses. Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

.3 Any equipment that has operating parts, bearings or machined surfaces that show signs of rusting, pitting or physical damage will be rejected.

.4 Refinish damaged or marred factory finishes to the satisfaction of the Departmental Representative, using equal quality materials.

3.6 Field Quality Control

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 – Quality Control and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Where specified, obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.7 Demonstration and Operating Instructions

.1 Departmental Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Provide training to Departmental Representative for the controls and operation of mechanical equipment and systems installed and/or modified as part of this project.

.3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual and as-built drawings as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 During substantial performance review of the work the Mechanical Contractor, together with the Departmental Representative, Controls Contractor, and other Subcontractors designated by the Departmental Representative, shall instruct the Owner's operating personnel in the proper operation and maintenance of all systems and equipment installed under the contract.

.7 It shall be the Mechanical Contractor's responsibility to have the specified equipment manuals prepared, previously approved by the Departmental Representative, and ready for presentation to the Owner at this meeting.

.8 Convene the meeting with the aforementioned parties at the time called for in the substantial performance review. The arrangements shall include written notices to all the parties concerned. Should the equipment manuals, or system installation not be complete and operable at the proper time, he shall then convene the operating instruction meeting at a later date and pay any additional costs including time and travelling expenses for the personnel involved which are attributable to the delay.

.9 Keeping a sign-in sheet is mandatory for the demonstration and training session. Submit a copy of the sign-in sheet to Departmental Representative for record.

3.8 Access Doors

.1 Furnish access doors for concealed expansion joints, traps, strainers, cleanouts, balance dampers, fire dampers, other parts requiring accessibility for operating and maintenance. Access doors shall be provided to General Contractor for installation and shall be coordinated.

.2 In suspended panel ceilings, use panel in place of access door; provide in such panel a button or other means of identification and easy removal when necessary.

END OF SECTION

PART 1 GENERAL

1.1 Use of Systems

.1 Use of new permanent heating and ventilating systems for supplying temporary heat or ventilation is permitted only under the following conditions:

.1 Entire system is complete, pressure tested, cleaned, flushed out.

.2 Specified water treatment system has been commissioned, water treatment is being continuously monitored.

.3 Building has been closed in, areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes.

.4 There is no possibility of damage from any cause.

.5 Supply ventilation systems are protected by filters, which shall be inspected daily, changed every week or more frequently as required.

.6 Return systems have approved filters over all openings, inlets, outlets.

.7 All systems will be:

.1 operated as per manufacturer's recommendations or instructions.

.2 operated by Contractor.

.3 monitored continuously by Contractor.

.8 Warranties and guarantees are not thereby relaxed.

.9 Regular preventive and all other manufacturers recommended maintenance routines are performed by Contractor at his own expense and under supervision of Departmental Representative.

.10 Before static completion, entire system to be refurbished, cleaned internally and externally, restored to "as- new" condition, filters in air systems replaced.

.2 Filters referred to herein are over and above those specified elsewhere in this specification.

PART 2 PRODUCTS

2.1 Not Used

.1 Not Used.

PART 3 EXECUTION

3.1 Not Used

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.3 Section 01 74 19 Waste Management and Disposal

.2 Section 23 05 00 Common Work Results – Mechanical

.3 Section 23 05 29 Hangers & Support for Piping & Equipment

.4 Section 23 08 02 Cleaning and Start-up of Mechanical Piping Systems

.5 This Section applies to all related work under Divisions 22 and 23.

1.2 References

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-1999, Ready-Mixed Organic Zinc-Rich Coating.

1.3 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

PART 2 PRODUCTS

2.1 Not Used

.1 Not Used

PART 3 EXECUTION

3.1 Connections to Equipment

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

3.2 Clearances

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, or components.

3.3 Pipework Installation

.1 Protect openings against entry of foreign material.

.2 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.5 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.6 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2,400mm above floor in Mechanical Rooms.

.7 Install dielectric coupling between dissimilar metals.

.8 Install in accordance with Section 23 05 29 – Hanger & Support for Piping & Equipment.

3.4 Sleeves

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies (where steel sleeves are part of the listed assemblies), and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and un-insulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.

.2 Other floors: Terminate 25mm above finished floor.

.6 Sealing:

.1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.

.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

.3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.5 Escutcheons

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 304 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe.

3.6 Cleaning of Piping Systems

.1 Before start-up, clean interior of piping systems in accordance with requirements of Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.7 Pressure Testing of Equipment and Pipework

.1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections.

.3 Maintain specified test pressure without loss for 24 hours minimum unless specified for longer period of time.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.

.6 Conceal work only after approval and certification of tests by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 33 00 — Submittal Procedures

.2 Section 01 35 33 — Health and Safety Requirements

.3 Section 01 74 19 — Waste Management and Disposal

.4 Section 01 78 00 — Closeout Submittals

.5 Section 23 05 00 — Common Work Results – Mechanical

.6 This Section applies to all related work under Divisions 22 and 23.

1.2 References

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1-2013, Energy Code for Buildings Except Low-Rise Residential Buildings.

.2 Electrical Equipment Manufacturers' Advisory Council (EEMAC)

.3 Workplace Hazardous Material Information System (WHMIS)

.4 National Energy Code for Buildings (NECB) 2011.

1.3 Section Includes

.1 Electrical work to conform to Division 26 including the following:

.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 23. Refer to Division 26 for quality of materials and workmanship.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

1.5 Closeout Submittals

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.6 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

.3 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.4 Dispose of packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PART 2 PRODUCTS

2.1 General

.1 Motors to be high efficiency, in accordance with local Hydro company standards and the requirements of ASHRAE 90.1.

2.2 Motors

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 373 W 1/2 HP : speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120V, unless otherwise specified or indicated.

.3 Motors 373 W 1/2 HP and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C, single phase, 240V, unless otherwise specified or indicated.

2.3 Belt Drives

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

.3 For motors under 7.5 kW 10HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 For motors 7.5 kW 10HP and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave to be determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

2.4 Drive Guards

.1 Provide guards for unprotected drives.

.2 Guards for belt drives:

.1 Expanded metal screen welded to steel frame.

.2 Minimum 1.2mm thick sheet metal tops and bottoms.

.3 38mm dia holes on both shaft centres for insertion of tachometer.

.4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Guard for flexible coupling:

.1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.

.2 Securely fasten in place.

.3 Removable for servicing.

.6 Unprotected fan inlets or outlets:

.1 Wire or expanded metal screen, galvanized, 19 mm mesh.

.2 Net free area of guard: not less than 80% of fan openings.

.3 Securely fastened in place.

.4 Removable for servicing.

PART 3 EXECUTION

3.1 Installation

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

END OF SECTION

PART 1 GENERAL

1.1 Section Includes

.1 Materials and installation for thermometers and pressure gauges in piping systems.

.2 This Section applies to all related work under Divisions 22 and 23.

1.2 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 74 19	Waste Management and Disposal
.4	Section 23 05 00	Common Work Results – Mechanical
.5	Section 23 05 53	Mechanical Identification

1.3 References

.1 American Society of Mechanical Engineers (ASME).

.1 ASME B40.100-2013, Pressure Gauges and Gauge Attachments.

.2 ASME B40.200-2008, Thermometers, Direct Reading and Remote Reading.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-14.4-[M88], Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.

.2 CAN/CGSB-14.5-[M88], Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

1.4 Submittal

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit shop drawings and product data.

1.5 Health and Safety

.1 Do construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety Requirements.

1.6 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Collect, separate and place in designated containers for packaging in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

.4 Place materials defined as hazardous or toxic waste in designated containers.

.5 Ensure emptied containers are sealed, labeled and stored safely for disposal away from children.

PART 2 PRODUCTS

2.1 General

.1 Design point to be at mid-point of scale or range.

.2 Ranges: as indicated.

2.2 Thermometers

.1 Industrial, adjustable angle, liquid-in-glass:

.1 Case: aluminum.

.2 Stem: Aluminum, 89mm [3-1/2”} length, adjustable angle.

.3 Window: acrylic or glass.

.4 Accuracy: 1%

.5 Scale length: 180mm [7"] minimum.

.6 Reading: dual Celsius and Fahrenheit.

.7 Socket: comply with industrial standard dimension.

2.3 Thermometer Wells

.1 Copper pipe: copper or bronze, 3/4 NPT.

.2 Steel pipe: brass or stainless steel, 3/4 NPT.

2.4 Pressure Gauges

.1 100 mm [4.0”] dial type: to ASME B40.100, Grade 1A, phosphor bronze bourdon tube having 1.0% accuracy full scale unless otherwise specified.

.1 Casing: Stainless Steel.

.2 Reading: S.I./Imperial.

.3 Range: indicate mid-scale under normal operating conditions.

.2 Provide:

.1 Siphon for steam service.

.2 Snubber for pulsating operation.

.3 Diaphragm assembly for corrosive service.

.4 Gasketted pressure relief back with solid front.

.5 Bronze stop cock.

PART 3 EXECUTION

3.1 General

.1 Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.

.2 Install between equipment and first fitting or valve.

3.2 Thermometers

.1 Install in wells on all piping. Provide heat conductive material inside well.

.2 Install on inlet and outlet of:

.1 DHW tanks, heaters.

.3 Install wells as indicated for balancing purposes.

.4 Use extensions where thermometers are installed through insulation.

3.3 Pressure Gauges

.1 Install in the following locations:

.1 Suction and discharge of pumps, and across pump strainers. Provide a single pressure gauge with point needle valves to isolate each point.

.2 Upstream and downstream of PRV's.

.2 Use extensions where pressure gauges are installed through insulation.

END OF SECTION

PART 1 GENERAL

1.1 Related Section

.1 Section 01 33 00 Submittal Procedures

.2 Section 01 35 33 Health and Safety Requirements

.3 Section 01 61 00 Common Product Requirements

.4 Section 01 74 11 Cleaning

.5 Section 01 74 19 Waste Management and Disposal

.6 Section 01 78 00 Closeout Submittals

.7 Section 23 05 00 Common Work Results – Mechanical

.8 Section 23 05 48 Vibration & Seismic Control for Ductwork, Piping and Equipment

.9 All work installed under Divisions 22 and 23 shall conform to this Section.

1.2 References

.1 American National Standards Institute / Sheet Metal and Air Conditioning Contractors National Association (ANSI/SMACNA):

.1 ANSI/SMACNA 001-2008, Seismic Restraint Manual, Guidelines for Mechanical Systems, 3rd Edition.

.2 American Society of Mechanical Engineers (ASME):

.1 ASME B31.1-12, Power Piping.

.3 American Society for Testing and Materials (ASTM):

.1 ASTM A125-96(2013) e1, Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):

.1 MSS SP58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

.5 National Plumbing Code 2010.

1.3 System Description

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP58.

.2 Performance Requirements:

.1 Design supports and hangers to withstand seismic events as specified Section 23 05 48 – Vibration & Seismic Control for Ductwork, Piping and Equipment.

1.4 Submittals

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit shop drawings and product data for following items:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in S01 78 00 – Closeout Submittals.

1.5 Quality Assurance

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 General

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 Upper Attachment

.1 Concrete:

.1 Inserts for cast-in-place concrete: galvanized steel wedge. ULC listed for pipe NPS 3/4 through NPS 8 - Grinnell/Anvil Fig. 281.

.2 Carbon steel plate with clevis for surface mount: malleable iron socket with expansion case and bolt. Minimum two expansion cases and bolts for each hanger – Grinnell/Anvil, plate fig. 49, socket fig. 290, expansion case fig. 117.

.2 Steel Beam (bottom flange):

.1 Cold piping NPS 2 and under: malleable iron C clamp - Grinnell/Anvil fig. 61.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: malleable iron beam clamp - Grinnell/Anvil fig. 292.

.3 Steel Beam (top):

.1 Cold piping NPS 2 and under: malleable iron "top of beam" C clamp - Grinnell/Anvil Fig. 61.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer - Grinnell/Anvil fig. 227.

.4 Steel Joist:

.1 Cold piping NPS 2 and under: steel washer plate with double locking nuts.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket - Grinnell/Anvil: washer plate, fig. 60; clevis, fig. 66; socket, fig. 290.

.5 Steel Channel or Angle (bottom):

.1 Cold piping NPS 2 and under; malleable iron C clamp - Grinnell/Anvil fig. 86.

.2 Cold piping NPS 2-1/2 and larger and all hot piping; universal channel clamp - Grinnell/Anvil fig. 226.

.6 Steel Channel or Angle (top):

.1 Cold piping NPS 2 and under: malleable iron "top of beam" C clamp - Grinnell/Anvil fig. 61.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer - Grinnell/Anvil fig. 227.

.7 Wood beam or ceiling:

.1 Ceiling plate and flanges: malleable iron – Grinnell/Anvil Fig. 128R.

.2 Eye socket: galvanized steel – Grinnell/Anvil fig. 189 or 190.

2.4 Middle Attachments (Rod)

.1 Carbon steel black (electro-galvanized/cadmium plated for mechanical rooms) continuous threaded rod - Grinnell/Anvil fig. 146.

.2 Ensure that hanger rods are subject to tensile loading only.

2.5 Pipe Attachments

.1 Piping with less than 25 mm [1"] horizontal movement, NPS 2 and under: adjustable swivel ring hanger - Grinnell/Anvil fig. 69.

.2 Piping with less than 25 mm [1"] horizontal movement, NPS 2-1/2 and over: adjustable clevis hanger - Grinnell/Anvil fig. 260.

.3 Suspended hot piping with horizontal movement more than 25 mm [1"], all steam piping: pipe roller - Grinnell/Anvil fig. 174 or Grinnell/Anvil fig. 181 up to NPS 6 and Grinnell/Anvil fig. 171 NPS 8 and larger.

.4 Bottom-supported hot piping: pipe roller stand - Grinnell/Anvil fig. 271.

.5 Spring hangers; where required to offset expansion on horizontal runs which follow long vertical risers - Grinnell/Anvil fig. 171 single pipe roll hanger with Grinnell/Anvil fig. 178.

.6 Use oversize pipe hangers for cold piping all sizes, hot piping NPS 2-1/2 and over, and steam piping all sizes.

.7 Perforated band iron, wire or chain hangers will not be approved.

.8 All hangers for copper pipe shall be copper, copper clad, felt lined or use plastic tape wrapped pipe at hanger.

2.6 Riser Clamps

.1 Steel or cast iron pipe: galvanized carbon steel - Grinnell/Anvil fig. 261.

.2 Copper pipe: carbon steel copper finished - Grinnell/Anvil fig. CT-121.

2.7 Protection Shields

.1 Cold piping, all sizes: protection shield with calcium silicate pipe insulation under shield with uninterrupted vapour barrier.

.2 Hot piping with less than 25 mm [1"] horizontal movement, NPS 2 and under: insulation over pipe hanger.

.3 Hot piping with less than 25 mm [1"] horizontal movement, NPS 2-1/2 and over: protective shield with calcium silicate insulation under shield.

.4 Hot piping with horizontal movement more than 25 mm [1"], all sizes: protective shield with calcium silicate insulation under shield.

.5 Steam piping, all sizes: protective shield with calcium silicate insulation under shield.

2.8 Wall Supports

.1 Horizontal pipe adjacent to wall:

.1 Angle iron wall brackets with specified hangers.

.2 Vertical pipe adjacent to wall.

.1 Exposed pipe wall support for lateral movement restraint - Grinnell/Anvil fig. 262 or 263.

.2 Channel type support.

2.9 Floor Support

.1 Horizontal pipe.

.1 Do not support piping from the floor unless specifically indicated.

.2 Vertical pipe.

.1 Mid-point of risers between floor slabs - adjustable fabricated steel supports.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems per Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment.

.3 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations. Supporting piping from underside of light weight roof deck (without concrete) is not permitted.

.5 Use expansion anchor on existing concrete structure.

3.2 Hanger Spacing

.1 HVAC piping: in accordance with table below.

.2 Plumbing piping: in accordance with the most stringent requirements of the table below as well as the following:

.1 National. Plumbing Code.

.2 Authority Having Jurisdiction.

.3 Pipe hanger rods shall be sized in accordance to SMACNA Seismic Restraint Manual based on Seismic Hazard Level (SHL). For SHL, see Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment.

MAXIMUM HANGER SPACING						
PIPE DIA. NPS	STEEL SCH.40	COPPER L,K Hard Drawn	CAST.I STD.	GLASS	ABS/PVC	PEX
1/2	1.8 m [6'-0"]	1.8 m [6'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
3/4 & 1	2.4 m [8'-0"]	2.4 m [8'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
1-1/4	2.4 m [8'-0"]	3.0 m [10'-0"]			1.2 m [4'-0"]	0.8 m [2'-6"]
1-1/2 & 2	2.4 m [8'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]		1.2 m [4'-0"]	0.8 m [2'-6"]
2-1/2, 3, 4 & 5	2.4 m [8'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]	2.4 m [8'-0"]	1.2 m [4'-0"]	0.8 m [2'-6"]
6 & 8	3.0 m [10'-0"]	3.0 m [10'-0"]	3.0 m [10'-0"]	2.4 m [8'-0"]	1.2 m [4'-0"]	0.8 m [2'-6"]

3.3 Hanger Installation

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.4 Horizontal Movement

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 Final Adjustment

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

3.6 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 33 00 — Submittal Procedures

.2 Section 01 74 11 — Cleaning

.3 Section 01 74 19 — Waste Management and Disposal

.4 Section 23 05 00 — Common Work Results – Mechanical

.5 This Section applies to all related work under Divisions 22 and 23.

1.2 References

.1 National Building Code of Canada (NBC)

.2 American National Standards Institute / Sheet Metal and Air Conditioning Contractors National Association (ANSI/SMACNA):

.1 ANSI/SMACNA 001-2008, Seismic Restraint Manual, Guidelines for Mechanical Systems, 3rd Edition.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide vibration isolation systems shop drawings complete with performance and product data. Shop drawings shall demonstrate compliance with the National Building Code and shall bear the seal of a Professional Engineer.

.3 Provide detailed drawings of all seismic restraint systems for piping and equipment.

1.4 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

.3 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.4 Dispose of packaging material in appropriate on-site bin for recycling in accordance with the site waste management program.

PART 2 PRODUCTS

2.1 Vibration Isolation System – General

.1 Performance of vibration isolation systems shall be designed by manufacturer specializing in vibration isolation materials and devices.

.2 Size and shape of bases type shall be coordinated with submitted equipment.

.3 Products shall of the same manufacturer unless otherwise noted.

2.2 Elastomeric Pads

.1 Type EP1 - neoprene waffle or ribbed; 9 mm [3/8”] minimum thick; 50 durometer; maximum loading 350 kPa [50 psi].

.2 Type EP2 - rubber waffle or ribbed; 9 mm [3/8”] minimum thick; 30 durometer natural rubber; maximum loading 415 kPa [60 psi].

.3 Type EP3 - neoprene-steel-neoprene; 9 mm [3/8”] minimum thick neoprene bonded to 1.71 mm [16 gauge] steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa [50 psi].

.4 Type EP4 - rubber-steel-rubber; 9 mm [3/8”] minimum thick rubber bonded to 1.71 mm [16 gauge] steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa [60 psi].

2.3 Hangers

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, molded with rod isolation bushing which passes through hanger box.

.3 Type H2 - stable spring, elastomeric washer, cup with molded isolation bushing which passes through hanger box.

.4 Type H3 - stable spring, elastomeric element, cup with molded isolation bushing which passes through hanger box.

.5 Type H4 - stable spring, elastomeric element with pre-compression washer and nut with deflection indicator.

2.4 Acoustic Barriers for Anchors and Guides

.1 Acoustic barriers: between pipe and support, consisting of 25 mm [1”] minimum thick heavy duty duck and neoprene isolation material.

2.5 Flexible Pipe Connectors

.1 Inner corrugated hose: stainless steel.

.2 Outer braid: Braided wire mesh stainless steel outer jacket.

.3 Type of end connection: threaded for 50mm [2”] or smaller; flange for 65mm [2-1/2”] or larger.

.4 Operating conditions:

.1 Working pressure: 1379 kPa [200 psi].

.2 Working temperature: 4540 °C [850 °F].

2.6 Seismic Control Measures

.1 General:

.1 Design anchorage and attachment methods for all systems and/or equipment as specified herein.

.2 Seismic control systems to work in all directions.

.3 Fasteners and attachment points to resist same maximum load as seismic restraint.

.4 Drilled or power driven anchors and fasteners not permitted.

.5 No equipment, equipment supports or mounts to fail before failure of structure.

.6 Supports of cast iron or threaded pipe not permitted.

.7 Seismic control measures not to interfere with integrity of firestopping.

.8 For equipment mounted on housekeeping pad, specify the minimum distance between anchor bolt and edge of housekeeping pad.

.2 Static equipment:

.1 Anchor equipment to equipment supports. Anchor equipment supports to structure.

.2 Seismic restraints:

.1 Cushioning action to be gentle and steady.

.2 Shall never reach metal-like stiffness.

.3 Vibration isolated equipment:

.1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9mm clearance during normal operation of equipment and systems between seismic restraint and equipment.

.2 Provide seismic restraints in addition to vibration isolation system to resist complete isolator unloading.

.4 Piping systems:

.1 Provide seismic restraints for all piping in accordance to the latest edition of SMACNA Seismic Restraint Manual.

.2 Seismic restraints may be omitted for the following conditions:

.1 All piping less than 32mm [1-1/4”] diameter located inside boiler rooms, mechanical rooms and refrigeration rooms.

.2 All piping less than 65mm [2-1/2”] diameter located outside boiler rooms, mechanical rooms and refrigeration rooms.

.3 All piping suspended by individual hangers 305mm [12”] or less in length, as measured from the top of the pipe to the bottom of the structural support for the hanger.

.3 To be compatible with requirements for anchoring and guiding of piping systems.

.4 Wet weight of piping shall be to be used for designing seismic restraint systems.

.5 Small pipes may be rigidly secured to larger pipes for restraint purposes, but not reverse.

.6 Where cable is used for restraining vibration isolated piping systems, install cable with sufficient slack to avoid short-circuiting of vibration isolators.

.5 Ductwork systems:

.1 Provide seismic restraints for all ductwork in accordance to the latest edition of SMACNA Seismic Restraint Manual as described below:

.1 All rectangular ducts with cross sectional areas 0.56m^2 [6 ft^2] and larger.

.2 All round ducts with diameters 711 mm [28”] and larger.

.2 Seismic restraints may be omitted for the following conditions:

.1 All ductwork suspended by hangers 305mm [12”] or less in length, as measured from the top of the duct to the bottom of the structural support for the hanger.

.6 Bracing methods:

.1 Approved by Departmental Representative.

.2 Structural angles or channels.

.3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

PART 3 EXECUTION

3.1 Manufacturer’s Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Installation

.1 Seismic control measures to meet requirements of NBC.

.2 Install vibration isolation equipment in accordance with manufacturer’s instructions and adjust mountings to level equipment.

.3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.4 Where isolation is bolted to floor use vibration isolation rubber washers.

.5 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.3 Field Quality Control

.1 Provide the services of the Professional Engineer(s) who designed the restraint systems for "Field Review" of the installed components, and submit the following to the Departmental Representative:

.1 Schedule B, signed and sealed; provided at the commencement of the project.

.2 Signed and sealed shop drawings of seismic restraints for equipment, piping and ductwork; provided prior to installation.

.3 Typewritten inspection reports; provided during the construction period.

.4 Schedule C-B, signed and sealed; provided after performing “Field Review”.

3.4 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 35 33 Health and Safety Requirements

.2 Section 01 74 11 Cleaning

.3 Section 01 74 19 Waste Management and Disposal

.4 Section 23 05 00 Common Work Results – Mechanical

.5 This Section applies to all related work under Divisions 22 and 23.

1.2 References

.1 Canadian Standards Association (CSA International):

.1 CAN/CSA B149.1, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.4 Delivery, Storage, and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 – Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Dispose of unused paint and coating material at official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused paint and coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 Manufacturer's Equipment Nameplates

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 System Nameplates

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	11 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Identification for PWGSC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: Size #9.

.2 Source and Destination identifiers: Size #6.

.3 Terminal cabinets, control panels: Size #5.

.3 Equipment elsewhere: Sizes as appropriate.

2.3 Identification of Piping Systems

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive [plastic-coated cloth] [vinyl] with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Departmental Representative.

.2 Colours for legends, arrows: to following table

Background colour:	**Legend, arrows:**
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background Colour Marking	Legend
Domestic hot water supply	Green	DOM.HWSUPPLY

Domestic HW recirculation	Green	DOM.HWCIRC
Domestic cold water supply	Green	DOM.CWS
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN.VENT

2.4 Identification Ductwork Systems

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.5 Valves, Controllers

.1 Plastic tags with 12 mm stamped identification data.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.6 Controls Components Identification

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.7 Language

.1 Identification in English.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Timing

.1 Provide identification only after painting specified has been completed.

3.3 Installation

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to PWGSC PMSS.

3.4 Nameplates

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.5 Location of Identification on Piping and Ductwork Systems

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 General

.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 Qualifications of TAB Company

.1 Testing and balancing shall be performed by an agency that specializes in this type of work. Provide proof that the agency has successfully completed five projects of similar size and scope

.2 All work shall be performed by persons with proven ability and thoroughly versed in the type of testing and balancing. Submit names, complete with experience, record and references for review by the Consultant prior to work being carried out.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees forms part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 Purpose of TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate installed equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and installed equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 Exceptions

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.5 Coordination

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 Pre-TAB Review

.1 Review contract documents before project construction is started. Confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Departmental Representative in writing all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 Start-Up

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 Operation of Systems During TAB

.1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

1.9 Start of TAB

.1 Notify Departmental Representative 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.1 Installation of ceilings, doors, windows, other construction affecting TAB.

.2 Application of weather-stripping, sealing, caulking.

.3 All pressure, leakage, other tests specified elsewhere Division 23.

.4 All provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

1.10 Application Tolerances

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 5%, minus 5%.

.2 Hydronic systems: plus or minus 10%.

1.11 Accuracy Tolerances

.1 Measured values to be accurate to within plus or minus 2% of actual values.

1.12 Instruments

.1 Prior to TAB, submit to Departmental Representative list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

1.13 Submittals

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 Preliminary TAB Report

.1 Prior to calling Substantial Completion, submit for checking and approval of Departmental Representative prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.15 TAB Report

.1 Format to be in accordance with Associated Air Balance Council Manual.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Include final TAB report in O&M manual. Provide one (1) copy of final TAB Report to Departmental Representative.

1.16 Verification

.1 Reported results subject to verification by Departmental Representative.

.2 Provide manpower and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results to be at discretion of Departmental Representative.

.4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

1.17 Settings

.1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 Completion of TAB

.1 TAB to be considered complete when final TAB Report received and approved by Departmental Representative.

1.19 Air Systems

.1 Standard: TAB to be to most stringent of this section or TAB standards of AABC, NEBB, SMACNA and ASHRAE.

.2 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop, temperatures (dry bulb, wet bulb, dew point, duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.3 Locations of equipment measurements: To include, but not be limited to, following as appropriate:

.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.

.2 At controllers, controlled device.

.4 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 Domestic Hot Water Systems

.1 Meet requirements as specified for liquid systems.

.2 Locations of equipment measurements: To include, but not be limited to, following as appropriate: Inlet and outlet of heaters, tank, pump, circulator, at controllers, controlled device.

.3 Locations of systems measurements to include, but not be limited to, following as appropriate: main, main branch, branch, sub-branch.

.4 Domestic hot water recirculation system shall be balanced by proportioning the water flow at balancing fittings and ensuring adequate flow through each circuit.

PART 2 PRODUCTS

2.1 Not Used

.1 Not used.

PART 3 EXECUTION

3.1 General

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 61 00	Common Product Requirements
.4	Section 01 74 11	Cleaning
.5	Section 01 74 19	Waste Management and Disposal
.6	Section 01 78 00	Closeout Submittals
.7	Section 23 05 00	Common Work Results - Mechanical
.8	Section 23 05 29	Hangers and Supports for HVAC Piping and Equipment

1.2 References

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1-2013; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM B209M-10, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335/C335M-10e1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411-11, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547-12, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795-08(2013), Standard Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.9 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-1989, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

.5 Thermal Insulation Association of Canada (TIAC):

.1 Mechanical Insulation Best Practice Guide, 2013.

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-11, Standard for Thermal Insulation Polyotrene, Boards and Pipe Covering.

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 Definitions

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED"-will mean "not concealed" as defined herein.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

.2 CRF: Code Rectangular Finish.

1.4 Submittals

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 – Submittal Procedures.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.5 Quality Assurance

.1 Qualifications:

.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 – Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

PART 2 PRODUCTS

2.1 Fire and Smoke Rating

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 Insulation

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612. Provide factory applied vapour retarder jacket to CGSB 51-GP-52Ma as scheduled in PART 3 of this Section.

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553. Provide factory applied vapour retarder jacket to CGSB 51-GP-52Ma as scheduled in PART 3 of this section.

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to ASTM C553.

.5 Evidence shall be provided to the Departmental Representative on the site of ULC listings of all products being used. Duct insulation adhesives and coatings shall be non-toxic as defined by WCB Regulations.

2.3 Jackets

.1 Canvas:

.1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: Compatible with insulation.

.1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.2 Aluminum:

.1 To ASTM B 209 with and without moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Stucco embossed.

.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

2.4 Accessories

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².

.5 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.6 Contact adhesive: quick-setting

.1 Maximum VOC limit 80 g/L to SCAQMD Rule 1168.

.7 Canvas adhesive: washable.

.1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.8 Tie wire: 1.5 mm stainless steel.

.9 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.10 Facing: 25 mm stainless steel hexagonal wire mesh stitched on one face of insulation.

.11 Fasteners: 2 mm diameter pins with 35 mm square clips, length to suit thickness of insulation.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Pre-Installation Requirement

.1 Pressure testing of ductwork systems complete, witnessed and certified.

.2 Surfaces clean, dry and free from foreign material.

3.3 Installation

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and as indicated.

.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.

.3 Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Seal vapor barrier penetrations with vapor barrier adhesive.

.6 Supports, Hangers in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.7 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.

.8 All ductwork exposed to weather shall have waterproof seams for weathertight construction. Ductwork exposed to weather which are not insulated or finish painted, shall be coated with two applications of bitumastic waterproofing compound to prevent corrosion. Exposed ducts, which are insulated, shall have aluminum jacket.

3.4 Duct Insulation Schedules

.1 Insulation types and thicknesses: Conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Exhaust ducts between dampers and louvers	C-1	No	25
Rectangular ducts outside air	C-1	Yes	50
Round ducts outside air	C-2	Yes	40
Acoustically lined ducts			None

.2 Finish: Conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	None	None
Indoor, exposed within Mechanical Rooms and Service Corridors.	CRF/1	CRD/1
Indoor, exposed elsewhere	CRF/2	CRD/2

3.5 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 61 00	Common Product Requirements
.4	Section 01 74 11	Cleaning
.5	Section 01 74 19	Waste Management and Disposal
.6	Section 01 78 00	Closeout Submittals
.7	Section 23 05 00	Common Work Results - Mechanical
.8	Section 23 05 05	Installation of Pipe Work.
.9	Section 23 05 29	Hangers and Supports for Piping and Equipment

1.2 References

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1-2013; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM B209M-10, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335/C335M-10e1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411-11, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547-12, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795-08(2013), Standard Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.9 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-1989, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Thermal Insulation Association of Canada (TIAC):

.1 Mechanical Insulation Best Practice Guide, 2013.

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-11, Standard for Thermal Insulation Polyotrene, Boards and Pipe Covering.

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 Definitions

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED"-will mean "not concealed" as defined herein.

.2 TIAC Codes:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 Submittals

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 01 50 – General Instructions. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 – Submittal Procedures.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.5 Quality Assurance

.1 Qualifications:

.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 – Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 Fire and Smoke Rating

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 Insulation

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-1: Rigid molded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/CGSB-51.9 / ASTM C547.

.2 Maximum "k" factor: to CAN/CGSB-51.9.

.4 TIAC Code A-3: Rigid molded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/CGSB-51.9 / ASTM C547.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/CGSB-51.9 / ASTM C547.

.5 TIAC Code C-2: Mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702 / ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702 / ASTM C553.

.6 TIAC Code A-6: Flexible unicellular tubular elastomer.

.1 Insulation: flexible closed-cell elastomer to ASTM C534.

.2 Jacket: to CGSB 51-GP-52Ma. Required for outdoor application.

.3 Maximum "k" factor: 0.27.

.4 Vapour transmission: 0.08 perm-inch.

.5 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants.

.7 To be formaldehyde free, low VOC; resists mold and mildew.

.8 Evidence shall be provided to the Engineer on the site of ULC listings of all products being used. Duct insulation adhesives and coatings shall be non-toxic as defined by WCB Regulations.

2.3 Insulation Securement

.1 Tape: Self-adhesive, aluminum, reinforced, 50mm wide minimum.

.2 Contact adhesive: Quick setting.

.1 Maximum VOC limit 80 g/L to SCAQMD Rule 1168.

.3 Canvas adhesive: Washable.

.1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.4 Tie wire: 1.5mm diameter stainless steel.

.5 Bands: Stainless steel, 19mm wide, 0.5mm thick.

2.4 Cement

.1 Thermal insulating and finishing cement:

.1 To CAN/CGSB-51.12.

.2 Hydraulic setting or Air drying on mineral wool, to ASTM C 449.

2.5 Vapour Retarder Lap Adhesive

.1 Water based, fire retardant type, compatible with insulation.

2.6 Indoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 Outdoor Vapour Retarder Finish

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m.

2.8 Jackets

.1 Polyvinyl Chloride (PVC):

.1 One-piece molded type and sheet to CGSB 51-GP-53M with pre-formed shapes as required.

.2 Colours: White.

.3 Minimum service temperatures: 20°C [68°F].

.4 Maximum service temperature: 65°C [150°F].

.5 Moisture vapour transmission: 0.02 perm.

.6 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.2 Canvas:

.1 220 and 120 gm/m cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.2 Lagging adhesive: Compatible with insulation.

.1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.3 Aluminum:

.1 To ASTM B 209 with and without moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Stucco embossed.

.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

PART 3 - EXECUTION

3.1 Pre-Installation Requirement

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces to be clean, dry and free from foreign material.

3.2 Installation

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized pipe supports, saddles and shoes. See Section 23 05 29 – Hangers and Supports for Piping and Equipment.

.6 Seal vapor barrier penetrations with vapor barrier adhesive.

3.3 Removable, Pre-fabricated, Insulation and Enclosures

.1 Application: At expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

.2 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: high temperature fabric for indoor applications and aluminum for outdoor applications.

3.4 Installation of Elastomeric Insulation

.1 Insulation to remain dry at all times. Overlaps to manufacturer's instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.5 Piping Insulation Schedules

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1.

.1 Securements: SS Bands at 300mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-3.

.1 Securements: SS Bands at 300mm on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Seals: lap seal adhesive, lagging adhesive.

.2 Installation: TIAC Code: 1501-CA; per manufacturer's recommendation.

.5 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements: SS Bands at 300mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation to be as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000mm long.

.2 Do not insulate exposed run-outs to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp °C	TIAC Code	Run out	To NPS1	1 ¼-2	2 ½-4	5-6	8 & over
Domestic HW		A-1	25	25	25	38	38	38
Domestic CW		A-3	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: Canvas or PVC jacket.

.2 Exposed indoor in Mechanical Rooms and Service Corridors: Canvas or PVC jacket.

.3 Concealed, indoors: ASJ, no further finish.

3.6 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 91 13 — General Commissioning (Cx) Requirements

.2 Section 23 05 93 — Testing, Adjusting and Balancing

1.2 Quality Assurance

.1 The commissioning of mechanical systems shall be executed in accordance with the intent of:

.1 ASHRAE Guideline 1.1-2007, HVAC&R Technical Requirements for the Commissioning Process.

.2 ANSI/ASHRAE/IES Standard 202-2013, Commissioning Process for Buildings and Systems.

1.3 General

.1 Commissioning of the mechanical systems, including the HVAC, and Plumbing and Drainage Systems, shall be carried out by an independent Commissioning Agent acceptable to the Departmental Representative with technicians specifically trained in commissioning procedures.

.2 The Mechanical Subcontractor shall retain a Commissioning Agent, who shall be active in the commissioning process and actively encourage his own forces and sub-trades to work together to achieve optimum system performance for the mechanical systems in a timely manner. Refer to Section 01 91 13 – General Commissioning (Cx) Requirements for additional requirements.

.3 It is not intended that this work shall, in any way, replace normal factory start-up service for equipment or relieve the Contractor or his sub-trades of their responsibility for providing first-class installation in satisfactory working order.

.4 As part of the final commissioning report, submit a Certificate stating that the commissioning procedures have been completed, that complete factual reports have been distributed and that directions have been given to the Contractor to correct faults and omissions and finally, that follow-up testing, after the correction of faults and omissions has been completed and recorded.

.5 Be responsible for the performance and commissioning of all equipment supplied under the Sections of Division 22, 23. Commissioning is the process of advancing the installation from the stage of static completion to full working order in accordance with the contract documents and design intent. It is the activation of the completed installation.

.6 In consultation with the General Contractor, ensure that sufficient time is allowed and fully identified on the construction schedule for the proper commissioning of all mechanical systems.

1.4 Commissioning and Demonstration

.1 Submit a schedule for the commissioning phase of the work. This schedule shall show:

.1 Equipment start-up schedule.

.2 Submission dates for the various documents required prior to substantial completion.

.3 Timing of the commissioning, testing, balancing, and demonstration process.

.2 Commissioning is concluded when the air and water system is balanced and the installation is in full working order and acceptable for use. The work shall include the following:

.1 Balancing of the air systems as specified in this section.

.2 Set up air diffusers, registers and grilles for optimum distribution/comfort.

.3 Plug all air pressure and flow measuring holes.

.4 Adjust vibration isolators and earthquake restraints for optimum performance.

.5 Verification of water tightness of all roof and exterior wall penetrations.

.6 Set up all automatic dampers and automatic temperature control devices.

.3 In addition to the piping, equipment and systems listed above provide commissioning of all plumbing piping, equipment and systems including the following:

.1 Domestic cold water including PRV setpoint.

.2 Domestic hot water and recirculation including temperature set points.

.3 Sanitary waste and venting.

.4 Plumbing fixtures including adjustments of all flush valves, and setting temperature limit stops on shower valves.

.4 At the conclusion of commissioning, demonstrate the operation of the systems to the Departmental Representative. For demonstration and instruction to Operating staff requirements, refer to this section of the specification.

.5 The verification process shall include the demonstration of the following:

.1 The ease of access that has been provided throughout for servicing coils, motors, drives, control dampers and damper operators.

.2 Location of and opening and closing of all access panels.

.3 Operation of all automatic control dampers and automatic temperature control devices.

.4 Operation of all alarm and protective devices.

.5 Operation of all equipment and systems under each mode of operation, and failure.

.6 At the completion of commissioning, testing, balancing and demonstration submit the following to the Departmental Representative:

.1 A letter certifying that all work specified under this contract is complete, clean and operational in accordance with the specification and drawings.

.2 Completed copies of all commissioning check lists plus copies of start-up reports from specialty contractors and vendors.

.3 "As-Built" record drawings, as specified.

.4 A list of all alarm and protective devices tested, with the final operating settings.

.7 Training

.1 During "Substantial Performance" review, the Mechanical Contractor, Control Subcontractor, and other Subcontractors designated by the Departmental Representative shall provide training to the operating personnel in the proper operation and maintenance of all systems and equipment installed under the contract.

.2 It shall be the Mechanical Contractor's responsibility to have the specified equipment manuals prepared, previously approved by the Departmental Representative, and ready for presentation to the Departmental Representative at this meeting.

.3 Convene the meeting with the aforementioned parties at the time called for in the substantial performance review. The arrangements shall include written notices to all the parties concerned. Should the equipment manuals, or system installation not be complete and operable at the proper time, he shall then convene the operating instruction meeting at a later date and pay any additional costs including time and travelling expenses for the personnel involved which are attributable to the delay.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 01 91 13 General Commissioning (Cx) Requirements

.2 Section 22 42 01 Plumbing Specialties and Accessories

.3 Section 23 08 00 Commissioning of Mechanical Systems

.4 This Section applies to all related work under Divisions 22 and 23.

1.2 References

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM E202-12, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

1.3 Potable Water Systems

.1 When cleaning is completed and system filled:

.1 Verify performance of equipment and systems as specified elsewhere in Division 22.

.2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.

.3 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

1.4 Sanitary and Storm Drainage Systems

.1 Buried systems: Perform tests prior to back-filling. Perform hydraulic tests to verify grades and freedom from obstructions.

.2 Ensure that traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system.

.4 Operate flush valves, tank and operate each fixture to verify drainage and no leakage.

.5 Cleanouts: Refer to Section 22 42 01 - Plumbing Specialties and Accessories.

.6 Roof drains:

.1 Refer to Section 22 42 01 - Plumbing Specialties and Accessories.

.2 Remove caps as required.

1.5 Reports

.1 In accordance with Section 01 91 13 – General Commissioning (Cx) Requirements and Section 23 08 00 –Commissioning of Mechanical Systems

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used.

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 61 00	Common Product Requirements
.4	Section 01 74 11	Cleaning
.5	Section 01 74 19	Waste Management and Disposal

1.2 References

.1 American National Standards Institute (ANSI)

.1 IEEE C57.13-2013, Standard Requirements for Instrument Transformers.

.2 National Electrical Manufacturer's Association (NEMA)

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Include:

.1 Information as specified for each device.

.2 Manufacturer's detailed installation instructions.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.4 Quality Assurance

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.6 Waste Management Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan

.3 Fold up metal banding, flatten and place in designated area for recycling.

1.7 Spare Materials

.1 Provide the following spare materials:

.1 6@ solenoid valves for KS-1

PART 2 PRODUCTS

2.1 Thermostats

.1 Low voltage wall thermostat as supplied with equipment.

.2 N/A.

2.2 Thermostat Guards

.1 Thermostat guards: lockable, clear plastic. Slots for air circulation to thermostat.

2.4 Dampers and Actuators

.1 All control dampers not furnished with packaged equipment shall be supplied by the controls subcontractor and installed by the sheet metal subcontractor. Provide damper actuators for all dampers shown or specified.

.2 All dampers for outdoor air application shall be parallel blade, insulated, tight closing, low leakage type with replaceable blade and edge seals.

2.5 Electrical Components, and Conduit

.1 Provide all control system components, except those supplied as part of packaged equipment controls, but including all auto sequencing devices, electric relays, safety devices and electrical interlocks required to accomplish specified sequences. Refer to the electrical motor schedule in the electrical drawings and/or specification, which delineate the limits of electrical work in Division 26 (Electrical) serving mechanical systems.

.2 Provide all control circuit transformers required for control systems and not supplied by Division 26 including line voltage power connection from indicated outlets shall be included by Division 23.

.3 All line voltage wiring shall be copper with RW90 X-Link P.E. insulation #12 minimum size. AWG wire shall be sized to meet code.

.4 All wiring installed under this contract shall be plenum rated FT-6 or FT-4, if approved by all authorities having jurisdiction. Locate wiring away from top or bottom of ceiling joists or trusses to minimize possibility of accidental damage.

Number 18 gauge wire may be used in Class 2 circuits unless voltage drops are excessive. THHN wire will not be acceptable. Twisted shielded wiring, minimum of 22 gauge wire shall be used for all co-axial communication wiring. Line voltage alternating current wiring shall not be run in the same conduit, or cabling as low voltage wiring.

.5 Use 1m of flexible conduit for all connections to vibrating equipment. Use liquid tight flex cable and connections where required.

.6 The Control Contractor shall locate magnetic starters from the electrical drawings. All electrical work provided by this Contractor shall comply with all requirements of the Division 16 electrical specification, the Canadian Electrical Code and Local Codes and Ordinances.

.7 Wire all line voltage thermostats for single phase equipment.

.8 Division 26 has been requested to provide specific devices, including magnetic starters supplied with 120 volt holding coils, HOA switching and space for the addition of auxiliary contacts. The Control Contractor shall provide all necessary normally open and normally closed contacts, wired to a terminal strip within the starter enclosure, required to achieve the specified control interlocking and sequencing. Manual starters for 120 volt equipment are to contain On-Off selector, external H.O.A., integral overload protection and pilot lights. The Controls Contractor shall provide control wiring interlocks from the control contacts provided on the automatic branch lines of the assembly, which will be contained within the associated Motor Control or Starter Assembly.

.9 Refer to Division 26 Specifications and Motor Schedule for the scope of work to be provided by the Electrical Contractor. Division 23 shall supply and install all components, in addition to those outlined within the Division 26 documents, as may be deemed necessary to provide all interlocks or sequences as called for elsewhere within the specifications.

.10 All power supplies for controls are this Contractor's responsibility unless otherwise specified in the Electrical Specifications. All control transformers to be located in fan rooms or mechanical rooms only and are to be mounted in serviceable locations.

.11 Line voltage will not be run with signal or trunk wiring or be present in the same junction box.

.12 Run all wiring parallel to building lines. All wiring to be installed in a neat, workmanlike manner.

.13 Support wiring independent of piping, ductwork, and equipment. Keep wiring clear of hot piping, ductwork/equipment.

.14 Identify all junction boxes with control company label.

.15 There shall be no splices in any of the control wiring except at devices or control panels.

2.5 Temperature Control Panels

.1 Provide temperature control panels constructed of heavy gauge furniture steel with baked enamel finish, hinged door with locking latches, flush mounted gauges and thermometers. Each mounted device shall have an identity label, which shall

be in English text for switches or instruments mounted on panel faces. All panel wiring shall terminate at numbered and identified terminal strips. All wires and pneumatic tube within the panel shall be identified and neatly arranged.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Installation

.1 Check and verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate thermostats and temperature sensors 1.5m above floor.

.2 Install damper motors on outside of ducts. Do not locate inside air stream.

.3 The installation shall conform to each manufacturer's recommended procedures and to all applicable codes, statutes and ordinances.

.4 Equipment shall be installed so as to allow for easy maintenance access. Equipment shall be installed such that it does not interfere in any way with access to adjacent equipment and personnel traffic in the surrounding space.

.5 All transmitters, interfaces, terminations and control relays, etc. shall be mounted in field cabinets that may be locked.

.6 Equipment shall be installed in locations providing adequate ambient conditions for its specified functioning, allowing for adequate ventilation.

.7 Permanently identify each wire, cable, conduit and tube at each terminal.

.8 All wall mounted devices in new finished space shall be mounted on a wall box.

.9 Provide tamperproof screws to all controls equipment located in public areas.

.10 Piping wells shall be installed with heat conductive compound. Well material shall be of a material suitable for the sensed medium without undue corrosion or breakdown. All wells shall be screwed and shall be installed in such a manner to allow the sensing element to be truly indicative of the medium temperature.

3.3 Enclosure and Conduit

.1 Relays, transformers, and controls devices shall be installed in controls enclosures.

.2 All wires penetrating the enclosure that are not required to be in conduit must be neatly bundled and strapped in place.

.3 The wiring diagram shall be affixed on the inside of the door/cover of the enclosure.

.4 The inside bottom of the enclosure shall be clean of dirt, metal shavings, and debris.

.5 Wiring is to be in EMT conduit with set screw metal fittings in all wall spaces and exposed locations as well as in pipe chases, service spaces, attics, and crawl spaces which are entered for service access. Wiring in suspended ceiling spaces does not require conduit but shall be neatly installed parallel to building lines using bridle rings. All conduits shall be piped smoothly and neatly following building lines. Wiring above existing ceilings and wall cavities may be run free-air.

.6 Liquid-tight flexible conduit to be used for rooftop unit wiring c/w liquid-tight fittings. Provide spun aluminum roof jack where control wiring penetrates roof unless penetration is within waterproof rooftop unit curb.

.7 All junction boxes will have covers properly and firmly affixed after installation completion.

3.4 Ventilation and Heating Controls

.1 Provide wiring, relays, transformers and other field devices to complete the following controls.

.2 Provide thermally insulated motorized dampers [c/w damper actuators with end switch] and interlock with exhaust fan [EF-1]. When fan is enabled, motorized air intake dampers open. Once the damper is open 25%, the end switch shall enable the exhaust fan. (Note: exhaust fans are controlled by time clock and motion sensor provided by Division 26).Damper actuator will be line voltage, supplied and installed by Division 23 and wired by Division 26. Damper is to be energized open.

.3 For electric cabinet unit heaters (ECUH) provide low voltage (24V), 7 day programmable thermostat c/w 4 time / temperature periods per day and install in the temperature control panel, located in the Service Room. Provide (24V) remote sensor in Washroom [compatible with all Emerson thermostats]. One programmable thermostat each for Mens and Ladies Washrooms – (Typical for each Washroom building). Set points: 18°C from 6am to 11pm, 13°C from 11pm to 6am.

.4 Green Point #1 & #4 (Type B Layout): For electric wall heaters (EWH) provide low voltage (24V), 7 day programmable thermostat c/w 4 time / temperature periods per day and install in the temperature control panel, located in the Service Room. Provide (24V) remote sensor in Shower Rooms [compatible with all Emerson thermostats]. One programmable thermostat each for Mens and Ladies Shower Rooms – (Typical for each Type “B” Washroom building). Set points: 18°C from 6am to 11pm, 13°C from 11pm to 6am.

.5 Green Point #1 & #4 (Type B Layout): Supply Fan (SF-1) and associated electric duct heater (EDH-1) serve the crawlspace. SF-1 is to run continuously. Provide a duct mounted thermistor to control (EDH-1) leaving air temperature. Provide low voltage control wiring from the thermistor to the duct heater internal controller by Div. 23. Set the thermistor to 10°C

.6 For electric unit heater (EUH) in the Service Rooms, provide a low voltage wall mounted thermostat, and control wiring [by Div. 23.] Set points: 10°C. (Typical for all Washroom Buildings)

.7 Temperature control panel by Division 23.

3.5 Kitchen Faucet Control

.1 Green Point #1 & #4 (Type B Layout): Provide solenoid valves (low voltage) on the tempered water supply lines to each kitchen faucet. Solenoid valves to be located in the Service Rooms. Provide push button control at each kitchen faucet. Provide transformer and adjustable timer in the temperature control panel. Upon activation of push button, the solenoid valves shall open for a pre-set period (adjustable). Provide wiring, relays, and other field devices to complete the controls.

3.6 Domestic Hot Water Re-circulating Pump Controls

.1 Provide aquastat with brass immersion well in domestic hot water recirculation pipe to cycle domestic hot water re-circulating pump. Line voltage wiring by Division 26.

3.7 Sanitary Sump Pump Control

.1 Provide control panel, conduits, wiring, relays, float switches and other field devices to complete sump pump installation.

.2 Install control wiring for sanitary sump pump (Green Point #1).

.3 Refer to details on plumbing drawings for sanitary simplex pump station.

3.8 Domestic Water Booster Pump Control (Wickaninnish Beach Only)

.1 Provide separate VFD as specified on the drawing. Wiring to VFD and booster pump is by Div. 26.

.2 Control wiring for domestic water booster pump (Wickaninnish Beach Only).

.3 Refer to details on plumbing drawing P-4 for Domestic Water Booster Pump Station.

3.9 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 74 19 — Waste Management and Disposal

.2 Section 23 05 00 — Common Work Results-Mechanical

1.2 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Dispose of unused cleaning solutions at official hazardous material collections site approved by the Departmental Representative.

.3 Do not dispose of unused cleaning solutions into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

.4 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.5 Dispose of packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.3 Scope

.1 All air systems installed by this contract shall be cleaned by a Cleaning Contractor.

.2 The Cleaning Contractor shall visit the site in the case of existing systems or shall review the drawings and specifications of new systems, in order to be fully acquainted with the scope of work and requirements before tendering. No consideration will be granted for any misunderstanding of work to be done resulting from failure to visit the site or inspect the contract documents.

.3 The following air systems shall be cleaned, as applicable:

- .1 Supply, outdoor air
- .2 Exhaust

.4 All components within each system shall be thoroughly cleaned to the Departmental Representative's satisfaction and shall include but not be limited to the following:

- .1 Intake and exhaust air louvres
- .2 Bird screens
- .3 Auto dampers
- .4 Fans & motors - complete assembly
- .5 All plenum surfaces
- .6 Supply / outdoor air grilles, registers and diffusers
- .7 Ductwork

.8 Return, exhaust and relief air grilles and diffusers.

1.4 Qualifications

.1 Cleaning shall be performed by a cleaning service company with high capacity cleaning equipment designed specifically for the work involved, executed by personnel specifically trained for the application.

PART 2 PRODUCTS

2.1 Cleaning Equipment

.1 Cleaning shall generally by high capacity power vacuum.

.2 High pressure compressed air, wire brushing and/or non-toxic solvent cleaning shall be used where dirt or scale cannot be removed otherwise.

PART 3 EXECUTION

3.1 Cleaning HVAC Systems

.1 The Cleaning Contractor shall provide access as required for the work and shall reseal and make good any duct or insulation damaged in the process of this work.

.2 Remove cheesecloth from grilles, etc., let over from the temporary use of the air systems.

.3 Air systems must not be shut down without prior approval from the owner

.4 The Cleaning Contractor shall mark balancing damper positions before cleaning and return them to their original position when cleaning is completed unless the system is to be balanced.

.5 Re-install any grilles, registers and diffusers which may have been removed for cleaning purposes.

3.2 Report

.1 After completion of the work, the Contractor shall provide four copies of a certificate stating that all systems have been cleaned as specified and that all access panels for all cleaning openings are in place. This certificate shall be placed in the Operating and Maintenance Manuals.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01 33 00 Submittal Procedures

.2 Section 01 35 33 Health and Safety Requirements

.3 Section 01 74 19 Waste Management and Disposal

.4 Section 23 05 00 Common Work Results - Mechanical

.5 Section 23 05 48 Vibration and Seismic Controls for Ductwork, Piping and Equipment

.6 Section 23 07 13 Thermal Insulation for Ducting

.7 Section 23 31 10 Cleaning of Mechanical Duct Systems

1.2 References

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A312/A312M-2014, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

.2 ASTM A480/A480M-2013, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.3 ASTM A635/A635M-2013, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

.4 ASTM A653/A653M-2013, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33 .

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Agency (NFPA)

.1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-2012, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 ANSI/SMACNA 006-2006, HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012.

.3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

.7 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.8 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.9 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.3 Submittals

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:

.1 Sealants.

.2 Adhesive

.3 Duct tape.

.4 Duct liners.

1.4 Quality Assurance

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery Storage and Handling

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 Seal Classification

.1 Classification as follows:

Pressure Class	Maximum Pressure (Pa)	SMACNA Seal Class
Low Pressure	500	[B]

.2 Seal classification:

.1 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.

2.2 Ductwork - General

.1 Duct dimension noted on drawings are clear inside dimensions. Insulation thickness shall be as noted on the drawings.

.2 All seams, joints and raw edges shall be sealed and covered with glassfab.

.3 Insulation shall be applied with mechanical fasteners and suitable adhesives. Duct insulation adhesive and coatings shall be non-toxic as defined by WCB Regulations.

.4 Round duct: with spiral seams. Sections shall be joined with a RT1 slip joint, screw fastened and sealed with no visible duct sealant to interfere with finish painting.

.5 Exposed round duct shall be installed in a neat workmanlike manner parallel to building walls and roof with no sags or misalignment, and shall be true and round.

2.3 Fittings

.1 Fabrication: to SMACNA. Fittings shall be 2 gauges heavier than connecting ductwork.

.2 Radius elbows:

.1 Rectangular: Centre-line radius equal to 1.5 times width of duct, with single thickness turning vanes.

.2 Round: Centre-line radius equal to 1.5 times diameter. 5-gore for 300mm [12”] and larger; die-stamped for 254mm [10”] and smaller.

3 Mitered elbows, rectangular:

.1 To 400mm [16”]: with single thickness turning vanes.

.2 Over 400mm [16”]: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: 45° entry on branch.

2 Round main and branch: enter main duct at 45° or with conical connection. The use of spin-in collars is not acceptable.

.5 Transitions:

.1 Diverging: 20° maximum angle.

.2 Converging: 30° maximum angle.

.6 Offsets: full radius elbows.

.7 Obstruction deflectors: maintain full cross-sectional area.

2.4 Galvanized Steel

.1 Lock forming quality: to ASTM A653, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA.

.4 Applications:

.1 All supply and exhaust ductwork unless otherwise noted.

2.5 Aluminum

.1 To SMACNA. Aluminum type: 3003-H-14.

.2 Thickness: 2 gauges heavier than gauges required for galvanized duct.

.3 Joints: to SMACNA.

.4 Applications:

.1 Rooms with high humidity: first 3,000mm [10’-0”] of exhaust duct.

.2 As noted on drawings.

.5 Provide neoprene gaskets between dissimilar metals.

.6 Do not use of sheet metal screws or other fasteners which will obstruct air flow in clothes dryer exhaust duct.

2.6 Stainless Steel

.1 Material: 316 stainless steel to ASTM A312.

.2 Thickness: minimum 1.2mm [18 gauge], built for structural strength.

.3 Joints: continuously welded.

.4 Duct system shall be fitted with copper-grounding straps, connected to the duct and to an effective grounding system.

.5 Applications:

.1 May be used as an alternative to aluminum duct at Contractor's option.

2.7 Hangers and Supports

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500mm [20"].

.2 Hangers, hanger configuration and attachment to structure: to SMACNA.

2.8 Duct Liner

.1 Fibrous glass duct liner: air stream side faced with FSK facing.

.2 Rigid:

.1 Use on flat surfaces.

.2 25mm [1"] or 50mm [2"] thick fibrous glass rigid board duct liner.

.3 Density: 36 kg/m^3 [2.2 lb/ft^3].

.4 Thermal resistance: RSI-0.76 [R-4.3] for 25mm [1"], RSI-1.53 [R-8.7] 50mm [2"].

.3 Flexible:

.1 Use on round or oval surfaces.

.2 25mm [1"] or 50mm [2"] thick fibrous glass blanket duct liner as indicated.

.3 Density: 24 kg/m^3 [1.5 lb/ft^3].

.4 Thermal resistance: RSI-0.74 [R-4.2] for 25mm [1"], RSI-1.47 [R-8.3] 50mm [2"].

.4 Fasteners shall be weld pins with metal retaining clips and square head.

.5 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.9 Sealant

.1 For indoor and outdoor applications:

.1 Water based, fiber reinforced, non-toxic, elastomeric duct sealant. Suitable for indoor and outdoor use, non-sagging, non-cracking, UV resistant, freeze/thaw stable, paintable. Temperature range of -32°C to

99°C [-26°F to 210°F]. ULC listed and comply with NFPA 90A and NFPA 90B.

.2 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

.2 For outdoor applications only:

.1 Solvent based, fiber reinforced, elastomeric duct sealant. Suitable for outdoor unit, non-sagging, non-cracking, UV-proof, freeze/thaw stable, paintable. Temperature range of -45°C to 120°C [-50°F to 250°F].

.3 Maximum VOC limit 420 g/L to SCAQMD Rule 1168 and SMACNA Technical Resource Bulletin (TRB) #9-09.

2.10 Adhesive

.1 Water-based vinyl copolymer adhesive. Temperature range of -23°C to 71°C [-10°F to 160°F]. ULC listed and comply with NFPA 90A and NFPA 90B. Adhesive shall be non-toxic as defined by Worksafe BC Regulations.

.2 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

.3 Maximum VOC limit 80 g/L to SCAQMD Rule 1168.

2.11 Duct Tape System

.1 Two part system combined of treated woven fibreglass tape and liquid sealant/adhesive. ULC listed and comply with NFPA 90A and NFPA 90B.

.2 Flame and smoke ratings:

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

PART 3 EXECUTION

3.1 General

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, SMACNA, and as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

.7 All openings in ductwork shall be sealed with temporary duct cover during construction. Failure to maintain duct cleanliness will require the inside of all air ducts, plenums and equipment in the air stream to be cleaned with an industrial vacuum cleaner before system balancing is started.

.8 Apply protective galvanize coating to galvanized ductwork and accessories which have been welded.

.9 Apply duct sealer to all joints of metal ducts, connections to diffusers, plenums and flexible duct.

.10 The use of plastic duct tape is not permitted.

.11 Thermal insulation to Section 23 07 13 – Thermal Insulation for Ducting.

3.2 Hangers

.1 Strap hangers: Install in accordance with SMACNA.

.2 Rectangular duct: Extend strap hanger down on both sides of duct, turn under bottom 25mm [1”] minimum. On each strap provide two sheet metal screws on the side and one in the bottom.

.3 Angle hangers: complete with locking nuts and washers.

.4 Hanger spacing: to SMACNA.

.5 Seismic restraint to Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment.

3.4 Duct Liner

.1 Install in accordance with manufacturer's recommendations, and as follows:

.1 Fasten to interior sheet metal surface with 100% coverage of adhesive.

.2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425mm on centres.

.3 Acoustically lined round ducts shall have perforated inner metal liner.

.2 Line inside of ducts where indicated.

.3 Duct dimensions, as indicated, are clear inside duct lining.

.4 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:

.1 Bed tape in sealer.

.2 Apply two coats of sealer over tape.

.5 Replace damaged areas of liner.

.6 Protect leading and trailing edges of duct sections with sheet metal nosing having 15mm [1/2”] overlap and fastened to duct.

.7 Provide 50mm [2”] liner for ductwork exposed to weather which is not insulated.

3.5 Watertight Duct

.1 Provide watertight duct for:

.1 Dishwasher exhaust.

.2 Fresh air intake.

.3 Minimum 3,000 mm from duct mounted humidifier in all directions.

.2 Form bottom of horizontal duct without longitudinal seams.

.1 Solder or weld joints of bottom and side sheets.

.2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards fume hoods served.

.1 Slope header ducts down toward risers.

3.6 Sealing and Taping

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.7 Cleaning

.1 Perform cleaning operations as specified in Section 23 31 10 – Cleaning of Mechanical Duct Systems and in accordance with manufacturer's recommendations.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 74 11	Cleaning
.4	Section 01 74 19	Waste Management and Disposal
.5	Section 01 78 00	Closeout Submittals
.6	Section 23 05 00	Common Work Results - Mechanical

1.2 References

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 ANSI/SMACNA 006-2006, HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition.

.2 National Fire Protection Association (NFPA)

.1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-2012, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S110-07, Standard Method of Tests for Air Ducts.

.2 UL 181-2013, Standard for Factory-Made Air Ducts and Air Connectors.

1.3 Submittals

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:

.1 Flexible duct connectors.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturer's Field Reports: manufacturer's field reports specified.

.7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 Quality Assurance

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan (WMP).

.5 Divert unused materials from landfill to recycling facility as approved by Departmental Representative.

PART 2 PRODUCTS

2.1 General

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 Flexible Duct Connectors

.1 Frame: galvanized sheet metal frame 0.66mm [24 gauge] thick with fabric clenched by means of double locked seams.

.2 Fabric:

.1 Indoor: Fire resistant, self extinguishing, neoprene coated fibreglass fabric, temperature rated at -40°C to 90°C [-40°F to 200°F], thickness of 0.63mm [0.025”].

.2 Outdoor: Fire resistant, self extinguishing, DuPont Hypalon coated fibreglass fabric, temperature rated at -40°C to 120°C [-40°F to 250°F], thickness of 0.61mm [0.024”].

2.3 Access Doors in Ducts

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm [24 gauge] thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm [24 gauge] thick complete with sheet metal angle frame and 25mm [1”] thick rigid fibreglass insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks complete with safety chain.

.2 301 to 450 mm: four sash locks complete with safety chain.

.3 451 to 1000 mm: piano hinge and minimum two sash locks.

.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.

2.4 Turning Vanes

.1 Factory-made, single or double thickness as specified elsewhere, with trailing edge. Vanes shall be constructed of same material as duct, 0.55mm [26 gauge].

.2 Rails shall be fabricated of same material as duct, 0.66m [24 gauge]. Vanes shall be attached to rails using fasteners.

2.5 Instrument Test Ports

.1 Alloy casting with screw-in cap, neoprene gasket, 18 mm [3/4”] inside diameter opening for pitot tube or velometer.

PART 3 EXECUTION

3.1 Manufacturer’s Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 Installation

.1 Flexible Duct

.1 Do not use flexible duct on return and exhaust ductwork.

.2 Flexible Duct Connectors

.1 Install in following locations:

.1 Inlets and outlets of exhaust air fans.

.2 As indicated.

.2 Length of connection: 100mm [4”].

.3 Minimum distance between metal parts when system in operation: 75mm [3”].

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.3 Access Doors in Ducts

.1 Size:

.1 610mm x 1520 mm [24”x60”] for person size entry.

.2 460mm x 460 mm [18”x18”] for service.

.3 300mm x 200mm [12”x8”] for cleaning.

.4 As indicated.

.2 Locations:

.1 Fire dampers and smoke dampers.

.2 Control dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Reheat coils.

.6 On both sides of turning vanes.

.7 At the base of all duct risers.

.8 At 12,000m [40’-0”] intervals in all duct systems, and 6,000mm [20’-0”] intervals in horizontal exhaust ducts for cleaning purposes.

.4 Instrument Test Ports

.1 Install in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments.

.3 Locations:

.1 For traverse readings:

.1 Ducted inlets to roof and wall exhausters.

.2 Inlets and outlets of other fan systems.

.3 Main and sub-main ducts.

.4 And as indicated.

.2 For temperature readings:

.1 At outside air intakes.

.2 In mixed air applications in locations.

.3 At inlet and outlet of coils.

.4 Downstream of junctions of two converging air streams of different temperatures.

.5 And as indicated.

.5 Turning Vanes

.1 Install in accordance with manufacturer's recommendations.

3.3 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 61 00	Common Product Requirements
.4	Section 01 74 11	Cleaning
.5	Section 01 74 19	Waste Management and Disposal
.6	Section 23 05 00	Common Work Results – Mechanical

1.2 References

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 ANSI/SMACNA 006-2006, HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition.

.2 SMACNA – Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems, 2002.

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S112-10, Standard Method of Fire Test of Fire Damper Assemblies.

.2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.

.3 ULC-S505-1974, Standard for Fusible Links for Fire Protection Service.

.3 National Fire Protection Agency (NFPA)

.1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Indicate the following:

.1 Volume dampers.

1.4 Quality Assurance

.1 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 PRODUCTS

2.1 General

.1 Manufacture to SMACNA standards.

2.2 Single Blade Volume Dampers

.1 Blade: Of same material as duct. Two gauges heavier than duct but not less than 0.6mm [24 gauge], stiffened.

.2 Maximum dimension: 305mm [12”] height for rectangular ducts.

.3 Axles: 9.5mm [3/8”] continuous square rod up to 457mm [18”] wide duct, and 13mm [1/2”] continuous square rod up to 1,219mm [48”] wide duct.

.4 Linkage: shaft extension with locking quadrant and position indicator.

.5 Bearings: bronze oilite.

.6 Frame: of the same material as duct. Complete with angle stop for rectangular duct.

PART 3 EXECUTION

3.1 General

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

3.2 Volume Damper

.1 For supply, return and exhaust systems, locate balancing dampers in each branch duct.

.2 Run-outs to registers and diffusers: install single blade damper located as close as possible to main ducts.

.3 All dampers to be vibration free.

.4 Attach fluorescent tape to regulator handle for concealed volume dampers.

.5 Provide remote control damper regulator for volume dampers above inaccessible ceiling where ceiling access panel is not provided, and as indicated.

3.3 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 61 00	Common Product Requirements
.4	Section 01 74 11	Cleaning
.5	Section 01 74 19	Waste Management and Disposal
.6	Section 01 78 00	Closeout Submittals
.7	Section 01 91 13	General Commissioning (Cx) Requirements
.8	Section 23 05 13	Common Motor Requirements for Mechanical Equipment
.9	Section 23 05 48	Vibration & Seismic Controls for HVAC Piping & Equipment
.10	Section 23 08 00	Commissioning of Mechanical Systems
.11	Section 23 33 00	Air Duct Accessories

1.2 References

.1 Air Movement and Control Association (AMCA)

- .1 ANSI/AMCA 99-10, Standards Handbook.
- .2 ANSI/AMCA 210-07, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .3 ANSI/AMCA 300-08, Reverberant Room Method for Sound Testing of Fans.
- .4 AMCA 301-90, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB 1.181-1999, Ready-Mixed Organic Zinc-Rich Coating.

1.3 System Description

.1 Performance Requirements:

- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
- .2 Capacity: flow rate, static pressure, BHP, HP, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.

.3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.

.4 Sound ratings: comply with AMCA 301, tested to AMCA 300.

.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210.

1.4 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Shop Drawings:

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.3 Provide:

.1 Fan performance curves showing point of operation, BHP and efficiency.

.2 Sound rating data at point of operation.

.4 Indicate:

.1 Motors and sheaves details.

.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.6 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Waste Management and Disposal:

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Fans General

.1 Motors:

.1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC Equipment supplemented as specified herein.

.2 For use with variable speed controllers where specified.

.3 Sizes as specified.

.2 Accessories and hardware: as specified.

.3 Scroll casing drains: as indicated.

.4 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.5 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Controls for Ductwork Piping and Equipment.

.6 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

2.2 Centrifugal Fans

.1 Fan wheels:

.1 Welded steel construction.

.2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.

.3 Air foil or backward inclined blades, as indicated.

.2 Bearings: heavy duty grease lubricated ball or roller self aligning type with oil retaining, dust excluding seals and a certified minimum rated life (L50) of 200,000 hours.

.3 Housings:

.1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, steel, for smaller wheels, braced, and with welded supports.

.2 Provide bolted or latched airtight access doors with handles.

.4 Provide belt driven sets with adjustable motor bed plate and variable pitch driver sheave.

2.3 In-Line Centrifugal Fans

.1 Characteristics and construction: as for centrifugal fan wheels.

.2 Provide AMCA arrangements 1 or 9 as indicated with stiffened flanges, smooth rounded inlets, and stationary guide vanes.

2.4 Cabinet Fans – General Purpose

.1 Fan characteristics and construction: as centrifugal fans.

.2 Cabinet hung single wheel with centrifugal fan in factory fabricated, acoustically insulated casing complete with vibration isolators and seismic control measures, motor and other accessories as noted.

.3 Fabricate casing of zinc coated or phosphate treated steel of 18 gauge reinforced and braced for rigidity. Provide removable panels for access to interior. Paint uncoated, steel parts with corrosion resistant paint to CAN/CGSB 1.181.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Fan Installation

.1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment, flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

.2 Provide sheaves and belts required for final air balance.

.3 Bearings and extension tubes to be easily accessible.

.4 Access doors and access panels to be easily accessible.

3.3 Anchor Bolts and Templates

.1 Size anchor bolts to withstand seismic acceleration and velocity forces as specified in Section 23 05 48 – Vibration and Seismic Controls for Ductwork, Piping and Equipment. Provide seismic bracing for suspended equipment as specified in Section 23 05 48.

3.4 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.5 Field Quality Control

.1 Commissioning:

.1 In accordance with Section 01 91 31 General Commissioning (Cx) Requirements, and Section 23 08 00 – Commissioning of Mechanical Systems.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 61 00	Common Product Requirements
.4	Section 01 74 11	Cleaning
.5	Section 01 74 19	Waste Management and Disposal
.6	Section 23 05 00	Common Work Results – Mechanical
.7	Section 23 31 10	Cleaning of Mechanical Duct Systems

1.2 System Description

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.3 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Indicate following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.5 Neck velocity.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.4 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with 01 35 33 - Health and Safety Requirements.

1.5 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 PRODUCTS

2.1 General

.1 Size as indicated.

.2 Capacity, pressure drop, terminal velocity, throw, noise level, neck velocity shall conform to intended performances of specified materials.

.3 Frames:

.1 Full perimeter gaskets.

.2 Plaster frames where set into plaster or gypsum board and as specified on architectural reflected ceiling plans.

.3 Concealed fasteners.

.4 Where balancing damper is scheduled, damper shall be of opposed blade type.

.5 Diffusers, grilles and registers in areas with high humidity shall be of aluminum construction.

.6 Provide neck transition as required.

2.2 Manufactured Units

.1 Grilles, registers and diffusers of same generic type, product of one manufacturer.

2.3 Exhaust and Transfer Grilles and Registers

.1 Exhaust grille, Type EG-1: fixed louvre, aluminum, 32 mm border, 45 degree deflection, 19mm blade spacing, front blades parallel to long dimension. Finish: white baked enamel.

.2 Exhaust register, Type ER-1: fixed louvre, aluminum, 32 mm border, 45 degree deflection, 19mm blade spacing, front blades parallel to long dimension, opposed blade damper. Finish: white baked enamel.

.3 Transfer grille, Type TG-1: egg crate, aluminum frame, 13 mm x 13 mm x 13 mm aluminum grid core, lay-in. Finish: white baked enamel.

.4 Transfer grille, Type TG-2: fixed louvre, aluminum, 32 mm border, 45 degree deflection, 19mm blade spacing, front blades parallel to long dimension. Finish: white baked enamel.

PART 3 EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Installation

.1 Install in accordance with manufacturer's instructions.

.2 Install with flat head screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

.4 Paint matte black behind all diffusers, grilles and registers so that no metallic part will be visible from the exposed side.

3.3 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning, and Section 23 31 10 - Cleaning of Mechanical Duct Systems.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 61 00	Common Product Requirements
.4	Section 01 74 11	Cleaning
.5	Section 01 74 19	Waste Management and Disposal
.6	Section 23 05 00	Common Work Results – Mechanical
.7	Section 23 31 10	Cleaning of Mechanical Duct Systems

1.2 References

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.3 Air Movement and Control Association (AMCA)

1.3 System Description

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.4 Submittals

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Indicate following:

.1 Pressure drop.

.2 Face area

.3 Free area.

.4 Beginning point of water penetration.

.2 Quality assurance submittals: submit following in accordance with 01 33 00 – Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.3 Test Reports:

.1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

1.5 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 001 61 00 – Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

PART 2 PRODUCTS

2.1 Louvres

.1 Louvres shall have free areas as scheduled, be of extruded aluminum sections and have all welded assemblies. Fitted with removable aluminum 12mm (1/2") mesh, 16 gauge bird-screen on interior. Louvre flanges shall be suitable for type of construction encountered, caulked and weather-tight.

PART 3 EXECUTION

3.1 Manufacturer’s Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Installation

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking around to ensure weather tightness.

3.3 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning, and Section 23 31 10 - Cleaning of Mechanical Duct Systems.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1	Section 01 33 00	Submittal Procedures
.2	Section 01 35 33	Health and Safety Requirements
.3	Section 01 74 11	Cleaning
.4	Section 01 74 19	Waste Management and Disposal
.5	Section 23 05 00	Common Work Results – Mechanical
.6	Section 26 05 00	Common Work Results for Electrical

1.2 References

.1 National Electrical Manufacturer's Association (NEMA)

.2 Canadian Standards Association (CSA International):

.1 CSA C22.2 No.46-2013, Electric Air-Heaters.

1.3 Product Data

.1 Submit product data in accordance with Section 01 01 50 – General Instructions

.2 Submit product data sheets for unit heaters. Include:

.1 Product characteristics.

.2 Performance criteria.

.3 Mounting methods.

.4 Physical size.

.5 kW rating, voltage, phase.

.6 Cabinet material thickness.

.7 Limitations.

.8 Colour and finish.

.3 Manufacturer’s Instruction: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

1.4 Closeout Submittals

.1 Provide operation and maintenance data for unit heaters for incorporation into manual specified in Section 01 33 00 – Submittal Procedures.

1.5 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material for recycling.

.4 Diver unused metal and wiring materials from landfill to metal recycling facility.

1.6 Quality Assurance

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.7 Spare Materials

.1 Provide the following spare materials:

.1 6@ 3kW electric cabinet unit heater, ECUH-1

.2 3@ 3kW electric unit heater, EUH-1

.3 1@ 1kW electrical wall heater EWH-1

PART 2 PRODUCTS

2.1 Electric Unit Heaters

.1 General: Electric unit heater to CSA C22.2 No.46, horizontal or downflow discharge complete with adjustable louvres finished to match cabinet.

.2 Fan type unit heaters with built-in high-heat limit protection, fan-delay switches, heavy duty contactor and wall-mounted line voltage thermostat.

.3 Fan motor: with resilient mount.

.1 Built-in fan motor thermal overload protection.

.4 Hanger: 12mm [1/2”] diameter hanger rod with rubber vibration isolators on supporting rods.

.5 Element: steel sheath with brazed fins.

.6 Cabinet: 18 and 20 gauge steel, fitted with brackets for rod or wall mounting.

.7 Controls: As specified.

.8 The following factory installed/prewired optional equipment shall be supplied:

.1 Disconnect switch [40A].

.2 24V control relay with transformer.

2.2 Electric Wall Heaters

.1 General: Commercial grade, electric wall heater to CSA/cUL, designed for wall mounting, surface or recessed mounting.

.2 Construction: 18 gauge steel cover with bottom air outlet.

.3 Finish: epoxy/polyester powder paint.

.4 Fan: closed, factory-lubricated, with fan delay.

.5 Heating elements: tubular heating element with fins.

.6 Safety control: high-limit temperature control with automatic reset.

.7 Controls: As specified.

.8 The following factory installed/prewired optional equipment shall be supplied:

.1 Disconnect switch [40A].

.2 24V control relay with transformer.

2.3 Electric Cabinet Unit Heaters

.1 General: Electric cabinet unit heater to CSA/cUL, designed for mounting in any position, including on-end, fully recessed, semi-recessed or surface mounted.

.2 Construction: 18 gauge steel with extruded aluminum bar grilles.

.3 Finish: epoxy/polyester powder paint.

.4 Fan: direct drive, variable speed squirrel-cage fan, with fan delay.

.5 Heating elements: tubular heating element with fins.

.6 Safety control: high-limit temperature control with automatic reset.

.7 Cabinet length: as scheduled.

.8 Temperature control: As specified.

.9 Heat selection / fan speed: Two fan speeds and high-low heat ranges shall be selectable by means of a single rocker switch located behind the front cover.

.10 The following factory installed/prewired optional equipment shall be supplied:

.1 Disconnect switch [40A].

.2 Permanent (washable) filter

.3 24V control relay with transformer.

Electric Duct Heater

.1 General: Tubular Duct Heater Flanged-Type. CSA/NRTL/C Approved.

.2 Construction: Corrosion resistant galvanized steel enclosure.

.3 Heating elements: Heating elements shall be tubular type made of heavy gauge incoloy 800 filled with compacted magnesium oxide insulating powder.

.4 Air Flow Switch: Used to prevent Heater from operating if there is no air flow.

.6 Automatic Reset Thermal Cut-out: Automatic reset thermal cut-out is a fail-safe, fixed temperature, disc type safety device that opens the circuit when it's set point is reached. Automatically resets and returns the heater to operating conditions.

.7 SCR Controller: Time proportioning type controller that modulates the heater and supplies the exact amount of power to match the heat demand.

.8 Transformer: Built-in control transformer supplies 24 volts to the control circuit.

.9 Fuses: Protection for the for the total load or individual stages.

.10 Solid State Relay: Electronic contactor used to silently and proportionally control the heater response to a pulsed signal.

.11 Disconnect Switch: Built-in disconnect switch allows user to disconnect heaters to safely perform maintenance work.

.12 Modulating Duct Thermostat: Provide thermistor proportional type that is compatible with the heater controls. Provide metal casing.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with manufacturer's instructions.

.2 Suspend unit from ceiling or mount on wall as indicated.

.3 Maintain sufficient clearance to permit performance of service maintenance.

.4 Install thermostats in locations indicated.

3.2 Field Quality Control

.1 Perform test in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Test cut-out protection when air movement is obstructed.

.3 Test fan delay switch to assure dissipation of heat after element shuts down.

.4 Test unit cut-off when fan motor protection has operated.

.5 Ensure heaters and controls operate correctly.

3.3 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

EXHAUST FANS								
Mark	EF-1		EF-1		EF-1		EF-1	
Service/Location	General Exh. Green Point #1 [Type BJ		General Exh. Green Point #4 [Type BJ		General Exh. Long Beach North [Type A]		General Exh. Long Beach South [Type A]	
Type	Inline Cabinet		Inline Cabinet		Inline Cabinet		Inline Cabinet	
Size	-		-		-		-	
Drive	Direct Drive		Direct Drive		Direct Drive		Direct Drive	
Air Flow - Lis (cfm)	416	882	416	882	416	882	416	882
External S.P. - Pa (in w.g.)	188	0.75	188	0.75	188	0.75	188	0.75
BHP / Motor HP		735W		735W		735W		735W
Power Supply	115/1/60		115/1/60		115/1/60		115/1/60	
RPM	1,100		1,100		1,100		1,100	
Tip Speed	-		-		-		-	
Sones	3.0		3.0		3.0		3.0	
Notes	1,2,3,4		1,2,3,4		1,2,3,4		1,2,3,4	

Mark	EF-1		EF-1					
Service/Location	General Exh. Incinerator Rock **[Type A1]**		General Exh. Wickannish Beach [Type A]					
Type	Inline Cabinet		Inline Cabinet					
Size	-		-					
Drive	Direct Drive		Direct Drive					
Air Flow - Lis (cfm)	**416**	**882**	**416**	**882**				
External S.P. - Pa (in w.g.)	188	0.75	**188**	0.75				
BHP / Motor HP		**735W**		**735W**				
Power Supply	115/1/60		**115/1/60**					
RPM	**1,100**		**1,100**					
Tip Speed	-		-					
Sones	**3.0**		**3.0**					
Notes	**1,2,3,4**		**1,2,3,4**					

Specification for accessories not scheduled. Refer to drawings for installation details.

1. Complete with backdraft damper, disconnect switch, rubber mount isolators & steel grille.
2. Galvanized steel housing, Sound absorbing insulation, outlet duct collar with spring loaded integral BOD, adjustable mounting brackets, square duct connection
3. Motor with thermal overload and motor with CSA appoval
4. Fan size 890(W)x375(L)x375(D) [35"Wx15"Lx15"0]

LOUVRES

Mark	L-1		L-1		L-1		L-1		L-1	
Service/Location	Exhaust Green Point #1 [Type BJ		Exhaust Green Point #4 [Type BJ		0/A Intake Long Beach N. [Type AJ		0/A Intake Long Beach S. [Type AJ		0/A Intake Wickannish Beach [TypeAJ	
Air Flow - Us (cfm)	416	882	416	882	416	882	416	882	416	882
Width - mm (in.)	610	24	610	24	610	24	610	24	610	24
Height - mm (in.)	356	14	356	14	508	20	508	20	508	20
Depth - mm (in.)	152	6	152	6	152	6	152	6	152	6
Face Area - m^2 (Sq. Ft.)	0.2	2.3	0.2	2.3	0.3	3.3	0.3	3.3	0.3	3.3
Face Velocity - m/s (FPM)	35.0	378	35.0	378	24.5	265	24.5	265	24.5	265
Air P.O. - Pa (in w.g.)	25	0.1	25	0.1	25	0.1	25	0.1	25	0.1
Notes										

Mark	L-1		L-2		L-3		L-3			
Service/Location	0/A Intake Incinerator Rock [Type A1J		Exhaust Incinerator Rock [Type A1J		0/A Intake Green Point #1 Crawl Space		0/A Intake Green Point #4 Crawl Space			
Air Flow - Us (cfm)	416	882	416	882	85	180	85	180		
Width - mm (in.)	610	24	610	24	305	12	305	12		
Height - mm (in.)	508	20	356	14	305	12	305	12		
Depth - mm (in.)	152	6	152	6	152	6	152	6		
Face Area - m^2 (Sq. Ft.)	0.3	3.3	0.2	2.3	0.1	1.0	0.1	1.0		
Face Velocity - m/s (FPM)	24.5	265	35.0	378	16.7	180	16.7	180		
Air P.O. - Pa (in w.g.)	25	0.1	25	0.1	25	0.1	25	0.1		
Notes										

Select louvre fastening type to suit building construction.

Custom baked enamel finish. Colour to be selected by Architect at shop drawing review.

Air P.O. = 46 Pa (0.18 in. w.g.) at beginning point of water penetration, 381 m/min (1,250 FPM).
Provide 12mm birdscreen on all louvres.
See architectural drawing for flange option and flashing detail.
See floor plans for quantity.

MOTORIZED DAMPERS						
Mark	MD-1		MD-1		MD-1	
Service	*OIA* Intake Green Point #1		*OIA* Intake Green Point #4		*OIA* Intake Long Beach N.	
Air Flow - Lis (cfm)	416	882	416	882	416	882
Width - mm (in.)	356	14	356	14	356	14
Height - mm (in.)	609.6	24	610	24	610	24
Free Area - Sq. Metres (Sq. Ft.)	0.2	2.3	0.2	2.3	0.2	2.3
Face Velocity - mis (FPM)	35.0	378	35.0	378	35.0	378
Notes	1,2		1,2		1,2	

Mark	MD-1		MD-1		MD-1	
Service	*OIA* Intake Long Beach S.		*OIA* Intake Incinerator Rock		*OIA* Intake Wickannish Beach	
Air Flow - Lis (cfm)	416	882	416	882	416	882
Width - mm (in.)	356	14	356	14	356	14
Height - mm (in.)	610	24	610	24	610	24
Free Area - Sq. Metres (Sq. Ft.)	0.2	2.3	0.2	2.3	0.2	2.3
Face Velocity - mis (FPM)	35.0	378	35.0	378	35.0	378
Notes	1,2		1,2		1,2	

1. Air P.O. shall be less than 7 Pa (0.03 in. w.g.) at 5.08 mis (1,000 FPM).
2. Insulated blade.

ELECTRIC CABINET UNIT HEATERS				
Mark	ECUH-1	ECUH-2	ECUH-3	ECUH-4
Location	Various - All Sites	Various - All Sites	Various - All Sites	Various - All Sites
Heating Cap. - kW (MBH)	3.0 | 10.2	3.o | 10.2	3.o | 10.2	3.o | 10.2
Power Supply	240/1/60	240/1/60	240/1/60	240/1/60
Notes	1,2	1,2	1,2	1,2

Refer to Specification for accessories not scheduled. Refer to drawings for installation details.

See floor plans for quantity.

Notes:
1. Cabinet length = 711mm. For recessed mounting; c/w wall mounting kit and special back plate.
2. Complete with disconnect switch (40A), 24V control relay with transformer, and washable

ELECTRIC UNIT HEATERS								
Mark	EUH-1							
Model	-							
Fan Motor Horsepower	-							
Fan Motor RPM	-							
Air Flow - Lis (cfm)	240	510						
Heating Cap. - kW (MBH)	3	10.26						
WeiQht - Kg (lbs)	9.10	20.0						
Power Supply	240/208, 1/60							
Amps	-							
Mounting Orientation	Horizontal							
Notes	1,2,3,4							

Refer to Specification for accessories not scheduled. Refer to drawings for installation details.

See floor plans for quantity.

Notes:
1. Unit size: 419(W)x432(D)x305(H) or [16.5"Wx17"Dx12"H)

2. Complete with disconnect switch. Refer to Section 23 09 33 Electric and Electronic Control System for Mechanical Systems for control requirements.

3. Stainless steel heating element, mounted brackets for ceiling or wall installation, 1-year warranty against defect, totally enclosed factory-lubricated motor, thermally protected motor, adjustable louvres to control warm air flow, epoxy/polyester powder paint.

4. EUH to be c/w 24V relay & transformer.

PUMPS								
Mark	DWP-1							
Type	Wet rotor							
Location	Mech Rm - All Sites							
Service	DHWR							
Flow - Lisee (usgpm)	0.1893	3						
Head - kPa (ft.)	18	6						
Pipe Size - mm (in.)	20	3/4						
BHP @ Runout | Motor HP		1/4						
Power Supply	115/1/60							
RPM								
Notes	1,2,3							

1. Pumps to be bronze or stainless steel construction for all domestic water applications.
2. Pump to be with 3-step speed selector.
3. Thermal overload protector.

SUPPLY FANS								
Mark	SF-1		SF-1					
Service	Crawl Space - Supply Green Point #1 [Type BJ		Crawl Space - Supply Green Point #4 [Type BJ					
Type	Inline Cabinet		Inline Cabinet					
Size	-		-					
Drive	Direct Drive		Direct Drive					
Air Flow - Us (cfm)	85	180	85	180				
External S.P. - Pa (in w.g.)	156	0.63	156	0.63				
BHP / Motor HP		108W		108W				
Power Supply	120/1/60		120/1/60					
RPM								
Tip Speed								
Sones	-		-					
Notes	1,2,3		1,2,3					

Specification for accessories not scheduled. Refer to drawings for installation details.

1. Complete with disconnect switch, and rubber mount isolators.
2. Galvanized steel housing, sound absorbing insulation, outlet duct collar, adjustable mounting brackets, square duct connection etc.
3. Motor with thermal overload and CSA appoval.

ELECTRIC DUCT HEATERS								
Mark	EDH-1		EDH-1					
Service	Crawl Space Supply Green Point #1 [Type BJ		Crawl Space Supply Green Point #4 [Type BJ					
Type	RFT		RFT					
Width - mm (in.)								
Height - mm (in.)								
Air Flow - Lis (cfm)	85	180	85	180				
Face Velocity - m/s (FPM)								
Air P.O. - Pa (in. w.c.)	949	0.10	949	0.10				
Enterinq Air Temp. °C (°F)	-4.0	24.8	-4.0	24.8				
Leaving Air Temp. °C (°F)	7.2	45.0	7.2	45.0				
Heating Cap. - kW (MBH)	1.2	3.9	1.2	3.9				
Power Supply	120/1/60		120/1/60					
Notes	1, 2, 3		1,2. 3					

Refer to Specification for accessories not scheduled. Refer to drawings for installation details.

SC - Slip-in open coil type.
ST - Slip-in Tubular type.
FC - Flanged open coil type.
FT - Flanged Tubular type.
RFC - Round collar open coil type.
RFT - Round collar tubular type.

1. 2030 duct connection. c/w SCR controller (modulating), modulating duct thermostat in metal casing. Tubular coil type. Automatic and manual reset thermal cut-out. Differential airflow proving switch. CSA approved for zero clearance from combustible.
2. Local disconnect switch.
3. Airflow switch is standard.

ELECTRIC WALL HEATERS					
Mark	EWH-1				
Location	GP#1 & GP#4				
Heating Cap. - kW (MBH)	1.5 | 5.1	|	|	|	
Power Supply	120/1/60				
Notes	1,2,3,4				

Refer to Specification for accessories not scheduled. Refer to drawings for installation details.
See floor plans for quantity.

Notes:

1. For recessed mounting. Complete with wall mounting kit. Construction: 20 gauge steel. Epoxy/polester powder paint finish.
2. Durable tubular heating elements with fins. For recessed mounting; c/w wall mounting kit and special back plate.
3. Complete with disconnect switch. (40A] and 24V relay with transformer.
4. Heater size 406(W)x558(H)x102(D) (16"Wx22"Hx4"D]. Install heater at location shown on Dwg.

1 GENERAL

1.1 SECTION INCLUDES

.1 This Section covers items common to Sections of Division 26. This section supplements the requirements of Section 01 11 55.

1.2 CODES AND STANDARDS

.1 Do complete installation in accordance with the latest CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1987 except where specified otherwise.

1.3 SCOPE OF WORK

.1 The scope of Work covered by these specifications and drawings covers the complete fit-up of the project area including but not limited to:

.1 Demolition of existing Washroom buildings at Incinerator Rock, Long Beach North, Long Beach South, Wickaninnish Beach, Green Point #1 and Green Point #4,

.2 Power distribution system in each new Washroom building including panelboards and circuit breakers,

.3 Lighting including luminaires and control devices such as occupancy, daylight and photocell sensors and relays,

.4 Sewage lift station electrical kiosk and control panel at Wickaninnish Beach,

.5 Service conduits, service pole (at Incinerator Rock), meter bases, coordination with “BC Hydro”,

.6 Raceways,

.7 Cables and wiring,

.8 Grounding and bonding,

.9 Labeling,

.10 All necessary attachments, brackets and braces for mounting and supporting equipment,

.11 All necessary materials, labour, apparatus and tools to complete the installation.

1.4 CARE, OPERATION AND START-UP

.1 Instruct Departmental Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.5 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.6 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.

.4 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Departmental Representative.

1.7 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 11 55 - General Requirements.

.2 All equipment and materials shall be new and shall bear a certification mark (CSA, ULc, ETL, etc.) that is acceptable to the BC Safety Authority. Where there is no alternative to supplying equipment which does not bear an acceptable certification mark, obtain special approval from Electrical Inspection Department.

.3 Factory assemble control panels and component assemblies.

1.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.

.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.9 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates:

.1 Lamicoid 3 mm thick plastic engraving sheet, white face, black core unless indicated otherwise attached with epoxy cement similar to Locktite 414 adhesive. Pre-gummed labels are not acceptable.

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.1 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.2 Allow for average of twenty-five (25) letters per nameplate and label.

.3 Identification to be English.

.4 Nameplates for junction and pull boxes to indicate system and/or voltage characteristics.

.5 Nameplate for pull boxes to indicate system and type of cable.

1.10 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

1.11 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.12 MANUFACTURERS AND CSA LABELS

.1 Visible and legible, after equipment is installed.

1.13 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Departments and Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm.

1.14 LOCATION OF OUTLETS

.1 Locate outlets as indicated on drawings.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.3 Do not install outlets back-to-back in walls; allow minimum 150 mm horizontal clearance between boxes.

.4 Locate light switches as indicated on drawings.

1.15 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise:

.1 Local switches: 1200 mm

.2 Wall receptacles: 400 mm

.3 Over-the-counter receptacles: as shown on electrical drawings or as instructed by the Engineer.

1.16 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

1.17 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

1.18 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The Work of this division to be carried out by a Contractor who holds a valid Master Electrical contractor license as issued by the Province that the work is being constructed.

.3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.4 Insulation resistance testing.

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Check resistance to ground before energizing.

.5 Carry out tests in presence of Departmental Representative.

.6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.7 Submit test results for Departmental Representative's review.

1.19 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

1.20 RECORD DRAWINGS AND MAINTENANCE MANUALS

.2 Submit 3 CDs and 3 hardcopies of the record drawings in Autocad format after Departmental Representative’s approval.

.3 Submit 3 sets of maintenance manuals. The manuals shall include all shop drawings, catalogue numbers of all electrical equipment installed and manufacturer’s parts list.

1.21 SEISMIC BRACING

.1 All new and relocated equipment / panels shall be seismic braced per NBC 2010.

1.22 FIRESTOPPING

.1 Install fire stopping in new and existing penetrations through fire rated walls and floors.

.2 Fire stopping material to match fire rating of walls and floors.

1.23 STORAGE OF ELECTRICAL EQUIPMENT

.1 All equipment shall be adequately protected from damage and dust, dampness or any other injurious substances during delivery to the site, while stored at the site and after construction. Equipment stored in unheated or open areas on the site shall be covered and provided with thermostatically controlled heaters of sufficient size to keep the temperature of the equipment above the dew point. Control panels and other electrical equipment shall not be installed until the room in which they are to be installed is completely free of any dust, dirt, dampness, construction debris or any other contaminants that might affect the future operation of the electrical equipment.

.2 Storage shall be made accessible to the Departmental Representative at any time for determining the condition of the storage.

1.24 SPARE PARTS

.1 Refer to other sections of Specifications for spare parts that are required.

2 PRODUCTS

2.1 NOT USED

.2 Not used.

3 EXECUTION

3.1 NOT USED

.3 Not used.

END OF SECTION

PART 1 – GENERAL

1.1 References

.1 CSA C22.2 No.65-93 - Wire Connectors.

PART 2 – PRODUCTS

2.1 Materials

.1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

PART 3 - EXECUTION

3.1 Installation

.1 Remove insulation carefully from ends of conductors and:

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

********** END **********

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

.1 C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131-M89(R1994), Type TECK 90 Cable.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.1 BUILDING POWER WIRING

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of chemically cross linked thermosetting polyethylene material rated RW90 for above ground wiring.

.3 Copper conductors: size as indicated, with 600 V insulation of chemically cross linked thermosetting polyethylene material rated RWU90 for under ground wiring.

2.2 BUILDING CONTROL WIIRNG

.1 Copper conductors: with 600 V insulation of chemically cross linked thermosetting polyethylene material rated RW90. Minimum size: 14 AWG.

2.3 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum.

.6 Overall covering: polyvinyl chloride material.

.7 Fastenings:

.1 One hole malleable iron straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 3000 mm centers.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Type: flame retardant jacket over thermoplastic armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2 m.

.5 Connectors: Spin on watertight.

3 EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34.

.2 In underground conduit systems in accordance with Section 26 05 44.

3.2 INSTALLATION OF TECK CABLE

.1 Group cables wherever possible on channels.

3.3 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

.1 This Section covers items common to Sections of Division 26. This Section supplements requirements of Division 01.

1.2 REGULATORY REQUIREMENTS

.1 Restraints shall meet the requirements of the National Building Code, and B.C. Building Code.

.2 All electrical equipment that is new or being relocated is to be seismically restrained.

1.3 SEISMIC RESTRAINT DESIGN AND INSPECTION

.1 Arrange and pay for the services of a professional engineer registered in the province of B.C. “Seismic Engineer” who shall provide all required engineering services related to seismic restraints of the equipment.

.2 The Seismic Engineer shall provide assistance to the contractor during the course of the equipment install if necessary.

.3 The Seismic Engineer shall inspect the completed seismic installation and shall submit a letter to the departmental representative stating that the complete seismic installation is installed in accordance with the Seismic Engineer’s drawings and it complies with all regulatory requirements.

1.4 SUBMITTALS

.1 Submit shop drawings of all restraining devices, including details of attachments to the structure, either tested in an independent testing laboratory or approved by a B.C. registered professional Engineer.

1.5 SCOPE OF WORK

.1 Provide restraint for electrical all equipment, including generator, transfer switch, and all other related electrical equipment, to prevent injury or hazard to persons and equipment and to retain equipment in its normal position in the event of an earthquake.

.2 Provide all seismic restraint related hardware, including bolts and anchors, from point of attachment to equipment through to and including attachment to structure.

.3 It is the entire responsibility of equipment manufactures to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

2 PRODUCTS

2.1 GENERAL

.1 Provide anchor bolts, straps and other mounting materials as specified by Seismic Engineer.

3 EXECUTION

3.1 INSTALLATION

.1 Carry out all seismic restraint works on electrical equipment as per the recommendations of the Seismic Engineer and in accordance with all regulatory requirements.

.2 Co-ordinate the work with other trades as required.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

.2 Section 26 05 02 - Common Work Results - Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837-1989(R1996), Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

.5 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.1 EQUIPMENT

.1 Rod electrodes: copper clad steel 19 mm diameter by 3.0 m long complete with inspection well unless noted otherwise on drawings.

.2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.3 Insulated grounding conductors: green, type RW 90.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Reconnect all existing ground connections.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.8 Install separate ground conductor in all raceways, minimum size #12 AWG.

3.2 ELECTRODES

.1 Install rod electrodes and make grounding connections.

.2 Bond separate, multiple electrodes together.

3.3 EQUIPMENT BONDING

.1 Install bonding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 02 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 01 50 – General Instructions for Construction/Demolition Waste Management And Disposal.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 01 50 – General Instructions for Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal, conduit and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

.5 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, suspended.

3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 5 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Departmental Representative.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 EXTERIOR JUNCTION BOXES

.1 All exterior junction boxes shall be Rigid PVC type.

3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION AND PULL BOX INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 75m of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 02 – Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

1 GENERAL

1.1 REFERENCES

.1 CSA C22.1, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES - GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 120 V outlet boxes for 120 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.

2.3 CONDUIT BOXES

.1 Rigid PVC boxes with mounting feet for surface wiring of exterior mounted switches and receptacles.

2.4 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.2 No. 18-98, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.

.2 CSA C22.2 No. 45-M1981 (R1992), Rigid Metal Conduit.

.3 CSA C22.2 No. 56-1977 (R1999), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83-M1985 (R1999), Electrical Metallic Tubing.

.5 CSA C22.2 No. 211.2-M1984 (R1999), Rigid PVC (Unplasticized) Conduit.

.6 CAN/CSA C22.2 No. 227.3-M91 (R1999), Flexible Nonmetallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

2 PRODUCTS

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Rigid steel conduit: to CSA C22.2 No. 45, galvanized steel, threaded.

.3 Rigid PVC conduit.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Channel type supports for two or more conduits at 3 m oc.

.3 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Set screws connectors and couplings for EMT. Cast type metal connectors and couplings are not permitted.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

2.4 FISH CORD

.1 Polypropylene.

3 EXECUTION

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Use rigid steel conduit on outside installations where indicated.

.3 Use electrical metallic tubing (EMT) where indicated.

.4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.5 Minimum conduit size for lighting and power circuits 21 mm.

.6 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.7 Mechanically bend steel conduit over 21 mm dia.

.8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.9 Install fish cord in empty conduits.

.10 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.11 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Do not place conduits is slabs in which slab thickness is less than 4 times conduit diameter.

3.4 WIRE IN CONDUIT

.1 All wiring shall be in conduit unless otherwise indicated.

END OF SECTION

1 GENERAL

1.1 REFERENCES

.1 CSA C22.1-2012 Canadian Electrical Code, Part 1.

1.2 RELATED WORK

.1 Section 01 11 55 – General Instructions.

.2 Section 26 05 02 – Common Work Results – Electrical.

.3 Section 26 05 21 – Wire and Cables 0 – 1000 V.

.4 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

2 PRODUCTS

2.1 NOT USED

.1 Not used.

3 EXECUTION

3.1 INSTALLATION

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables in ducts.

.3 Install multiple cables in ducts simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 Use specified rope to pull cables into ducts.

.6 Before pull cables into ducts and until cables are properly terminate, seal end of cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct seal compound.

.8 Provide pull string in all ducts for future use.

3.2 FIELD QUALITY CONTROL

.1 Perform tests of each type of cable and system as indicated.

.2 Remove and replace entire length of cable if cable fails to meet any test criteria.

END OF SECTION

1 GENERAL

1.1 RELATED WORK

.1 Excavation and backfilling: Section 02223 Excavating, Trenching and Backfilling

1.2 REFERENCES

.1 Canadian Standards Association (CSA) - CSA C22.2 No. 211.1, Rigid Types EBI and DB2/ES2 PVC Conduit.

.2 Canadian Standards Association (CSA) - CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit

2 PRODUCTS

2.1 PVC CONDUITS AND FITTINGS – RIGID PVC AND DB2

.1 Rigid PVC conduit for direct burial: with expanded flange ends, with minimum wall thickness at any point of 2.8 mm. Nominal length: 3 m plus or minus 12 mm.

.2 Rigid PVC reducers, bell end fittings, plugs, caps, adaptors as required to make complete installation.

.3 Rigid PVC 90 deg. and 45 deg. bends as required.

.4 Rigid PVC 5 deg. angle couplings as required.

.5 DB2 PVC conduit, orange colour for direct burial or concrete encasement: DB2 PVC conduit shall be used for future fibre-optic cables only. Size and quantity as shown on drawings.

.6 DB2 PVC reducers, bell end fittings, plugs, caps, adaptors as required to make complete installation.

.7 DB2 PVC conduit bends shall be long-sweep type only (minimum 36” radius).

.8 Expansion joints as required.

2.2 SOLVENT WELD COMPOUND

.1 Solvent weld compound for PVC conduit joints.

2.3 CABLE PULLING EQUIPMENT

.1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.4 MARKERS

.1 150 mm wide polyethylene warning tape marked “Warning - Buried Electric Line”.

3 EXECUTION

3.1 INSTALLATION

.1 Install conduit in accordance with manufacturer's instructions.

.2 Clean inside of conduits before laying.

.3 Ensure full, even support every 1.5 m throughout conduit length.

.4 Slope conduits with 1 to 400 minimum slope.

.5 During construction, cap ends of conduits to prevent entrance of foreign materials.

.6 Pull stiff bristle brush through each conduit immediately before pulling-in cables.

.7 In each conduit install pull rope continuous throughout each conduit run with 3 m spare rope at each end.

.8 Install markers as required.

.9 Where a conduit leaves a warm room and enters a cooler atmosphere, it shall be sealed so as to prevent breathing and subsequent condensation, and shall be done in such a manner that condensate will not be trapped at the seal.

END OF SECTION

1 GENERAL

1.1 REFERENCES

.1 CAN/CSA-C83-96 - Communication and Power Line Hardware.

1.2 CO-ORDINATION WITH POWER SUPPLY AUTHORITY

.1 Co-ordinate and meet requirements of power supply authority. Ensure availability of power when required.

2 PRODUCTS

2.1 MATERIAL

.1 Service mast: rigid galvanized steel, suitable for attachment of support clamps, weatherhead, service drop fittings.

.2 Service mast support devices.

.3 Weatherhead: cast

.4 Rigid steel galvanized conduit, necessary fittings: to Section 26 05 34 - Conduits, Conduits Fastenings and Conduit Fittings.

.5 Service drop conductors: to Section 26 05 21 - Wires and Cables (0-1000V), copper type, size and number of conductors as indicated.

.6 Meter socket: as specified on the drawings and to the approval of supply authority.

3 EXECUTION

3.1 INSTALLATION

.1 Install service mast, insulator rack, weatherhead.

.2 Install meter socket and conduit.

.3 Install service drop conductors allowing adequate conductor length for connection to service equipment.

.4 Allow adequate conductor length for connection to supply by power supply authority.

.5 Allow adequate conductor length for drip loops.

.6 Make grounding connections in accordance with Section 26 05 28 - Grounding and Bonding.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 02 - Common Work Results - Electrical.

.2 Perform additional tests if required by authority having jurisdiction.

END OF SECTION

1 GENERAL

1.1 CO-ORDINATION WITH POWER SUPPLY AUTHORITY

.1 Co-ordinate and meet requirements of power supply authority. Ensure availability of power when required.

2 PRODUCTS

2.1 MATERIALS

.1 Underground ducts: to Section 26 05 45 - Direct Buried Underground Ducts, rigid type, size as indicated.

.2 Rigid steel galvanized conduit and fittings: to Section 26 05 34 - Conduits, Conduits Fastenings and Conduit Fittings.

.3 Conductors: copper, type RW90, to Section 26 05 21 - Wires and Cables (0-1000V), size and number of conductors as indicated.

.4 Meter socket: as specified on the drawings and to the approval of supply authority.

3 EXECUTION

3.1 INSTALLATION

.1 Install cables in trenches and in ducts conduit in accordance with Section 26 05 44 - Installation of Cables in Underground Ducts.

.2 Allow adequate conductor length for connection to supply by power supply authority.

.3 Install meter socket and conduit.

.4 Allow adequate conductor length for connection to service equipment.

.5 Make grounding connections in accordance with Section 26 05 28 - Grounding and Bonding.

.6 Provide suitable drainage in service conduit prior to point of building entry. Seal service conduit with suitable compound to prevent entry of moisture or gases.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 02 - Common Work Results - Electrical.

.2 Perform additional tests if required by authority having jurisdiction.

END OF SECTION

1 GENERAL

1.1 PRODUCT DATA

.1 Submit product data in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

2 PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SENSOR

.1 Wall mounting using stem and swivel.

.2 Thermal type control with built-in relay to ensure that the controlled lighting does not switch off due to light striking the photocell from car headlights or lightning.

.3 Self contained line voltage type capable of switching 1800W of lighting at 120V.

.4 Voltage variation: ±10%.

.5 Temperature range: -40ºC to 70ºC.

.6 Housing: high impact polycarbonate.

.7 Activation: 1-50 Lux ON; 3-15 Lux OFF

.8 Color coded leads: 150mm long.

.9 Minimum acceptable standard: Intermatic K4221C

2.2 OUTDOOR MOTION SENSOR

.1 Suitable for attachment directly onto electrical box cover plate

.2 Self contained line voltage type

.3 Capable of switching 1000W of lighting at 120V.

.4 Voltage variation: ±10%.

.5 Temperature range: -40ºC to 70ºC.

.6 Housing: high impact polycarbonate.

.7 270 degree field of view

.8 Weatherproof and raintight

.9 Rotatable front for easy coverage adjustment

.10 User adjustable time delay settings from 10 seconds to 15 minutes

.11 Minimum acceptable standard: WattStopper EW-200 series

2.3 INDOOR DAYLIGHT SENSOR

.1 Ceiling mounted self contained line voltage type mounted on single gang electrical box.

.2 Capable of finding optimum set-point and digitally programmable via simple push button commands.

.3 Capable of switching 800W of lighting at 120V.

.4 Green LED activity indicator.

.5 Temperature range: -10ºC to 75ºC.

.6 Relative humidity: 20 to 90% non-condensing.

.7 Minimum acceptable standard: Sensorswitch #CMR PC

2.4 INDOOR OCCUPANCY SENSOR

.1 Ceiling mounted self contained line voltage type mounted on single gang electrical box.

.2 360º coverage and dual technology with PIR / Microphonics detection

.3 Capable of switching 800W of lighting at 120V.

.4 Green LED activity indicator.

.5 Temperature range: -10ºC to 70ºC.

.6 Relative humidity: 20 to 90% non-condensing.

.7 Adjustable ON timer with minimum of 15 minutes

.8 Adjustable OFF time delay: from 3 seconds to 20 minutes

.9 Minimum 3.6 m radial coverage when mounted to 2.7 m ceiling for devices in shower stalls

.10 Minimum 8.5 m radial coverage when mounted to 2.7 m ceiling for devices common areas

.11 Minimum acceptable standard: Sensorswitch CMR PDT9 and PDT10

2.5 AC RELAY - CONTROL

.1 120 VAC operation

.2 Electrical life: minimum 200,000 operations

.3 SPDT or DPDT with quantity as required and c/w contacts rated for minimum 8 A

.4 High visibility LED indicator for coil status

.5 Socket for DIN-rail mounting

2.6 AC RELAY - POWER

.1 120 VAC coil

.2 General-purpose, open type

.3 Contacts rated 40A make & break at 120 VAC resistive

.4 Contact configuration as shown on drawings

.5 Minimum acceptable standard: Allen-Bradley “Bulletin 700-HG”

2.7 TIME CLOCK

.1 Digital daily timer

.2 Pulsed output configurable for up to 59 second pulse width

.3 Manual override switch

.4 SPST output contact, rated 15A resistive @ 240VAC

.5 Battery backup

.6 Minimum acceptable standard: Omron “H5F” Series #H5F-KB

2.8 LIGHTING/ EXHAUST FAN CONTROL CABINET

.1 Height and width as required to house all control devices with minimum 40% spare space. Depth: minimum 150 mm.

.2 Single hinged, lockable door and interior plastic pocket.

.3 Full size interior back panel.

.4 Minimum 14 gauge, stiffened steel body and door with welded seams.

.5 ANSI 61 grey exterior, white enamel interior.

3 EXECUTION

3.1 INSTALLATION

.1 Install all field lighting control devices in accordance with manufacturer's instructions.

.2 Install lighting / exhaust fan control cabinet c/w relays, time clock etc. Coordinate with Division 23 contractor for operation of exhaust fan. Confirm with Departmental Representative for programming of time clock.

.3 Install a detailed wiring diagram in the lighting / exhaust fan control cabinet.

3.2 FIELD QUALITY CONTROL

.1 Perform tests for correct operation.

3.3 SPARES

.1 Supply and deliver the following spare devices to Departmental Representative for a signed receipt:

.1 Six (6) outdoor photoelectric sensor.

.2 Six (6) outdoor motion sensor.

.3 Three (3) indoor daylight sensor.

.4 Six (6) indoor occupancy sensor

.5 Six (6) AC relays

.6 One (1) time clock

END OF SECTION

PART 1 – GENERAL

1.1 Product Data

.1 Submit shop drawings and product data in accordance with Section 26 05 02 - Common Work Results - Electrical.

PART 2 – PRODUCTS

2.1 Manual Transfer Switches (10 kA or less symmetrical interrupting capacity)

.1 Equipment Characteristics:
- .1 Non-fusible, horsepower-rated disconnect switch in EEMAC 1 enclosure, voltage, ampacity and poles as indicated on drawings.
- .2 Provision for padlocking in off switch position by one lock.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Quick-make, quick-break action. Rated 100% load make & break.
- .5 ON-OFF-ON switch position indication on switch enclosure cover.

.2 Minimum Acceptable Standards:
- .1 Cutler Hammer “DT” series (agent/distributor: Eaton-Yale Ltd.)
- .2 Square D “F” series (agent/distributor: Nedco)
- .3 Siemens “Double Throw” series (agent/distributor: Siemens Canada Ltd.)

2.2 Equipment Identification

.1 Provide equipment identification in accordance with Section 26 05 02 - Common Work Results - Electrical.

.2 Indicate names of source connections on transfer switch.

PART 3 – EXECUTION

3.1 Installation

.1 The contractor shall verify the required short circuit symmetrical interrupting capacity from the drawings or through consultation with the Engineer prior to ordering or installing transfer switches. Ensure that the transfer switch meets the required short circuit symmetrical interrupting capacity.

.2 Install transfer switches as shown on drawings.

********** END **********

1 GENERAL

2 PRODUCTS

2.1 UTILITY METER BASE (100A OR 200A)

.1 Meter base shall comply with BC Hydro requirements (or power supply authority having jurisdiction)

.2 Equipment characteristics:

.1 System voltage, ampacity, phases: As shown on drawings.

.2 For underground or overhead services.

.3 EEMAC3 steel enclosure

.4 CSA-approved for copper or aluminum conductors.

.5 Tunnel-type line, load and neutral lugs

.3 Minimum acceptable standard: Cutler-Hammer “Heavy Duty” series

2.2 UTILITY METER BASE (400A, 120/240V, 1-PHASE, 3-WIRE):

.1 Meter base shall comply with BC Hydro requirements (or power supply authority having jurisdiction)

.2 Equipment characteristics:

.1 400A, 120/240VAC, 1-phase, 3-wire.

.2 For underground or overhead services.

.3 EEMAC3 steel enclosure

.4 CSA-approved for copper or aluminum conductors.

.5 Tunnel-type line, load and neutral lugs

.6 Provision for current transformers & test switches (supplied by BC Hydro)

.3 Minimum Acceptable Standard:

.1 Thomas & Betts "Microlectric" series, #JS4B-STW

2.3 ENCLOSED CIRCUIT BREAKER

.1 To Section 26 28 21 - Moulded Case Circuit Breakers, rating as indicated.

2.4 PANELBOARD

.1 To Section 26 24 17 - Panelboards Breaker Type, rating as indicated.

3 EXECUTION

3.1 INSTALLATION

.1 Install service equipment

.2 Connect to incoming service.

.3 Connect to outgoing load circuits.

.4 Make grounding connections in accordance with Section 26 05 28 – Grounding and Bonding.

.5 Make provision for power supply authority's metering.

END OF SECTION

1 GENERAL

1.1 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.2 PLANT ASSEMBLY

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

1.3 REFERENCES

.1 Canada Standards Association (CSA International).

.1 CSA C22.2 No.29-M1989 (R2000), Panelboards and enclosed Panelboards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.2 120/240 V panelboard: bus and breakers rated for 10 kA (symmetrical) interrupting capacity.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, main breaker, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Copper bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim and door finish: baked grey enamel.

.9 Lockable door.

.10 CSA Approved.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 – Moulded Case Circuit Breakers.

.2 Breakers with thermal magnetic tripping in panelboards except as indicated otherwise.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Complete circuit directory with typewritten legend showing location and load of each circuit.

3 EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.

.2 Mount panelboards at height as indicated.

.3 Connect loads to circuits as indicated.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

1 GENERAL

1.1 PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic and corrugated cardboard packaging material in accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.1 ELECTRICAL KIOSK

.1 The kiosk shall be suitably sized to provide room for all components housed within. The dimensions shown on the drawings are approximate only. Final kiosk dimensions shall be determined by the manufacturer prior to fabrication.

.2 EEMAC 3R construction with rain gutter all around.

.3 Exterior panels shall be fabricated from #5052 marine-grade aluminum. Interior panels shall be fabricated from galvanized steel or #5052 marine-grade aluminum.

.4 Interior mounting pans shall be removable and suitable for drilling and tapping in order to mount internal components.

.5 Doors shall be marine-grade aluminum, fully-gasketted, 3-point latching with padlocking means and shall have bullet-style hinges with lower grease fittings. The padlocking means for the power compartment shall accommodate the installation of the Owners padlock and B.C. Hydro's padlock. The power compartment shall be made accessible via the removal of either of these padlocks.

.6 The kiosk shall be sufficiently braced and supported to form a rigid, free-standing structure and shall be equipped with lifting lugs.

.7 The entire kiosk enclosure shall be capable of withstanding maximum impact force of 86 MN/m2 area without rupture of material.

.8 The exterior walls and ceiling shall be fully-insulated with high-density polystyrene board with foil facing. "Soft" polystyrene batting or styrofoam board will not be accepted. All insulation joints and exposed edges shall be neatly covered with foil tape. Insulation shall be mechanically fastened to the interior enclosure walls with aluminium domed push-on caps (with mounting studs) as available from Crossroads C&I Distributors (604-421-1221).

.9 The metal base of the kiosk shall raise the bottom of the doors at least 100mm above the concrete pad.

.10 Controls and meters shall be at a level suitable for operation from ground elevation (ie. at eye level)

.11 The kiosk shall be sweep-blasted with aluminium oxide or glass bead media, covered with 2.0-3.0 mils of zinc-free powder primer coat, followed by 3.0-4.0 mils of powder top coat. The finish shall be free of thickness variations, poor adhesion, "orange peel", blistering, pinholes, craters, powder puffs, drips, color variations, clouding or grainy/wavy flow. The kiosk exterior shall be RAL #6005 "Moss Green" color. The interior mounting pans shall be white color. Primer coat shall be Tiger Drylac #69-70000 or equal. Top coat shall be Tiger Drylac – Series 38 or equal.

.12 All switches, panelboards, control panels and equipment shall be identified with engraved 3-ply lamacoid nameplates, white with black lettering.

.13 The kiosk base shall be caulked all around the outside perimeter where it meets the concrete slab. The base of the fan compartment shall be caulked all around the inside to prevent the leakage of wet well vapours into the other compartments.

.14 All wiring between the fan compartment and the electrical & controls compartments shall be run via rigid steel conduit with EYS seals. Seals are to be installed in accordance with BC Electrical Safety Act. Specific instructions for resealing the EYS seals shall be included in the O&M manual. Insofar as possible, the seals shall be positioned to facilitate the future removal and replacement of cables.

.15 There shall not be any control or power wiring junction boxes in the sewage wet well. Any splices in control or power cables shall be made at clearly-labelled terminal blocks (rated for Class 1, Zone 2 operation) within the junction box located in the kiosk fan compartment.

.16 The wet well ventilation fan shall be housed within a separate compartment. The fan compartment shall be continuously welded and shall contain sufficient air inlet louvers to provide adequate air flow to the lift station without causing excessive air velocities or noise via the louvers during fan operation. All louver openings shall be covered with bug screens. The combined area of the louver openings shall be a minimum of 150% of the cross-sectional area of the ventilation duct to the well well. (minimum 42.2 square inches for 6" duct; minimum 75.4 square inches for 8" duct; minimum 117.8 square inches for 10" duct)

.17 The wet well ventilation fan shall be arranged to draw fresh air from the inlet louvers at the top of the fan compartment and shall pressurize the wet well via the air duct running from the fan compartment the wet well. The fan motor shall be approved for use in a Class 1, Zone 2 environment. The fan blades shall be non-sparking and shall be guarded against accidental personnel contact via a mechanical barrier. The wet well ventilation fan shall be as listed in Specifications Section 16870. The size and type of the air duct shall be as shown on the drawings.

.18 A red 3-ply lamacoid nameplate with white lettering shall be placed immediately adjacent to the wet well ventilation fan starter (in the controls compartment). The nameplate shall read: "CAUTION: THE WELL VENTILATION FAN SHALL BE LEFT RUNNING AT ALL TIMES."

3 EXECUTION

3.1 INSTALLATION

.1 Mount equipment in kiosk. Configure and test all equipment prior to shipment to site.

.2 Mount kiosk on concrete pad. The kiosk shall be seismically-anchored to the concrete pad in accordance with the civil engineer's instructions.

3.2 TESTING

.1 Configure and test all equipment prior to shipment to site.

END OF SECTION

1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

2 PRODUCTS

2.1 SWITCHES

.1 15 A, 120 V or 347V, single pole, double pole, three-way, four-way switches to: CSA-C22.2, No.55 and CSA – C22.2, No.111.

.2 Manually-operated general purpose ac switches with following features:

.1 Specification grade.

.2 Terminal holes approved for No. 10 AWG wire.

.3 Silver alloy contacts.

.4 Urea molded housing.

.5 Suitable for back and side wiring.

.6 Ivory toggle.

.3 Toggle operated fully rated for fluorescent lamps, and up to 80% of rated capacity of motor loads.

2.2 RECEPTACLES

.1 Specification grade, duplex receptacles, CSA type 5-15 R or 5-20R, 125 V, 15 A or 20 A, U ground, with following features:

.1 Urea molded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and riveted grounding contacts.

.6 Ivory color.

.7 Other receptacles with ampacity and voltage as indicated.

2.3 GFCI RECEPTACLES

.1 Specification grade, self-contained with 15A, 120V circuit interrupter and duplex receptacle with following feature:

.1 Urea molded housing.

.2 Solid state ground sensing device.

.3 Triple wipe contacts and riveted grounding contacts.

.4 Ivory color.

.5 Integral “Test” and “Reset” Pushbuttons.

2.4 INDOOR COVER PLATES

.1 Brushed stainless steel cover plates for wiring devices in finished spaces.

.2 Sheet metal hot dip galvanized with rolled edges for surface mounted devices in service room.

2.5 OUTDOOR COVER PLATES

.1 Extra duty, die-cast, powdercoated, aluminum, while-in-use cover. Complete with mounting base, gasket and mounting screws.

.2 Certified type 3R for wet locations.

.3 Single gang with vertical orientation.

.4 Padlock hasp accepts up to 0.25” diameter shank.

.5 Minimum acceptable standard: Intermatic “WP Extra-Duty Die-Cast” series, cat. #WP1010MXD with #WP17 FlexiGuard insert.

3 EXECUTION

3.1 INSTALLATION

.1 Switches:

.1 Install single pole throw switches with handle in “UP” position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location. Mount receptacles at height in accordance with Section 26 05 02 - Common Work Results Electrical.

.3 Cover Plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 SPARES

.1 Supply and deliver the following spare devices to Departmental Representative for a signed receipt:

.1 Ten (10) outdoor cover plates.

END OF SECTION

1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 19 – Construction/Demolition Waste Management And Disposal.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Include time-current characteristics curves for breakers with ampacity of 100 A and over.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 Construction/Demolition Waste Management And Disposal.

.2 Collect and separate plastic paper packaging and corrugated cardboard in accordance with Waste Management Plan.

2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Bolt-on moulded case circuit breaker: quick-make quick-break type, for manual and automatic operation with temperature compensation for 40 C ambient.

.2 Common-trip breakers: with single handle for multi-pole applications.

.3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times currents rating.

.4 Circuit breakers with interchangeable trips as indicated.

.5 Circuit breakers to have symmetrical rms interrupting capacity rating as noted on drawings or in the specifications.

.6 All new circuit breakers in existing panelboards to match existing.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 COUNTERFEIT CIRCUIT BREAKERS

.1 Counterfeit circuit breakers are defined to mean any circuit breaker not authorized by the panel manufacturer.

.2 Submit a letter from the manufacturer authorized technical representative that all breakers supplied within this project are not counterfeit and they are authorized by panelboard manufacturer for use in each panelboard.

3 EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

.2 Provide type written panel directories.

END OF SECTION

PART 1 – GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and product data in accordance with Section 26 05 02 - Common Work Results - Electrical.

.2 Include schematic, wiring, interconnection diagrams.

PART 2 – PRODUCTS

2.1 General

.1 For each type of controls and instrumentation equipment, use products of one manufacturer throughout project.

.2 **Note that some of the controls and instrumentation equipment listed below may not be utilized for this project.** The contractor shall refer to the drawings to identify which equipment is required.

2.2 Alarm Strobes - Outdoors

.1 Equipment Characteristics:
- .1 Heavy duty, weatherproof, surface mount
- .2 120VAC operation
- .3 Xenon strobe lamp
- .4 Double-flash operation at 50 double-flashes per minute
- .5 Red lens with clear lexan protective dome
- .6 Wall-mounting bracket

.2 Minimum Acceptable Standard:
- .1 GE Security (ex-Edwards) “Adaptabeacon” series.
  Strobe cat. #94CDFR-N5
  Mounting bracket cat. #WBR

2.3 DC Power Supplies (24 VDC @ 2.5 A)

.1 Equipment Characteristics:
- .1 120 VAC input
- .2 2.5 A, 24 VDC adjustable output, +/- 2% regulation, <25mV peak-peak ripple
- .3 Switching type, capable of parallel operation
- .4 Protected against output short circuit, overload, open-circuit, input overvoltage
- .5 “On” LED indicator
- .6 35mm DIN rail mounting

.2 Minimum Acceptable Standards:
- .1 Sola “SDN” series. Cat. #SDN2.5-24-100
- .2 Phoenix Contact “TRIO” series. Cat. #TRIO-PS/1AC/24DC/2.5

2.4 Enclosures – Wall-Mounted Single Door Control Panel with Disconnect Switch

.1 Equipment Characteristics:
- .1 Height & width as shown on drawings. Minimum 10" depth (greater, if required)
- .2 Single door with 3 point, roller-end latch, lockable handle and interior data pocket
- .3 Main disconnect switch with interlocked, external operating handle
- .4 Full size interior backpan
- .5 EEMAC12, 14 gauge, stiffened steel body & doors with welded seams
- .6 ANSI61 grey exterior, white enamel interior
- .7 4" filtered cooling fan & exhaust grille
- .8 With optional door stop kit

.2 Minimum Acceptable Standards:
- .1 Hoffman "Bulletin A25" series
  Disconnect Switch – Cutler Hammer series C361, type NF

2.5 Indicating Lights

.1 Equipment Characteristics:
- .1 120 VAC operation
- .2 LED lamps
- .3 Fits 30.5mm cutout
- .4 EEMAC 4 & 13 (IP65) rating
- .5 Lens color and nameplate as shown on drawings
- .6 Push-to-test type (if indicated on drawings)

.2 Minimum Acceptable Standards:
- .1 Allen-Bradley "Bulletin 800T" series
- .2 Idec "TWTD" series
- .3 Siemens "Class 52 Heavy Duty Watertight/Oiltight " series

2.6 Level Controllers & Ultrasonic Level Transmitters

.1 Equipment Characteristics:
- .1 Ultrasonic type c/w transducer head
- .2 0.1% resolution, +/- 0.25% repeatability
- .3 Built-in pumping control algorithms
- .4 LCD status display
- .5 4 SPST & 2 SPDT output relays
- .6 4-20mA process signal input and output
- .7 120 VAC operation
- .8 Panel or wall mount EEMAC4 enclosure as shown on drawings
- .9 Complete with optional handheld programmer
- .10 Transducer – 15m range, 6° beam angle, **approved for use in Class 1, Zone 1 hazardous locations – complete with submergence shield**

.2 Minimum Acceptable Standards:
- .1 Siemens-Milltronics
  Controller: "Multiranger 100" series
  Transducer: "Echomax XPS-15" series, #7ML1118-0-0-?-A-4 (where ? denotes cable length)
  Submergence Shield: #7ML1830-1BJ

2.7 Level Switches – Float Type

.1 Equipment Characteristics:
- .1 Mercury-free, mechanical float switch
- .2 SPDT contacts
- .3 Polypropylene casing
- .4 Complete with cable (length to suit)

.2 Minimum Acceptable Standard:
- .1 ITT Flygt cat. #ENM-10

2.8 Meters - Elapsed Time

.1 Equipment Characteristics:
- .1 120 VAC power input
- .2 Electro-mechanical type
- .3 0.01 hours resolution, 0 – 99999.99 hours range
- .4 Non-resettable
- .5 48mm x 48mm housing, flush panel mount
- .6 Operation indication
- .7 CSA-approved

.2 Minimum Acceptable Standards:
- .1 Intermatic Grasslin #UWZ48E-120U
- .2 Veeder-Root “7795” series, #779516-201

2.9 Motor Circuit Protectors

.1 Equipment Characteristics:
- .1 600 VAC, 3 pole motor circuit protector
- .2 Continuous rating and adjustable trip range to suit motor FLA
- .3 Rotary handle mechanism for control panel door

.2 Minimum Acceptable Standards:
- .1 Cutler-Hammer “Series C”, frame size to suit
- .2 Schneider “GJL Mag-Gard” series

2.10 Motor Starters – FVNR Type

.1 Equipment Characteristics:
- .1 600 VAC, 3 phase, FVNR, NEMA-rated magnetic starter
- .2 Auxiliary contacts as shown on drawings
- .3 120VAC coil
- .4 3 pole, ambient-compensated, bimetallic, Class 10 overload relay with selectable manual/automatic reset and +/- 24% adjustment range

.2 Minimum Acceptable Standard:
- .1 Cutler-Hammer “Freedom Series”

2.11 Pushbuttons

.1 Equipment Characteristics:
- .1 1 normally open, 1 normally closed, momentary contacts
- .2 Fits 30.5mm cutout
- .3 Red flush head (or other color as shown on drawings)
- .4 EEMAC 4 & 13 rating
- .5 Nameplate as shown on drawings

.2 Minimum Acceptable Standards:
- .1 Allen-Bradley “Bulletin 800T” series. Cat. # 800T-A6A
- .2 Idec “TWTD” series
- .3 Siemens “Class 52 Heavy Duty Watertight/Oiltight ” series

2.12 Relays - Alternating

.1 Equipment Characteristics:
- .1 Solid-state, enclosed type
- .2 120VAC operation
- .3 DPDT output contacts rated 10 Amps
- .4 Selector switch for alternating or locked operation
- .5 LED status indicators
- .6 Track-mount socket for 35mm symmetrical DIN mounting track
- .7 Hold-down clip

.2 Minimum Acceptable Standard:
- .1 Entrelec SSAC “ARP” series. Cat. #Y-ARP-4-2-S

2.13 Relays - AC Control

.1 Equipment Characteristics:
- .1 General-purpose, enclosed type with unsealed housing
- .2 120VAC or 240VAC coil, as shown on drawings
- .3 4 pole, double-throw contacts (4PDT)
- .4 LED operation indicator
- .5 Push-to-test button
- .6 Plug-in style with matching front-connecting socket for 35mm symmetrical DIN mounting track

.2 Minimum Acceptable Standards:
- .1 Idec “RU” series
  - Relay cat. #RU4S-A110 (120VAC coil)
  - Relay cat. #RU4S-A220 (240VAC coil)
  - Socket cat. #SY4S-05
- .2 Omron “MY” series
  - Relay cat. #MY4IN-AC120 (120VAC coil)
  - Relay cat. #MY4IN-AC240 (240VAC coil)
  - Socket cat. #PYF14A-E

2.14 Relays - DC Control

.1 Equipment Characteristics:
- .1 General-purpose, enclosed type with unsealed housing
- .2 24VDC coil
- .3 4 pole, double-throw contacts (4PDT)

.4 LED operation indicator
.5 Push-to-test button
.6 Plug-in style with matching front-connecting socket for 35mm symmetrical DIN mounting track

.2 Minimum Acceptable Standards:
.1 Idec "RU" series
Relay cat. #RU4S-D24
Socket cat. #SY4S-05
.2 Omron "MY" series
Relay cat. #MY4IN-DC24
Socket cat. #PYF14A-E

2.15 Relays - AC Timing (On-delay or Interval type)

.1 Equipment Characteristics:
.1 Solid-state, enclosed type
.2 120VAC coil
.3 Double pole, double-throw output contacts (DPDT)
.4 0.05 sec. – 180 hrs. adjustable on-delay via labelled dial
.5 LED operation indicators
.6 Track-mount socket for 35mm symmetrical DIN mounting track

.2 Minimum Acceptable Standards:
.1 Idec "GT3A" series
Relay cat. #GT3A-3AF20
Socket cat. #SR2P-05
.2 Omron "H3CR" series
Relay cat. #H3CR-A8-AC100-240
Socket cat. #P2CF-08

2.16 Relays - AC Timing (Off-delay or Repeat Cycle type)

.1 Equipment Characteristics:
.1 Solid-state, enclosed type
.2 120VAC coil
.3 Double pole, double-throw output contacts (DPDT)
.4 0.05 sec. – 180 hrs. adjustable delay via labelled dial
.5 LED operation indicators
.6 Track-mount socket for 35mm symmetrical DIN mounting track

.2 Minimum Acceptable Standards:
.1 Idec "GT3F" series
.2 Omron "H3CR" series. Cat. #H3CR-A-AC100-240

2.17 Relays – Intrinsically Safe (20-250 VAC or 20-125 VDC input power)

.1 Equipment Characteristics:
.1 Renders switches or sensors safe for operation in explosion-hazard areas.
.2 20-250V AC or 20-125 VDC input power
.3 2 x 2A, 250VAC, SPST relay output configurable for normal or inverse operation
.4 LED status indicators
.5 CSA-approved

.6 Single input channel. Multi-channel models also acceptable

.2 Minimum Acceptable Standard:
.1 Turck “Interface Modul” series, cat. #IM1-12EX-R (single-channel version)

2.18 Relays – Pump Seal Leakage & Overtemperature (for Myers-brand or Zoeller-brand pumps)

.1 Equipment Characteristics:
.1 Detects seal leakage & overtemperature for one pump
.2 120 VAC input power
.3 2 x SPST, 250 VAC output relays for seal leakage & 2 x SPST, 250 VAC output relays for overtemperature
.4 External reset input
.5 Panel door mount or DIN rail mount enclosure

.2 Minimum Acceptable Standard:
.1 Engineered Pump Systems Ltd. "EHSM"

2.19 Selector Switches

.1 Equipment Characteristics:
.1 2 or 3 position as shown on drawings
.2 1 normally open, 1 normally closed, maintained contacts
.2 Fits 30.5mm cutout
.3 Standard knob operator
.4 EEMAC 4 & 13 rating
.5 Nameplate as shown on drawings

.2 Minimum Acceptable Standards:
.1 Allen-Bradley “Bulletin 800T” series. Cat. #800T-H2A or #800T-J2A
.2 Idec “TWTD” series
.3 Siemens “Class 52 Heavy Duty Watertight/Oiltight ” series

2.20 Terminal Blocks - Regular

.1 Equipment Characteristics:
.1 Minimum 600V, 32A rating
.2 Modular
.3 Polyamide or “Wemid” material
.4 Zinc-plated, hardened steel clamping body with 4mm sq. cross section
.5 35mm DIN symmetrical rail mounting

.2 Minimum Acceptable Standards:
.1 Weidmuller “W” series. Type #WDU4
.2 Wieland “WK” series. Type #WK4/U

2.21 Terminal Blocks – Circuit Breaker Type

.1 Equipment Characteristics:
.1 Up to 63A trip @ 600VAC or 50 VDC
.2 1, 2 or 3-pole, trip setting as shown on drawings

.3 Thermal-magnetic type with trip handle
.4 10kA interrupting capacity
.5 35mm DIN symmetrical rail mounting

.2 Minimum Acceptable Standards:
.1 Weidmuller “91H” series.
.2 ABB “S200” series

2.22 Uninterruptible Power Supply (UPS) – 1000VA

.1 Equipment Characteristics:
.1 True online type (continuous rectification & inversion)
.2 80-140 VAC, 50-60 hz input
.3 120 VAC, 700 watt, 1000 VA, 60hz sinewave output, ±3%
.4 7 minutes backup time at full load, 20 minutes at half load
.5 Complete with optional relay output card with contacts rated 3A @ 250VAC for “Inverter Bypass”, “Battery Low”, “Backup” & “Fault” conditions

.2 Minimum Acceptable Standard:
.1 Always On “N” series, cat. #GES-102N with optional relay contact output card

2.23 Variable Frequency Drives (for sewage wet well ventilation fans)

.1 Equipment Characteristics:
.1 120VAC, 1-phase, 2-wire 60 hz. input, 200-240VAC, 3-phase, 3-wire, PWM, 0-120 hz. output
.2 Output current rating to suit ventilation fan motor requirements (confirm ventilation fan motor FLA before ordering)
.3 Overload capacity 150% for 60 seconds
.4 NEMA4X wall-mount enclosure
.5 Internal, adjustable motor overload protection (50%-200% of VFD output rating)
.6 0-10 VDC, 0/4-20 mA analog input for frequency setting
.7 Discrete inputs for “Run”, “Speed Select” and “Fault Reset” commands
.8 Dry-contact output rated 250VAC / 30 VDC @ 1.0 A to indicate “Running”, “Up to Speed” or “Fault” condition
.9 Front-mounted operator interface pushbuttons & LED display

.2 Minimum Acceptable Standard:
.1 VFD unit: Teco-Westinghouse "Fluxmaster 50 ", cat. #FM50-1??N4

2.24 Wire Gutters

.1 Equipment Characteristics:
.1 Size as shown on drawings
.2 Slotted with snap-on cover
.3 Light grey PVC material

.2 Minimum Acceptable Standards:
.1 Panduit “Type E” with “Type C” cover
.2 Wieland type “DNG”

PART 3 – EXECUTION

3.1 Installation

.1 Install pushbutton stations, control and relay panels, control and instrumentation devices and interconnect as shown on drawings.

.2 Install all equipment in exact accordance with manufacturer's instructions.

3.2 Field Quality Control

.1 **Upon completion of kiosk, control panel and/or VFD panel fabrication, but prior to shipment to site, the fabrication shop shall notify the Engineer in writing. The Engineer will perform inspection and testing of the kiosk and/or panels at the fabrication shop. Demonstrate proper operation of all controls and instrumentation equipment to Engineer and correct all identified deficiencies prior to shipment to site. Fabrication shops located outside of the B.C. Lower Mainland (Vancouver to Chilliwack) shall directly reimburse the Engineer for travel time to & from the shop (less 2 hours) and all related travel expenses.**

.2 Configure, calibrate and test all controls and instrumentation equipment.

.3 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.

.4 Upon completion of sectional test, undertake group testing.

.5 Check out complete system for operational sequencing.

********** END **********

1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 26 05 02 - Common Work Results - Electrical.

2 PRODUCTS

2.1 EQUIPMENT

.1 Surge protective device shall comply with ANSI/IEEE C62.41 Category “C” requirements

.2 Surge protective device shall be tested and listed to UL 1449 3rd Edition – UL Standard for Safety for Surge Protective Devices

.3 Surge protective device shall be tested and listed to UL 1283– UL Standard for Electromagnetic Interference Filters

.4 Arrester characteristics:

.1 System voltage, phases, wiring: As shown on drawings.

.2 MOV-based with thermal protection for each MOV

.3 Minimum 50kA per phase peak surge current capacity

.4 Minimum 20kA nominal discharge current rating

.5 65 kAIC short circuit current rating.

.6 L-N, L-G, N-G, L-L protection modes (for 3-phase wye-connected systems)

.7 EEMAC 1 surface-mount enclosure with front-mounted display unit.

.8 LED status indicator for each phase

.9 5-year warranty

.10 CSA approved

.5 Minimum acceptable standard: Cutler-Hammer “CVX series”

3 EXECUTION

3.1 INSTALLATION

.1 Install surge protective device and connect to secondary bus and ground bus.

.2 Keep lead lengths to an absolute minimum.

END OF SECTION

1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.

2 PRODUCTS

2.1 TYPE `A' LUMINAIRE

.1 General Description:

.1 LED type downlight.

.2 Recessed ceiling mount with150 mm aperture

.3 Color Temperature: 3500 K; CRI: Minimum 80

.4 Total lumen output: 1200 Lumens; Efficacy: 71-80 lm/W

.5 Vandal resistant and suitable for high abuse environment such as public restrooms and parks

.6 Housing: Stem welded construction made of 0.50" aluminum

.7 Reflector: Spun aluminum with high efficiency diffuse whit coating

.8 Trim: 18-Ga type 304 stainless steel with flat white finish. Trim secured to housing with Torx SS tamper resistant fasteners.

.9 Lens: 125" clear polycarbonate

.10 Serviceable LED array and LED driver.

.11 120 Volt.

.12 Listing: IP65 rated and CSA Approved for non-accessible ceiling installation

.13 Minimum acceptable standard: Kenall HADL6VL2 series, #13L35K-DV-5FW-G

2.2 TYPE 'B' LUMINAIRE

.1 General Description:

.1 Same as type 'A' except with flat black finish for trim.

.2 Minimum acceptable standard: Kenall HADL6VL2 series, #13L35K-DV-5FB-G

2.3 TYPE `C' LUMINAIRE

.1 General Description:

.1 Fluorescent strip light c/w wire guard

.2 120 Volt

.3 Ballast: Electronic instant start; PF of minimum 0.95; THD of equal or less than 10% and sound rating of 'A'

.4 Lamp: 2 x T-8, 32W; Color Temperature: 3500 K.

.5 Housing: Heavy duty channel, die-formed from code-gauge steel

.6 Listing: CSA approved for damp location

.7 Minimum acceptable standard: Lithonia Lighting "Z" series, #Z-2-32-120-GEB10IS

2.4 EMERGENCY LIGHTING BATTERY UNIT

.1 General Description:

.1 Self-contained, fully-automatic emergency lighting unit

.2 2 fully-adjustable heads with 12 volt, 6 watt LED lamps

.3 120 VAC power

.4 Maintenance-free, sealed, 10 year lead battery

.5 Battery capacity – 30 minutes @ 72 watts (120 minutes @ 24 watts)

.6 Minimum acceptable standard: Ready-Lite "LDX" series, cat. #LDX12-72-2-LD10

2.5 EMERGENCY LIGHTING REMOTE HEADS

.1 General Description:

.1 Wall-mount, remote lighting heads

.2 1 or 2 fully-adjustable heads (as shown on drawings) with 12 volt, 6 watt LED lamps

.3 Clear, fully-gasketted, vandal-resistant, polycarbonate lens with white polycarbonate back plate and stainless-steel tamperproof screws. NEMA 4X certified.

.4 Minimum acceptable standard: Ready-Lite "TUF-NM" series, cat. #NMMP-1-LD10 (1 head) or #NMMP-2-LD10 (2 heads)

2.6 KIOSK POWER AND CONTROLS COMPARTMENT LUMINAIRES (FLUORESCENT)

.1 Equipment characteristics:

.1 Single-tube fluorescent luminaire

.2 High gloss, baked white enamel finish

.3 General purpose, indoor use

.4 Ceiling or wall-mounting

.5 Nominal dimensions: 1220 mm long x 53 mm wide x 37 mm high

.6 Cold-temperature (-20°F), multi-voltage, instant-start electronic ballast, <10% THD

.7 1 x 32W cool-white, T8, medium bipin lamp

.8 CSA certified

.9 Minimum Acceptable Standard: Lithonia “Z” series, #Z-1-32-MVOLT-OS10IS

2.7 PORTABLE (HANDHELD) LIGHTS

.1 Equipment characteristics:

.1 Explosion-proof handheld luminaire rated for Class 1, Div. 1&2, Groups C&D

.2 100W, A21 incandescant lamp

.3 120 VAC operation

.4 Molded phenolic handle

.5 Aluminum guard & globe holder

.6 Glass globe, heat and impact resistant

.7 Factory-attached 50’ 3#14 SOW cable

.2 Minimum Acceptable Standards:

.1 Crouse-Hinds #EVH106

.2 Daniel Woodhead “Haztex” series, cat. #61430B143

3 EXECUTION

3.1 INSTALLATION

.1 Install Luminaires as indicated.

.2 Connect to lighting circuits switches as indicated.

3.2 SPARES

.1 Supply and deliver the following spare devices to Departmental Representative for a signed receipt:

.1 Six (6) type ‘A’ luminaires.

.2 Six (6) type ‘B’ luminaires.

.3 Four (4) electronic ballasts for type ‘C’ luminaires.

.4 Thirty (30) fluorescent lamps for type ‘C’ luminaires.

.5 Three (3) emergency lighting battery units with heads.

.6 Six (6) sets of emergency lighting remote heads.

END OF SECTION

PART 1 – GENERAL

1.1 Operation and Maintenance Data

.1 Provide operation and maintenance data for electric heating and cooling equipment for incorporation into manual specified in Section 26 05 02 - Common Work Results - Electrical.

PART 2 – PRODUCTS

2.1 Heating Equipment & Controls:

2.1.1 Unit Heaters (for Outdoor Electrical Kiosks - Hardwired Type)

.1 Equipment Characteristics:
- .1 1500W, 120 VAC fan-forced electric heater
- .2 Built-in high-heat limit protection with automatic reset
- .3 Tubular finned heating element.
- .4 20 gauge steel cabinet
- .5 Vertical or horizontal mounting position
- .6 White, epoxy/polyester powdercoat finish
- .7 Required options: - Built-in, user-adjustable thermostat
  - Surface mounting box

.2 Minimum Acceptable Standards:
- .1 Ouellet “OVS” series
  #OVSU1502 (heater)
  #OVS-BS (surface mounting box)
  #OVS-TB6 (thermostat)
  (agent/distributor: Eecol Electric)
- .2 Stelpro “Pulsair RWF” series
  #RWF1501W (heater)
  #RWFSAW (surface mounting box)
  #RWFT1W (thermostat)

2.2 Ventilation Equipment & Controls:

2.2.1 Ventilation Fans (Inside Outdoor Electrical Kiosks - For Sewage Wet Wells) Ventilation)

.1 Equipment Characteristics:
- .1 12” diameter, shaft-mounted, axial fan
- .2 Performance: 920 CFM @ 0” WC, 300 CFM @ 0.5” WC, 0 CFM @ 1.0” WC
- .3 230/460 VAC, 3-phase, 0.25 hp, 1.0 FLA, totally-enclosed motor with no overload, suitable for VFD controls and Class 1, Zone 2 hazardous areas
- .4 Steel mounting chassis
- .5 Provide protective screening top and bottom (finger-safe)

.2 Minimum Acceptable Standard:
- .1 Leco #AL1214-VVVE

2.2.2 Ventilation Fans (for Outdoor Electrical Kiosk Interiors – Not for Sewage Wet Wells)

.1 Equipment Characteristics:

.1 Boxed fan c/w removable & washable filter
.2 ABS-FR grill
.3 120 VAC operation
.4 Draws air into enclosure
.5 Separate grill & filter for exhaust
.6 Rain hoods for fan and exhaust grill/filter
.7 Capacity to suit kiosk size and equipment heat dissipation requirements

.2 Minimum Acceptable Standards:
.1 Ventilation Fan & Filter: Hammond “PF” series.
Exhaust Grill & Filter: Hammond "PFA" series.
Rain Hoods: Hammond "RH" series.
(agent/distributor: Vanco Agencies Ltd. (604) 531-1235)

2.2.3 Ventilation Fans (for Control Panels)

.1 Equipment Characteristics:
.1 Fan c/w grill & removable/washable filter
.2 120 VAC operation
.3 105 CFM free-air delivery
.4 Draws air into enclosure
.5 Louvered, ABS intake grill with integral gasket
.6 Separate grill & filter for exhaust
.7 Capacity to suit panel size and equipment heat dissipation requirements

.2 Minimum Acceptable Standard:
.1 Hammond “PF” series.
(agent/distributor: Vanco Agencies Ltd. (604) 531-1235)

2.2.4 Ventilation Thermostats (for Outdoor Electrical Kiosks)

.1 Equipment Characteristics:
.1 SPST snap-action contact with 3 FLA capacity at 240 V, 6 FLA capacity at 120 V (inductive)
.2 User-adjustable temperature setting range: 4 to 32 deg C (40 to 90 deg F)
.3 Suitable for cooling control (contact closure on rising temperature)
.4 Adjustable high/low range stops
.5 Built-in thermometer. Range: 10 to 32 deg C (50 to 90 deg F)
.6 Vertically-oriented faceplate with Celsius temperature scales

.2 Minimum Acceptable Standard:
.1 Johnson Controls cat. #T26J (thermostat), #PLT333-5R (faceplate)
(agent/distributor: Johnson Controls (604) 438-3434)

2.2.5 Ventilation Thermostats (within Control Panels)

.1 Equipment Characteristics:
.1 Bi-metallic element with 15A capacity at 120 V (resistive)
.2 Suitable for cooling control (contact closure on rising temperature)
.3 User-adjustable temperature setting range: -1 - 60 deg C (30 - 140 deg F)
.4 Scaled in degrees celsius

.2 Minimum Acceptable Standard:
.1 Hammond Manufacturing cat. #SKT011419NO-C

PART 3 – EXECUTION

3.1 Installation

.1 Suspend room unit heater(s) from ceiling or mount on wall as indicated.

.2 Mount kiosk unit heater(s) on the removable backpan in the kiosk compartment as indicated.

.3 Mount control panel heater(s) on the removable backpan in the control panel as indicated.

.4 Mount thermostats as indicated.

.5 Make power and control connections.

3.2 Field Quality Control

.1 Perform tests in accordance with Section 26 05 02 - Common Work Results - Electrical.

.2 Test cut-out protection when air movement is obstructed.

.3 Test fan delay switch to assure dissipation of heat after element shut down.

.4 Test unit cut-off when fan motor overload protection has operated.

.5 Ensure that heaters and controls operate correctly.

********** END **********

1 GENERAL

1.1 RELATED SECTIONS

.1 Mechanical: Divisions 23 and 25

1.2 REQUIREMENTS

.1 Provide a complete system of wiring to motors and other mechanical equipment such as heaters and hot water tanks and mechanical controls as specified herein and as shown on the drawings.

.2 Unless specifically noted otherwise, wire and leave in operation all electrically operated equipment supplied under this contract or relocated or re-wired as part of the scope. Examine the drawings and shop drawings of all Divisions for the extent of electrically operated equipment supplied under other divisions.

.3 Unless specifically noted otherwise, supply all disconnects, relays, starters, etc., necessary of the operation of equipment. Check all starters, relay coils and thermal elements to ensure that they provide the necessary protection for motors and other equipment.

.4 Do not operated mechanical equipment unless approval is obtained from the trade providing the equipment.

.5 Examine drawings and shop drawings of other Divisions to obtain exact location of mechanical equipment shown on the drawings. Where necessary, obtain information for conduit locations from other trades' drawings and shop drawings.

.6 Assist in placing in operation all mechanical equipment having electrical connections.

.7 Provide single or three phase starters with fused 120V control transformers and overload relays where indicated.

.8 Provide all power wiring for all motors.

.9 Provide power wiring for heating ventilating and air conditioning equipment. Provide terminations in starters and MCCs for control wiring so that starter control circuits may be extended. Where 120V power is required for any mechanical equipment, wiring to equipment terminal is the work of this Division.

.10 Refer to Mechanical Equipment Schedule (Appendix A).

.11 Mechanical equipment control work which shall be provided under Division 26 shall include the following:

.1 All conduit and 120V control wiring and any other control wiring specifically noted on the drawings or outlined in the different parts of the Specifications.

.2 Conduit and 120V control wiring for baseboard heaters, unit heaters and force flow heater thermostats.

.3 All control wiring as specified in the Mechanical Equipment

Schedule.

.4 Where applicable, control wiring related to shut down on any mechanical equipment during fire alarm.

2 PRODUCTS

2.1 3-PHASE DISCONNECT SWITCHES

.1 Industrial type 'A', having quick make, quick break visible blade mechanism, cover interlocks and padlocking switch in the closed or open position. Use EEMAC 4 enclosures outdoors, and EEMAC 1 indoors, switches to be hp rated, heavy duty type.

2.2 120V, 1-PHASE DISCONNECT SWITCHES

.1 Manual disconnect switch hp rated without overload relay.

2.3 208V, 1-PHASE DISCONNECT SWITCHES

.1 Manual disconnect switch hp rated without overload relay -2 poles.

3 EXECUTION

3.1 INSTALLATION

.1 Provide disconnect switches adjacent to all equipment unless specifically noted otherwise.

.2 Provide all wiring between all force flow and unit heaters and their thermostats if the thermostats are 120V. Install wiring between all mechanical components to provide a functional system.

.3 Do control wiring as indicated on the drawings and the Mechanical Equipment Schedule.

END OF SECTION

APPENDIX A - MECHANICAL EQUIPMENT SCHEDULE

Pacific Rim National Park Washroom Buildings Replacement - Incinerator Rock, Long Beach North & South, Wickaninnish Beach
Tofino, BC
Project No. R.078666.001

Tag	Description	Location	Power	Volts	Phase	Starter by	Disconnect by	Starter type	Control Wiring	Emergency Power	Protection	Feeder	REMARKS
Heating and Ventilation													
EF-1	Exhaust fan	Service room	735 W	120	1	E	E	Prog Time Clock & MS	E	N	15A, 1P	21mmc 2#12 + bond	Controlled by time clock and occupancy sensors installed and wired by Div 26. Interlock exhaust fan with outdoor air motorized damper MD-1.
MD-1	Motorized damper actuator	Service room		120	1	E		Prog Time Clock & MS	E	N	15A, 1P	21mmc 2#12 + bond	Motorized damper actuator to be interlocked with Exhaust Fan EF-1. Actuator supplied and installed by Div. 23 and wired by Div. 26. Damper to be energize to open
ECUH-1	Electrical cabinet unit heater	Female WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
ECUH-2	Electrical cabinet unit heater	Female WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
ECUH-3	Electrical cabinet unit heater	Male WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
ECUH-4	Electrical cabinet unit heater	Male WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
EUH-1	Unit heater	Service room	3000 W	240	1	M	E	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	EUH c/w control transformer and relay. Low voltage thermostat by Div. 23
Temperature Control Panel		Service room		120	1					N	15A, 1P	21mmc 2#12 + bond	Div. 26 to provide power to control panel
Plumbing													
DHWH-1	Domestic hot water heater	Service room	12 kW	240	1	M		TSTAT	M	N	70A, 2P	27mmc 2#4 + bond	Built-in thermostat.
DWP-1	Domestic hot water recirculation pump	Service room	0.25 HP	120	1	M	E	OTHER	E	N	15A, 1P	21mmc 2#12 + bond	Controlled by aquastat.
BP-1	Domestic Water Booster Pump (Wickaninnish Beach Only)	Service room	7.5 HP	240	1	M	E	VFD	E	N	40A, 2P	21mmc 2#8 + bond	Control panel located in Service Room

M	Mechanical Contractor
E	Electrical Contractor

MAN	Manual Starter
MAG	Magnetic Starter
HOA	Hand / Off / Auto
VSD	Variable Speed Drive
SWITCH	Wall Switch / Starter
TSTAT	Thermostat
LIGHT	Interlocked with Light Switch
DDC	Controlled by DDC System
VS	Solid State Variable Speed Controller

APPENDIX A - MECHANICAL EQUIPMENT SCHEDULE

Pacific Rim National Park Washroom Buildings Replacement - Green Point #1 & Green Point #4
Tofino, BC
Project No. R.078666.001

Tag	Description	Location	Power	Volts	Phase	Starter by	Disconnect by	Starter type	Control Wiring	Emergency Power	Protection	Feeder	REMARKS
Heating and Ventilation													
EF-1	Exhaust fan	Service room	735 W	120	1	E	E	Prog Time Clock & MS	E	N	15A, 1P	21mmc 2#12 + bond	Controlled by time clock and occupancy sensors installed and wired by Div 26. Interlock exhaust fan with outdoor air motorized damper MD-1.
MD-1	Motorized damper actuator	Service room		120	1	E		Prog Time Clock & MS	E	N	15A, 1P	21mmc 2#12 + bond	Motorized damper actuator to be interlocked with Exhaust Fan EF-1. Actuator supplied and installed by Div. 23 and wired by Div. 26. Damper to be energize to open
ECUH-1	Electrical cabinet unit heater	Female WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
ECUH-2	Electrical cabinet unit heater	Female WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
ECUH-3	Electrical cabinet unit heater	Male WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
ECUH-4	Electrical cabinet unit heater	Male WR	3000 W	240	1	M	M	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	Programmable thermostat c/w remote sensor supplied by Div 23.
SF-1	Crawlspace Supply Fan	Service room	108W	120	1		E		E	N	15A, 1P	21mmc 2#12 + bond	Supply Fan to run continuously.
EDH-1	Electric Duct Heater	Service room	1200 W	120	1	M	E	TSTAT	M	N	15A, 1P	21mmc 2#12 + bond	Duct heater to be controlled by integral duct mounted thermostat.
EUH-1	Electric Unit Heater	Service room	3000 W	240	1	M	E	TSTAT	M	N	15A, 2P	21mmc 2#12 + bond	EUH c/w control transformer and relay. Low voltage thermostat by Div. 23
EWH-1	Electric Wall Heater	Female Shower	1500 W	120	1	M	M	TSTAT	M	N	15A, 1P	21mmc 2#12 + bond	EWH c/w control transformer and relay. Low voltage Programmable thermostat & remote sensor by Div. 23
EWH-2	Electric Wall Heater	Male Shower	1500 W	120	1	M	M	TSTAT	M	N	15A, 1P	21mmc 2#12 + bond	EWH c/w control transformer and relay. Low voltage Programmable thermostat & remote sensor by Div. 23
Temperature Control Panel		Service room		120	1					N	15A, 1P	21mmc 2#12 + bond	Div. 26 to provide power to control panel
Plumbing													
DHWH-1	Domestic hot water heater	Service room	36 kW	240	1	M		TSTAT	M	N	200A, 2P	53mmc 2#3/0 + bond	Built-in thermostat.
DWP-1	DHW Recirc pump	Service room	0.25 HP	120	1	M	E	TSTAT	E	N	15A, 1P	21mmc 2#12 + bond	Controlled by aquastat.
P-2	Sanitary Sump Pump (Green Point #1 Only)	Service room	0.4 HP	120	1	M	E	TSTAT	M	N	15A, 1P	21mmc 2#12 + bond	Control Panel located in Service Room

M	Mechanical Contractor
E	Electrical Contractor

MAN	Manual Starter
MAG	Magnetic Starter
HOA	Hand / Off / Auto
VSD	Variable Speed Drive
SWITCH	Wall Switch / Starter
TSTAT	Thermostat
LIGHT	Interlocked with Light Switch
DDC	Controlled by DDC System
VS	Solid State Variable Speed Controller

PART 1 - GENERAL

1.1 RELATED SECTIONS

1. Section 01 33 00-Submittal Procedures.
2. Section 31 23 10-Excavating, Trenching and Backfilling.
3. Section 31 24 13-Roadway Embankments.
4. Section 32 11 19-Granular Sub-Base.
5. Section 32 11 23-Aggregate Base Courses.
6. Section 33 11 16-Site Water Utility Distribution Piping.
7. Section 33 31 13-Sanitary Utility Sewerage Piping.
8. Section 33 41 00-Storm Utility Drainage Piping.

1.2 REFERENCES

1. ASTM; AWWA; CAN – As specified in the contract document

1.3 SOURCE QUALITY CONTROL

1. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
2. Inform Department Representative of proposed source and provide samples or access for sampling at least 2 weeks prior to commencing production.
3. If, in opinion of Department Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
4. Should a change of material source be proposed during work, advise Department Representative 2 weeks in advance of proposed change to allow sampling and testing.
5. Acceptance of material does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified.
6. Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

1. Divert unused granular materials from landfill to local facility as approved by Department Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

1. Gravel to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM test procedure C-88 or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.

2. All crushed gravel when tested according to ASTM C-136 and ASTM C-117, or latest revised issue, to have a generally uniform gradation and conform to following gradation limits and 60% of the material passing each sieve must have one or more fractured faces. Determination of the amount of fractured material shall be in accordance with the Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "A", which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.

2.2 NATIVE MATERIAL

1. To be any workable soil free of organic or foreign matter; any material obtained within limits of Contract may be approved by the Department Representative. Native material content or compact to specified density.

2.3 PIT RUN GRAVEL

.1 To be well graded granular material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description (300 mm Pit Run Gravel, 200 mm Pit Run Gravel, 100 mm Pit Run Gravel). Material to compact to specified density and conform to following gradations:

Sieve Designation	Percent Passing
(300mm dia)	(100)
(200mm dia)	(100)
(100mm dia)	(100)
75mm	100
50mm	70-100
25mm	50-100
4.75mm	22-100
2.36mm	10-85
0.075mm	2-8

Recycled concrete free from contaminated and other extraneous material, conforming to the specified gradations may be used as pit run gravel.

2.4 PIT RUN SAND

1. To be well graded pit run sand, free from organic materials and conform to following gradations:

Sieve Designation	Percent Passing
12.5mm	100
4.75mm	35-100
2.36mm	20-70
1.18mm	13-50
0.600mm	8-35
0.300mm	5-25
0.150mm	2-15
0.075mm	0-6

2.5 RIVER SAND

1. River sand, to be used only where shown on Contract Drawings or otherwise specified and approved by Department Representative, to be free of organic material, salt and foreign objects and conform to following gradations:

Sieve Designation	Percent Passing
19mm	100
4.75mm	80-100
0.600mm	20-80
0.150mm	0-20
0.075mm	0-8

2.6 DRAIN ROCK

.1 To consist of clean round stone or crushed rock conforming to the following gradations:

	Percent Passing	
Sieve Designation	Course	Fine
25.0mm	100	
19.0mm	0-100	
9.5mm	0-5	100
4.75mm	0	50-100
2.36mm		5-15
1.18mm		15-38
0.600mm		0-8
0.300mm		0-5
0.150mm		0-2
0.075mm		0

.2 Drain rock to be used only where specified on Contract Drawings. Use of drain rock other than as specified requires approval of DEPARTMENT Representative after examination of soils against which drain rock will be placed.

2.7 GRANULAR PIPE BEDDING AND SURROUND MATERIAL

.1 Crushed or graded gravels to conform to following gradations:

	Percent Passing	
Sieve Designation	Type 1*	Type 2*

25.0mm	100	100
19.0mm	90-100	90-100
12.5mm	65-85	70-100
9.5mm	50-75	
4.75mm	25-50	40-70
2.36mm	10-35	25-52
1.18mm	6-26	15-38
0.600mm	3-17	6-27
0.300mm		3-20
0.075mm	0-5	0-8

Type 1* standard gradation
Type 2* to be used only in dry trench conditions and with Departmental Representative's prior approval

Recycled concrete free from contaminated and other extraneous material, conforming to the Type 1 gradations, may be used as pipe bedding and surround material.

.2 Other permissible materials: only where shown on Contract Drawings or directed by Departmental Representative shall drain rock, pit run sand or approved native material be used for bedding and pipe surround.

2.8 SELECT GRANULAR SUB-BASE

1. To be well graded granular material, substantially free from lumps and organic matter, screened if required to conform to following gradations:

Sieve Designation	Percent Passing
75mm	100
25mm	50-85
0.150mm	0-15
0.075mm	0-8

2.9 CRUSHED GRANULAR SUB-BASE

.1 To be 75mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing
80mm	
75mm	100
38mm	60-100
25.0mm	-
19.0mm	35-80
12.5mm	-
9.5mm	26-60
4.75mm	20-40
2.36mm	15-30
1.18mm	10-20
0.60um	5-15
0.30um	3-10

0.18um	-
0.15um	-
0.075um	0-5

2.10 GRANULAR BASE .1 To be 19mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing
19.0mm	100
12.5mm	75-100
9.5mm	60-90
4.75mm	40-70
2.36mm	27-55
1.18mm	16-42
0.600mm	8-30
0.300mm	5-20
0.075mm	2-8

2.11 RECYCLED AGGREGATE MATERIAL .1 Aggregates containing recycled material may be utilized if approved by the DEPARTMENT Representative. In addition to meeting all other conditions of this specification, recycled material should not reduce the quality of construction achievable with quarried materials. Recycled material should consist only of crushed Portland cement concrete; other construction and demolition materials such as asphaltic pavements, bricks, plaster, etc. are not acceptable.

PART 3 - EXECUTION

3.1 HANDLING .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.2 Do not use intermixed or contaminated materials. Remove and dispose rejected materials within 48 h of rejection.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

1. Section 01 35 43-Environmental Procedures.
2. Section 31 05 16-Aggregate Materials.
3. Section 31 23 17-Rock Removal.
4. Section 33 05 13-Manholes and Catch Basin Structures
5. Section 33 11 16-Site Water Utility Distribution Piping
6. Section 33 31 13-Sanitary Utility Sewerage Piping
7. Section 33 41 00-Storm Utility Drainage Piping

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C 117, Standard Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D 422-63, Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m ^{3}).
- .5 ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m ^{3}).
- .6 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Green Building Council (CaGBC)
- .1 LEED Canada-NC Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.

.4 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
- .2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.5 U.S. Environmental Protection Agency (EPA)/Office of Water
.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

1. Rock Excavation: As defined in Section 31 23 17 – Rock Removal.

2. Common Excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan, partially cemented materials, clay or frozen materials which can be ripped and excavated with heavy construction equipment.

3. Over-excavation: excavation below design elevation of bottom of specified bedding, and including backfilling of resultant excavation with specified material, as authorized by Department Representative.

4. Removals: removal and disposal at an approved location off-site of surface concrete structures and walks, curbs, gutters, manholes, catchbasins, pipes, culvers, enwalls, and any other structure on surface or underground specifically designated on Contract Drawings for removal. Removals to include backfilling of resultant excavation with specified material.

1.4 SAFETY REQUIREMENTS

1. Comply with Section 01 35 33-Health and Safety Requirements.

2. Design and install trench shoring in accordance with the regulations of the Workers Compensation Act of British Columbia.

1.5 BLASTING

1. Ensure all blasting operations comply with Section 31 23 17-Rock Removal.

1.6 DISPOSAL

1. Dispose of all surplus spoil from excavations on-site and/or off-site as shown on Contract Drawings or as specified in Contract Documents. Suitability of excavated material for use as native bedding or trench backfill will be governed by Part 2 of this Section. Dumping of spoil on private property will be permitted only upon written approval from property owner and provided all necessary permits and approvals have been obtained.

1.7 LIMITATIONS OF OPEN TRENCH

1. Excavate trenches only as far in advance of pipe laying operation as safety, traffic, and weather conditions permit and, in no case, to exceed 30m. Before stopping work on last day of work before each weekend or holiday, completely backfill every trench. If circumstances do not permit complete backfilling of all trenches, adequately protect all open trenches or excavations with approved fencing or barricades and, where required, with flashing lights.

PART 2 - PRODUCTS

2.1 USE OF SPECIFIED MATERIALS

1. Back filling for over-excavated trench or structure excavations to be one of the following:
   .1 Granular pipe bedding and surround material.
   .2 Pit run sand.
   .3 Drain rock (only where approved by Department Representative)
   .4 Concrete.
   .5 Controlled density fill.

2. Pipe bedding and surround: see applicable Sections:
   1. Section 33 11 16-Site Water Utility Distribution Piping
   2. Section 33 31 13- Sanitary Utility Sewerage Piping
   3. Section 33 34 00-Sanitary Utility Sewerage Force Mains
   4. Section 33 41 00-Storm Utility Drainage Piping

3. Trench and excavation backfill to be one of the following:
   .1 Approved native material.
   .2 Pit run gravel.
   .3 Pit run sand.
   .4 Controlled density fill.

4. Surface treatment to be:
   .1 Restoration to match existing conditions
   .2 Subgrade, subbase and base for works described in other Sections
   .3 Topsoil, grass, sod or requirements for landscaping works described in other Sections.

2.2 MATERIALS

1. Refer to Section 31 05 16 – Aggregate Materials for specifications for approved granular materials and approved native materials.

2. Other granular materials: granular materials approved for roadwork (subbase, base,) also acceptable for trench backfill subject to approval of Department Representative.

3. Concrete: to Section 03 30 00, to be minimum 20 MPa.

PART 3 - EXECUTION

3.1 SITE PREPARATION

1. Remove all brush, weeds, grasses and accumulated debris to an approved offsite location.

2. Cut pavements or sidewalk neatly along limits of proposed excavation as shown on Contract Drawings in order that surface may break evenly and cleanly. Cut beyond limits shown only if authorized by Department Representative.

3. Where trench passes through lawn, neatly cut and remove sod before trench excavation. Save sod for replacement upon backfilling trench.

4. Strip topsoil after area has been cleared and stockpile in locations as directed by Department Representative. Stockpile height not to exceed 2m. Avoid mixing topsoil with subsoil. Dispose of unused topsoil as specified. Do not handle topsoil while wet or frozen condition or in any manner in which soil structure is adversely affected.

3.2 STOCKPILING

1. Stockpile fill materials in areas designated by Department Representative. Stockpile granular materials in manner to prevent segregation.

3.3 EXCAVATION

1. Connecting to existing mains:
   - .1 Prior to or at commencement for construction, check existing main for line and elevation at point of connection. If found different from Contract Drawings report such difference to Department Representative immediately.
   - .2 Connections to existing waterworks, sanitary and storm sewer systems to be made by the Contractor unless shown otherwise on Contract Drawings. Notify Department Representative minimum 48 hours in advance of schedule connection. Make connection in presence of Department Representative.
   - .3 To prevent damage to existing utilities, excavation last 300 mm over utility by hand.

2. Surface Drainage:
   - .1 Provide suitable temporary ditches or other approved means of handling drainage prior to excavation and during construction to protect construction area and adjacent lands. Provide siltation controls to protect natural watercourses or existing drainage facilities.
   - .2 Comply with Section 01 35 43-Environmental Procedures.

3. Excavation to grade: excavation trenches to allow pipe to be laid to alignment and grades required with allowance for specified pipe bedding.

4. Excavation below grade: when bottom of excavated trench at subgrade is unstable and in opinion of Department Representative, cannot adequately support pipe, install pipe using concrete bedding as shown on Contract Drawings or over-excavate trench to suitable subgrade or as directed by Department Representative. Backfill over excavated with specified materials and compact to minimum 95% Modified Proctor density in compliance with ASTM D1557. Use drain rock backfill only if authorized by Department Representative.

5. Trench width: excavation trench to section and dimension shown on Contract Drawings. If width exceeds maximum allowable, Contractor

may be required to demonstrate that specified pipe is still adequate or provide pipe with approved higher class bedding. All additional requirements as a result of excessive trench width to be to Contractor's cost.

6. Hand excavation: excavate by hand if necessary to preserve or minimize damage to existing trees, shrubs, building and all similar existing features or facilities.

7. Trench bottom conditions: remove disturbed or softened material from trench bottom before placing bedding material. Maintain trench free from water and soft materials during placement of pipe bedding, pipe installation and trench backfill to ensure proper compaction of granular materials.

8. Trench drainage:
   .1 During pipe laying, jointing, bedding and backfilling, keep trench free of water by pumping or other appropriate means. Provide pumps and dewatering equipment and take precautions to prevent any damage to adjoining buildings, structures, roads or land from prolonged or excessive pumping by installing shoring, sheeting or other supportive measures. Discharge water from excavations in such manner as not to cause nuisance, injury, loss or damage. Contactor to be responsible for any claims or actions arising from such discharge of water.
   .2 Keep bell holes free from water during jointing. Diverting trench water through newly laid system not allowed, unless authorized by Department Representative.

9. Disposal of surplus soil: Dispose of surplus excavation soil off-site. Side-casting not allowed in restricted areas where, in opinion of Department Representative, side-casting would create interference with flow of traffic. In such case, temporarily store materials or dispose to an approved site. Provisions of Provincial Contaminated Sites Legislation must be met prior to disposal of soil offsite.

10. Where native backfill is approved for re-use, and side-casting not allowed, transport approved material to other locations where material is required or temporarily store at approved site. Protect stored material from contamination, segregation and weather.

11. Rock excavation: Section 31 23 17-Rock Removal.

12. Maintain roads used for transporting materials and equipment in clean condition. Clean, flush and/or sweep on daily basis and more frequently if directed by Department Representative.

3.4 PIPE INSTALLATION

1. Related work: Pipe installation, including bedding, pipe laying, and granular surround to be in accordance with following sections:
   1. Section 33 05 13-Manholes and Catch Basin Structures

2. Section 33 11 16-Site Water Utility Distribution Piping
3. Section 33 31 13-Sanitary Utility Sewerage Piping
4. Section 33 34 00-Sanitary Utility Sewerage Force Mains
5. Section 33 41 00-Storm Utility Drainage Piping

2. Concrete encasements or protection: where specified or required by Department Representative provide concrete encasements of pipe or slab protection as shown on Contract Drawings. Do not place backfill material until concrete has taken its initial set and in no case less than 1 hour.

3. Anchor blocks: where specified or required by Department Representative provide anchor blocks as shown on Contract Drawings. Ensure all concrete anchor blocks at least 150 mm into undisturbed ground on bottom side of each trench.

3.5 BACKFILL AND COMPACTION 1. General: Place backfill carefully in trench to prevent damage to installed pipe.

2. Shoring: during backfill and compaction of trench, remove shoring in such a manner as to allow proper compaction and to prevent trench walls from collapsing. Remove all bracing and/or shoring from trench.

3. Backfill Materials:
   - .1 Boulevards and easements: for trenches in boulevards, easements or other areas not subjected to vehicle loading, and outside of ditch lines, backfill with approved native materials except as shown otherwise on Contract Drawings.
   - .2 Roads, driveways and shoulders: for trenches in paved or graveled roads, driveways, shoulders or other areas subjected to vehicle loading, backfill with imported granular material or approved native material as specified on Contract Drawings. Road shoulder is that portion of right-of-way between travelled, and road ditch. Where no ditch exists, ensure shoulder width minimum of 1.5 m.
   - .3 Ditches: backfill with imported granular material or approved native material as specified on Contract Drawings.
   - .4 Department Representative may permit native materials for all above uses subject to suitability of native material for said use. Native material approved for re-use to be handled, stockpiled and compacted using construction method appropriate for given moisture content and weather conditions.

4. Compaction: place backfill and compact to following Modified Proctor densities in compliance with ASTM D1557. (All following references to density imply compliance with ASTM D1557).
   - .1 Boulevards and easements to minimum 90%.
   - .2 Roads, driveways, shoulders, re-shaped ditches and sidewalks to minimum 95%.
   - .3 Use caution in pipe zone to ensure no damage to pipe.

3.6 SURFACE RESTORATION

1. General:
   - .1 Restore all disturbed surfaces to condition at least equal to which existed prior to construction.
   - .2 Make good any damage to adjacent lands or improvements.
   - .3 Resolve all reasonable claims arising from Contractor's actions and obtain written releases from land owners following final restoration.

2. Boulevards and easements:
   - .1 Restore surface to minimum 100 mm depth.
   - .2 Restore unimproved surfaces with material equal to that removed at surface.
   - .3 Restore gardens with approved topsoil or bark mulch to match existing conditions.
   - .4 Restore lawns with approved topsoil and seed or sod to match existing lawn.
   - .5 Restore gravel surfaces with matching granular materials.
   - .6 Complete final restorations immediately upon completion of trench backfilling.

3. Graveled roads and driveways:
   - .1 Restore surface with minimum 75 mm to 100 mm thick lift of 19 mm granular road base material.
   - .2 Compact to minimum 95% Modified Proctor density.
   - .3 Complete final restoration immediately upon completion of t rench backfilling.

4. Ditches:
   - .1 Re-shape ditches to specified lines, grades and sections as specified to ensure stability of ditch slopes and bottom.
   - .2 Compact to minimum 95% Modified Proctor Density.
   - .3 Complete final restoration immediately upon completion of trench backfilling.

5. Base preparation for paved surfaces:
   - .1 Paved surfaces to include all paved roads, driveways, sidewalks and parking areas.
   - .2 If native material used for backfill provide specified depth of subbase as shown on Contract Drawings.

6. Temporary pavement patching:
   - .1 Patch arterial and collector roads same day excavation made.
   - .2 Patch all other roads within 24 hours of closing trench.
   - .3 Patching material to be hot-mix asphalt on all roads unless specified otherwise, cold-mix may be used only where directed by Department Representative.
   - .4 Place temporary pavements to 50 mm minimum thickness.
   - .5 Maintain temporary patch to ensure safe and smooth conditions.

7. Permanent pavement restoration:
   - .1 Install permanent pavement within 30 days of placement of t emporary patch or sooner where directed by Department Representative.
   - .2 Remove broken or cracked pavement as well as any paves areas showing settlement and dispose off-site.
   - .3 Remove underlying granular road base material as required to permit placement of specified thickness of permanent pavement. Ensure remaining base meets specified thickness. Material and placement of road base to Section 32 11 23-Aggregate Base Courses
   - .4 Compact base to minimum 95% Modified Proctor density.
   - .5 Restore pavement as detailed on Contract Drawings. If thickness of existing pavement permits, grind 40 mm depth along edge of pavement. Dry if necessary and paint clean, dry edge with asphalt emulsion (tack coat).
   - .6 Place and compact hot-mix pavement material to minimum thickness as shown on Contract Drawings.
   - .7 Material and placement of hot-mix pavement to Section 32 12 16-Asphalt Paving.
   - .8 Restore surface to smooth condition and match with grade of adjacent pavement.
   - .9 Where shown on Contract Drawings place hot-mix overlay over restored trench section and adjacent pavement to Section 32 12 16-Asphalt Paving.
   - .10 Maintain restored pavements in complete repair during Maintenance Period. Effect repairs within 14 days from receipt of written notice from Department Representative or immediately if so directed by Department Representative if dangerous situation exists.

8. Landscape Restoration:
   1. Restoration of planted areas to consist of restoration to original condition by replacement to original depth of approved topsoil (minimum 100mm), seeding or sodding of grassed areas and replacement of any killed or removed plants or shrubs by ones equal quality, type and maturity to originals.
   2. Plant replacement trees and shrubs at a suitable time of year in accordance with good horticulture practice, to provide maximum assurance of plant survival. If tree or shrub has died, or shows signs of dying, as a result of environmental disturbance, cutting of roots, or other causes directly attributed to Contractors work, close to but not actually within excavation areas, replace with new tree or shrub of a similar variety, age and size, up to limits of maximum available size.

9. Restoration acceptance: no restoration work to be considered satisfactory until acceptance by Department Representative.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 REFERENCES

1. American Society for Testing and Materials (ASTM)
   .1 ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
2. British Columbia Landscape Standards.
3. Canadian System of Soil Classification.

1.2 SITE CONDITIONS

1. Examine site with Department Representative and obtain approval of previous work prior to commencing site grading.

PART 2 - PRODUCTS

2.1 MATERIALS

1. Fill material: in case of deficit of in-place or specified materials, all additional materials necessary to bring site up to specified grade to comply with material specified in appropriate Section or shown on Contract Drawings.
2. Obtain approval from Department Representative for excavated or graded material to be used as fill for grading work. Protect approved material from contamination.
3. Fill material to be placed under areas to be landscaped, i.e., with grass, sod, groundcover, shrubs and trees, to be non-toxic to plant and animal life in part or in concentration (leachate).

PART 3 - EXECUTION

3.1 STRIPPING OF TOPSOIL

1. Strip all organic material to specified limits and specified depth. Stockpile for re-use as shown in Contract Documents. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected. Remove all debris and unusable material as specified in the Contract Documents.
2. Surface drainage: provide suitable temporary ditches or other approved means of handling drainage prior to excavation and during construction to protect construction area and adjacent and other affected properties. Provide siltation controls to protect natural watercourses or existing drainage facilities.

3.2 GRADING

1. Rough grade to levels, profiles, and contours allowing for surface treatment as shown on Contract Drawings.
2. Compact subgrade to consistent 80% Modified Proctor Density in compliance with ASTM D1557.

3. Excavate soft and unstable areas below subgrade that cannot be compacted to this standard and fill with approved fill material, except in locations where special environmental conditions have been identified. In such cases, comply with details shown on Contract Drawings.

4. Remove and dispose to approved off-site disposal area, all debris, roots, branches, stones, building material, contaminated subsoil, visible weeds and anything else that may interfere with proper growth and development of planned finished landscaping.

5. Place fill materials to elevations and sections shown on Contract Drawings. Place in maximum 200mm lifts and compact each lift to 80% Modified Proctor Density.

6. Scarify areas showing excessive compaction to minimum depth of 150mm and compact to 80% Modified Proctor Density immediately before placing growing medium (topsoil).

7. Ensure gradients within ranges shown in Table 1, except where Contract Drawings show variations from this standard.

8. Grade transitions of subgrade smooth and even, such that ponding cannot occur on subgrade surface.

TABLE 1: Maximum and Minimum Gradients in Landscaped Areas

Location	Minimum	Maximum
Lawn and Grass	50:1 (2%)	3:1
Grass Swales (without additional erosion protection)	300:1* (0.3%)	10:1 (10%)
i) Slope along inverts	6:1 (Preferred)	3:1
ii) Side Slopes		
Unmowed Areas	100:1 (1%)	2:1*
Planted Areas	50:1 (2%)	2:1*
*Unless directed otherwise by Department Representative		

3.3 TOLERANCES

1. Accuracy of subgrade elevations to be within tolerances shown in Table 2.

TABLE 2: Tolerances for Subgrades Where Growing Medium (Topsoil) to be Placed Over Subgrade.

Conditions	Intended Growing Medium Depth	Tolerance
Within 3m from fixed elevations (e.g., paving edges, curbs, etc.)	0 – 150 mm	± 25 mm
	151 – 300 mm	± 25 mm
	301 – 600 mm	± 50 mm
Other areas	0 – 150 mm	± 25 mm
	151 – 300 mm	± 50 mm
	301 – 600 mm	± 50 mm

3.4 SURPLUS MATERIAL

1. Remove surplus material and material unsuitable for fill, grading or landscaping off site at approved disposal area.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

1. Section 01 33 00-Submittal Procedures.
2. Section 01 35 33-Health and Safety.
3. Section 31 24 13-Roadway Embankments.
4. Section 31 23 10-Excavating, Trenching and Backfilling.

1.2 DEFINITION

1. Rock is defined as all solid rock in form of bedrock, masses, ledges, seams or layer and includes igneous rock of any sort, conglomerate, sandstone or shale, that requires breaking by continuous drilling and blasting before excavation and removal. Rock also includes rocks having individual volumes in excess of 1.0 m^3, removed by blasting or other means.
2. Trench rock removal is defined as rock to be removed during roadway excavation, site grading, or other excavation work, generally, but not necessarily, in larger quantities, and not within the more confining limits of excavation specified for trench excavation.
3. Mass rock removal is defined as rock to be removed during roadway excavation, site grading, or other excavation work, generally, but not necessarily, in larger quantities, and not within the more confining limits of excavation specified for trench excavation.
4. Dense tills, hardpan, partially cemented materials, clay or frozen materials which do not require breaking by continuous drilling and blasting before excavation and removal are not classified as rock.

1.3 QUALIFICATIONS

.1 Retain licensed explosives expert to program and supervise blasting work, and to determine precautions, preparation and operations techniques.

1.4 BLASTING OPERATION PROPOSAL

.1 Submit to Department Representative for approval, written proposal of operations for removal of rock by blasting, in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate proposed method of carrying out work. Include details on protective measures, time of blasting and other pertinent details.

.3 No blasting to proceed without written approval of Department Representative.

1.5 BLASTING SURVEY AND MONITORING

.1 Department Representative will arrange for assessment of adjacent buildings and structures to determine existing conditions and will provide proposed blasting procedures and copies of assessment reports and seismic recording operations.

.2 Seismographic monitoring will be conducted during entire progress of blasting operations. Cost of seismic survey and monitoring reports will be paid by Department.

1.6 PROTECTION

.1 Prevent damage to surroundings and injury to persons. Erect fencing, post guards, sound warnings and display signs when blasting to take place.

PART 2 - MATERIALS

NOT USED.

PART 3 - EXECUTION

3.1 BLASTING AND VIBRATION CONTROL

.1 Complete all blasting before any structural elements are installed within 15m from blast holes.

.2 Minimize ground vibrations which may damage structures or shatter or damage rock mass to remain.

.3 Blasting not permitted within distance of 30m of concrete or grout less than 24 h after pouring.

.4 Maintain complete and accurate record of all drilling and blasting operations. Submit records to Department Representative at end of each shift.

3.2 ROCK REMOVAL

.1 Strip rock of all earth.

.2 Notify Department Representative within reasonable time to enable Department Representative to obtain necessary measurements.

.3 Do blasting operations in accordance with applicable bylaws.

.4 Remove rock to alignments, profiles and cross sections as shown on Contract Drawings.

.5 Locations where explosive blasting is not permitted, if applicable, are shown on Contract Drawings.

.6 Use methods, techniques and procedures for control of all factors affecting operations in order to produce smooth and sound peripheral surfaces of all completed excavations, to minimize overbreak, and to avoid damage to adjacent structures.

.7 Excavate trenches in accordance with 31 23 10 – Excavating, Trenching and Backfilling.

.8 Excavate rock for concrete walls, columns and footings to horizontal surfaces not exceeding slope shown on Contract Drawings. Scale, pressure wash and broom clean rock surfaces to assist concrete bond.

.9 Except as specified otherwise or as directed by Department Representative employ pre-shearing, cushion blasting or other smooth wall drilling and blasting techniques to achieve final excavation surfaces.

.10 Remove boulders and fragments which may slide or roll into excavated areas.

.11 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

3.3 ROCK DISPOSAL

.1 Dispose of surplus removed rock at an approved off site location.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

1. Section 01 35 43-Environmental Procedures.
2. Section 31 05 16-Aggregate Materials
3. Section 31 23 17-Rock Removal.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).

1.3 DEFINITIONS

1. Excavation classes: only two classes of excavation will be recognized:
   1. Rock excavation: to Section 31 23 17-Rock Removal.
   2. Common Excavation: to Section 31 23 10-Excavating, Trenching and Backfilling.
2. Embankment (subgrade fill): material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
3. Imported embankment fill: approved granular material, supplied by Contractor and obtained from off-site sources, to be used for embankment fill up to subgrade elevation.
4. Pavement structure: combination layers of unbound or stabilized granular subbase, base and sphalt or concrete surfacing.
5. Subgrade elevation: elevation immediately below pavement structure.
6. Waste Material: material unsuitable for embankment,

1.4 BLASTING

1. All blasting operations to comply with Section 31 23 17-Rock Removal.

1.5 WASTE MANAGEMENT AND DISPOSAL

1. Divert excess materials from landfill to site approved by Department Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

1. Unless shown otherwise on the Contract Drawings, the following specified materials are approved for their respective uses. Backfill for embankment fill (subgrade fill) to be:
   1. Approved native or imported granular material.
   2. Pit run gravel.
   3. Pit run sand.
2. Refer to Section 31 05 16-Aggregate Materials for specifications for approved granular materials.

PART 3 - EXECUTION

3.1 GENERAL

1. Strip all organic material to specified limits and specified depth or as directed by Department Representative. Do not handle topsoil while wet or frozen condition or in any manner in which soil structure is adversely affected. Remove all debris. Stockpile and place topsoil as specified.

2. Surface drainage:
   .1 Provide suitable temporary ditches or other approved means of handling drainage prior to excavation and during construction to protect construction are and adjacent and other affected properties. Provide siltation controls to protect natural watercourses or existing municipal drainage facilities.
   .2 Comply with Section 01 35 43-Environmental Procedures.

3.2 EXCAVATION

1. Notify Department Representative sufficiently in advance of excavation operations for initial cross-sections to be taken.

2. Notify Department Representative whenever unsuitable materials are encountered in cut sections and remove unsuitable materials to depth and extent as directed by Department Representative.

3. If, during excavation, material appearing to conform to classification for rock is encountered, notify Department Representative in sufficient time to enable measurements to be made to determine volume of rock.

4. Rock excavation: Rock excavation to Section 31 23 17-Rock Removal

3.3 INSPECTION OF NATIVE SURFACE

1. Prior to placing embankment fill, proof roll graded native surface using fully loaded single or dual axle dump truck. Department Representative may authorize use of other acceptable proof rolling equipment. Remove soft or other unstable material. Replace with approved embankment fill to Section 31 24 13-Roadway Embankments proctor density in compliance with ASTM D1557. (All following references to density imply compliance with ASTM D1557).

3.4 PLACING

1. Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.

2. Begin spreading material on crown line or high side of one-way slope.

3. Place materials using methods which do not lead to segregation or degradation.

4. Place material to full width in uniform layers and compact to specified densities.

5. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

6. Remove and replace that portion of any layer in which material becomes segregated during spreading.

7. Where shown on Contract Drawings or as directed by Department Representative, scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.

8. Where fill material consists principally of rock:
   .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case layer thickness to exceed 1 m.
   .2 Individual rock fragments not exceeding 1.5 m in horizontal dimension permitted provided their vertical dimension does not exceed one third of fill section depth.
   .3 Carefully distribute rock material to fill voids with smaller fragments to form compact mass.
   .4 Fill surface voids at subgrade level with rock spalls or selected material to form an earth-tight surface.
   .5 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of subgrade elevation.

3.5 COMPACTION

1. Compaction equipment to be capable of obtaining required densities in materials on project.

2. Compact to density of not less than 95% Modified Proctor density.

3. Shape and roll alternately to obtain smooth, even and uniformly compacted layers.

4. Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.

5. In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.

6. Finish slopes to neat condition, true to line and grade.
   .1 Remove boulders encountered in cut slopes and fill resulting cavities.
   .2 Hand finish slopes that cannot be finished satisfactorily by machine.

3.6 FINISHED TOLERANCES

1. Ensure finished subgrade within plus or minus 15 mm of specified grade and cross-section but not uniformly high or low.
2. Ensure finished subgrade surface has no irregularities exceeding 15 mm when checked with a 3 m straight edge places in any direction.
3. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.7 PROOF ROLLING

1. For proof rolling use fully loaded single or duel axle dump truck.
2. Department Representative may authorize use of other acceptable proof rolling equipment.
3. Proof roll top of embankment fill upon completion of fine grading and compaction.
4. Make sufficient passes with proof roller to subject every point on surface to three spate passes of loaded tore.
5. Where proof rolling reveals areas of unsuitable subgrade:
   - .1 Remove unsuitable embankment material to depth and extent directed by Department Representative.
   - .2 Replace with approved embankment material and compact in accordance with this section.

3.8 PLACE TOPSOIL

1. Place, spread and grade topsoil as shown on Contract Drawings.
2. Restore planted areas with topsoil, ground cover, and plants or shrubs to match existing planted areas as shown on Contract Drawings.

3.9 MAINTENANCE

1. Maintain finished embankment fill in condition conforming to this section until succeeding material is applied or until granular base is accepted by Department Representative.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

1. Section 01 35 14-Special Procedures for Traffic Control.
2. Section 31 24 13-Roadway Embankments
3. Section 31 05 16-Aggregate Materials.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 422, Standard Test Method for Particle-Size Analysis of Soils.
- .5 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m^3).
- .6 ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m^3).
- .7 ASTM D 1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .8 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular material from landfill to local facility as approved by Department Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

1. Material for road subbase to be:
   1. Select granular subbase.
   2. 75 mm pit run gravel.
   3. 75 mm minus crushed gravel.
   4. Pit run sand.
   5. Approved native material.
   6. Other approved materials.
2. Refer to Section 31 05 16-Aggregate Materials for material specifications.

3. Other granular materials: granular materials approved for road base or pipe bedding also acceptable for road subbase subject to approval of Department Representative.

PART 3 - EXECUTION

3.1 INSPECTION OF UNDERLYING SUBGRADE SURFACE

.1 Ensure underlying subgrade surface true to cross-section and grade and compacted to specified density. Department Representative may accept satisfactory proof rolling as evidence of acceptable compaction of undisturbed native subgrade. Do not place granular subbase until subgrade is inspected and approved by Department Representative.

3.2 PLACING

1. Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.

2. Begin spreading sub-base material on crown line or high side of one-way slope.

3. Place granular sub-base materials using methods which do not lead to segregation or degradation.

4. Place material to full width in uniform layers not exceeding 300mm compacted thickness. Department Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

5. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

6. Remove and replace portion of layer in which material has become segregated during spreading.

3.3 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density of not less than 95% Modified Proctor Density.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Department Representative.

3.4 SITE TOLERANCES

1. Ensure finished subbase within plus or minus 15 mm of specified grade and cross-section but not uniformly high or low.

2. Ensure finished subbase surface has no irregularities exceeding 15 mm when checked with a 3 m straight edge placed in any direction.

3. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

1. For proof rolling use fully loaded single or dual axle dump truck.

2. Department Representative may authorize use of other acceptable proof rolling equipment.

3. Proof roll at level in subbase as required. If alternative proof rolling equipment is authorized, Department Representative will determine level of proof rolling.

4. Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

5. Where proof rolling reveals area of unsuitable subgrade:
   1. Remove subbase and subgrade material to depth and extent as directed by Department Representative.
   2. Backfill excavated subgrade with approved embankment material and compact in accordance with Section 31 24 13-Roadway Embankments.
   3. Replace subbase material and compact in accordance with this section.

6. Where proof rolling reveals areas of unsuitable subbase, remove unsuitable materials to depth and extent directed by Department Representative and replace with new materials in accordance with this section at no extra cost.

3.6 MAINTENANCE

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Department Representative.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

1. Section 31 05 16-Aggregate Materials.
2. Section 32 11 19-Granular Sub-Base.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m^3).
- .5 ASTM D 1557-[00], Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m^3).
- .6 ASTM D 1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .7 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular material from landfill to local facility as approved by Department Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Material for road base to be:
- .1 19 mm crushed granular base gravels.
- .2 Refer to Section 31 05 16-Aggregate Materials for material specifications.

PART 3 - EXECUTION

3.1 INSPECTION OF UNDERLYING SUBGRADE SURFACE

.1 Ensure underlying subbase surface true to cross-section and grade and compacted to 95% Modified Proctor density in compliance with ASTM D1557. Do not place granular subbase until subgrade is inspected and approved by Department Representative.

3.2 PLACING

1. Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.
2. Begin spreading sub-base material on crown line or high side of one-way slope.
3. Place granular sub-base materials using methods which do not lead to segregation or degradation.
4. Place material to full width in uniform layers not exceeding 150mm compacted thickness. Department Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
5. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
6. Remove and replace portion of layer in which material has become segregated during spreading.

3.3 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density of not less than 95% Modified Proctor Density.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Department Representative.

3.4 SITE TOLERANCES

1. Ensure finished base within plus or minus 10 mm of specified grade and cross-section but not uniformly high or low.
2. Ensure finished surface has no irregularities exceeding 10 mm when checked with a 3 m straight edge placed in any direction.
3. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

1. For proof rolling use fully loaded single or dual axle dump truck.
2. Department Representative may authorize use of other acceptable proof rolling equipment.
3. Proof roll top of base upon completion of fine grading and compaction.

4. Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

5. Where proof rolling reveals area of unsuitable subgrade:
   1. Remove base, subbase and subgrade material to depth and extent as directed by Department Representative.
   2. Backfill excavated subgrade with approved embankment material and compact in accordance with Section 31 24 13-Roadway Embankments.
   3. Replace subbase material and compact in accordance with this Section 32 11 19-Granular Sub-Base.
   4. Replace base material and compact in accordance with this Section.

6. Where proof rolling reveals areas of unsuitable base or subbase, remove unsuitable materials to depth and extent directed by Department Representative and replace with new materials in accordance with Section 32 11 19-Granular Sub-Base at no extra cost.

3.6 MAINTENANCE

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Department Representative.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for asphalt concrete paving for roads.

1.2 RELATED SECTIONS

1. Section 01 33 00-Submittal Procedures.

2. Section 31 05 16-Aggregate Materials.

1.3 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO)
- .1 AASHTO M320, Standard Specification for Performance Graded Asphalt Binder.
- .2 AASHTO R29, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
- .3 AASHTO T245, Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

.2 Asphalt Institute (AI)
- .1 AI MS2 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.3 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C 117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C 123, Standard Test Method for Lightweight Particles in Aggregate.
- .4 ASTM C 127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
- .5 ASTM C 128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
- .6 ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .7 ASTM C 136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .8 ASTM C 207, Standard Specification for Hydrated Lime for Masonry Purposes.
- .9 ASTM D 995, Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .10 ASTM D 2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- .11 ASTM D 3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
- .12 ASTM D 4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
.3 CAN/CGSB-16.3, Asphalt Cements for Road Purposes.

1.4 PRODUCT DATA

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit manufacturer's test data and certification that asphalt cement meets requirements of this Section.

.3 Submit asphalt concrete mix design and trial mix test results to Department Representative for review at least 4 weeks prior to beginning Work.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.

.4 Divert unused asphalt from landfill to facility capable of recycling materials.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Asphalt cement: to CAN/CGSB-16.3-M90, grade: 80-100.

.2 Reclaimed asphalt pavement:
.1 Crushed and screened so that 100% of RAP material passes 37.5 mm screen before mixing.

.3 Aggregates: in accordance with Section 31 05 16 - Aggregate Materials: General following requirements:
.1 Crushed stone or gravel consisting of hard, durable angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
.2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117.
.3 Table

Sieve Designation	% Passing	
	Lower Course #1	Upper Course #1
25mm	100	--
19mm	--	--
12.5	70-85	100
9.5	--	--
4.75	40-65	55-75
2.36	32-53	38-58
1.18	26-44	28-47
0.600	18-36	20-36
0.300	10-26	10-26
0.150	4-17	4-17
0.075	3-8	3-8

.4 Coarse aggregate: aggregate retained on 4.75mm sieve and fine aggregate is aggregate passing 4.75mm sieve when tested to ASTM C 136.

.5 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75mm sieve and stockpile separately from coarse aggregate.

.6 Do not use aggregates having known polishing characteristics in mixes for surface courses.

.7 Sand equivalent: ASTM D 2419 Min: 40.

.8 Magnesium Sulphate soundness: to ASTM C 88 Max% loss by mass after five cycles:
- .1 Coarse aggregate: 15%.
- .2 Fine aggregate: 18%.

.9 Los Angeles abrasion: Grading B, to ASTM C 131 Max % loss by mass:
- .1 Coarse aggregate, upper course: 25%
- .2 Coarse aggregate, lower course: 35%.

.10 Absorption: to ASTM C 127 Max % by mass:
- .1 Coarse aggregate, upper course: 1.75%.
- .2 Coarse aggregate, lower course: 2.00%.

.11 Loss by washing: to ASTM C 117 Max % passing 0.075 mm sieve:
- .1 Coarse aggregate, upper course: 1.5
- .2 Coarse aggregate, lower course: 2.0

.12 Flat and elongated particles: to ASTM D 4791, (with length to thickness ratio greater than 3): Max% by mass:
- .1 Coarse aggregate, upper course: 10%.
- .2 Coarse aggregate, lower course: 10%.

.13 Crushed fragments: at least 60% of particles by mass within each of following sieve designation ranges, to have at least 2 freshly fractured face. Material to be tested according to ASTM C 136 and ASTM C117. Determination of amount of fractured material will be inaccordance with Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "B", which determines fractured faces by mass.

Passing		Retained on
25 mm	to	12.5mm
12.5 mm	to	4.75mm

.14 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

.4 Mineral filler:
- .1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
- .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.

.3 Mineral filler to be dry and free flowing when added to aggregate.

2.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:
- .1 Minimum drum diameter: 1200mm.
- .2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
- .1 Boxes with tight metal bottoms.
- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:
- .1 Lutes or rakes with covered teeth for spreading and finishing operations.
- .2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Department Representative may be used instead of tamping irons.
- .3 Straight edges, 3.0m in length, to test finished surface.

2.3 MIX DESIGN

.1 Mix design provided by the Contractor (to be developed by testing laboratory) for approval by Department Representative.

.2 Mix to contain maximum 20% by mass of RAP. Department Representative may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.

.3 Design of mix: by Marshall method to requirements below.
- .1 Compaction blows on each face of test specimens: 75.

.2 Mix physical requirements:

Property		Pavement Course	
Marshall Stability at 60°C	kN min	6.4	lower course
		5.5	upper course
		5.5	fine
Flow Value	mm	2-4	
Air Voids in Mixture	%	3-6	lower course
		3-5	upper course
		3-5	fine
Void in Mineral Aggregate	% min	13	lower course 1
		14	lower course 2
		14	upper course 1
		15	upper course 2
		15	fine
Index of Retained Stability		75	

.3 Measure physical requirements as follows:
.1 Marshall load and flow value: to ASTM D1559.
.2 Air voids: to ASTM D3203.
.3 Index of Retained Stability: measure in accordance with Marshall Immersion Test (ASTM D1559).
.4 Do not change job-mix without prior approval of Department Representative. When change in material source proposed, new job-mix formula to be reviewed by Department Representative.

PART 3 - EXECUTION

3.1 PLANT AND MIXING REQUIREMENTS

.1 Batch and continuous mixing plants:
.1 To ASTM D 995.
.2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Do not load frozen materials into bins.
.3 Feed cold aggregates to plant in proportions to ensure continuous operations.
.4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
.5 Before mixing, dry aggregates to moisture content not greater than 0.5% by mass or to lesser moisture content if required to meet mix design requirements.
.6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.
.7 Store hot screened aggregates in manner to minimize segregation and temperature loss.
.8 Heat asphalt cement and aggregate to mixing temperature directed by Department Representative. Do not heat asphalt cement above 160 degrees C.
.9 Maintain temperature of materials within 5 degrees C of

specified mix temperature during mixing.

.10 Mixing time:

.1 In batch plants, both dry and wet mixing times as directed by Department Representative. Continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30s or more than 75s.

.2 In continuous mixing plants, mixing time as directed by Department Representative but not less than 45s.

.3 Do not alter mixing time unless directed by Department Representative.

.11 Where RAP is to be incorporated into mix:

.1 Feed from separate cold feed bin specially designed to minimize consolidation of material. Provide 37.5mm scalping screen on cold feed to remove oversized pieces of RAP.

.2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti rollback device to prevent material from sliding backward on feed belt.

.3 Combine RAP and new aggregates in proportions as directed by Department Representative. Dry mix thoroughly, until uniform temperature within plus or minus 5 degrees C of mix temperature, as directed by Department Representative Consultant is achieved prior to adding new asphalt cement. Do not add new asphalt cement where temperature of dried mix material is above 160 degrees C.

.2 Dryer drum mixing plant:

.1 To ASTM D 995.

.2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.

.3 Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

.4 Where RAP is to be incorporated into mix, dryer drum mixer is to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180 degrees C.

.5 Feed RAP from separate cold feed bin designed to minimize r econsolidation of material.

.6 Meter total flow of aggregate and RAP by an electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate RAP and asphalt entering mixer remain constant.

.7 Provide for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.

.8 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved. Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time. Difference between

this value and amount shown by plant computer system to d iffer by not more than plus or minus 2%.

.9 Make provision for conveniently sampling full flow of materials from cold feed.

.10 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.

.11 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.

.12 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each week, if required.

.13 Mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer to be less than 0.5%.

.3 Temporary storage of hot mix:

.1 Provide mix storage of sufficient capacity to permit c ontinuous operation and designed to prevent segregation.

.2 Do not store asphalt mix in storage bins in excess of 12 hour.

.4 Mixing tolerances:

.1 Permissible variation in aggregate gradation from job mix (percent of total mass).

.75 mm sieve and larger	5.5
2.36 mm sieve	4.5
0.600 mm sieve	3.5
0.150 mm sieve	2.5
0.075 mm sieve	1.5

.2 Permissible variation of asphalt cement from job mix: 0.3%.

.3 Permissible variation of mix temperature at discharge from plant: 5 degrees C.

3.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:

.1 Minimum drum diameter: 1200mm.

.2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
- .1 Boxes with tight metal bottoms.
- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:
- .1 Lutes or rakes with covered teeth for spreading and finishing operations.
- .2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Department Representative may be used instead of tamping irons.
- .3 Straight edges, 3.0m in length, to test finished surface.

3.3 PREPARATION

.1 Reshape granular road bed, if required.

.2 When paving over existing asphalt surface, clean pavement surface. When leveling course is not require, patch and correct depressions and other irregularities to approval of Department Representative before beginning paving operations.

.3 Adjust existing castings to new elevations and protect from asphaltic mix.

.4 When matching new pavement with existing pavement make vertical cut between existing pavement and new pavement as shown on Contract Drawings.

.5 Apply prime coat and/or tack coat in accordance with Section 32 12 14-Asphalt Prime Coats and/or Section 32 12 15-Asphalt Tack Coats prior to paving.

.6 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required. Elevate truck bed and thoroughly drain. No excess solution to remain in truck bed.

.3 Schedule delivery of material for placing in daylight, unless Department Representative approves artificial light.

.4 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by Department Representative, but not less than 125 degrees C.

3.5 PLACING

.1 Obtain Department Representative's approval of base and existing surface and tack coat and prime coat prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as shown on Contract Drawings.

.3 Placing conditions:
- .1 Place asphalt mixtures only when air temperature is above 5 degrees C. Place overlay pavement only when air temperature is above 10 degrees C.
- .2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
- .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as shown on Contract Drawings:
- .1 Levelling courses to thicknesses required but not exceeding 100mm.
- .2 Lower course in layers of 100mm each.
- .3 Surface course in layers of maximum 60mm each.

.5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.6 Spread and strike off mixture with self propelled mechanical finisher.
- .1 Construct longitudinal joints and edges true to line markings. Position and operate paver to follow established line closely.
- .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
- .3 Maintain constant head of mix in auger chamber of paver during placing.
- .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
- .5 Correct irregularities in alignment left by paver by trimming directly behind machine.
- .6 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot

mix. Do not broadcast material over such areas.

.7 Do not throw surplus material on freshly screeded surfaces.

.7 When hand spreading is used:

.1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly. Do not broadcast material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt. Control temperature to avoid burning material. Do not use tools at higher temperature than temperature of mix being placed.

3.6 COMPACTING

.1 Roll asphalt continuously to density not less than 97% of 75 blow Marshall density to ASTM D1559 with no individual test less than 95%.

.2 General:

.1 Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be pneumatic tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. For subsequent rolling do not exceed 5 km/h for static steel-wheeled and 8 km/h for pneumatic tired rollers.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.5 Overlap successive passes of roller by minimum of 200mm and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.10 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.11 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.3 Breakdown rolling:

.1 Commence breakdown rolling immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators for this work.

.4 Second rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has be thoroughly compacted.

.5 Finished rolling:

.1 Accomplish finish rolling with steel wheel rollers while material is still warm enough for removal of roller marks.

.2 Conduct rolling operations in close sequence.

3.7 JOINTS

.1 General:

.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 600mm.

.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to

paving of adjacent lane.

.1 For airfield runway paving, avoid cold joint construction in mid 30 m of runway.

.2 If cold joint can not be avoided, tack face with thin coat of hot asphalt prior to continuing paving.

.3 Overlap previously laid strip with spreader by 100mm.

.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.

.5 Roll longitudinal joints directly behind paving operation.

.6 When rolling with static roller over onto previously placed lane in order that 100 to150 mm of drum width rides on newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until thoroughly compacted neat joint is obtained.

.7 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade. Location of feather joints as indicated.

.5 Construct butt joints as indicated.

.6 Wherever practical, locate joints under future traffic markings (paint lines.)

3.8 PAVEMENT PATCHING

.1 Ensure temporary and permanent pavement patching done by handwork conforms to all standards specified for machine place asphaltic concrete.

.2 Subbase and base preparation as specified in Section 32 11 19 and 32 11 23, respectively, unless shown otherwise on Contract Drawings.

3.9 SIDEWALKS, DRIVEWAYS AND CURBS

.1 Hot-mix asphalt concrete sidewalks, driveways and curbs as shown on Contract Drawings.

.2 Machine place where practical.

.3 Ensure placement by handwork conforms to all standards specified for machine placed asphaltic concrete.

.4 Other than requirements relating specifically to Portland cement concrete, ensure hot-mix asphalt concrete sidewalks and curbs comply with all requirements of Section 32 16 15-Concrete Walks, Curbs and Gutters.

.5 Ensure hot-mix asphalt concrete driveways comply with all requirements of Section 32 12 16-Asphalt Paving.

3.8 FINISH TOLERANCES	.1	Finished asphalt surface to be within 6mm of design elevation but not uniformly high or low.
	.2	Finished asphalt surface not to have irregularities exceeding 6mm when checked with 3 m straight edge placed in any direction.
	.3	Water ponding not permitted.
	.4	Against concrete gutter, finished asphalt surface to be higher than the gutter by not more than 6mm.
3.9 DEFECTIVE WORK	.1	Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
	.2	Repair areas showing checking, rippling, or segregation.
	.3	Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.
3.10 CLEAN-UP	.1	Remove lids or covers from all castings and clean any prime, tack coat or hot-mix asphaltic concrete from frames, lids and covers of all castings.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 03 30 00-Cast-In-Place Concrete.

.3 Section 31 24 13-Roadway Embankments.

.4 Section 32 11 23-Aggregate Base Courses.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C 117, Standard Test Method for Materials Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D 260, Standard Specification for Boiled Linseed Oil.
- .4 ASTM D 698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-3.3, Kerosene, Amend. No. 1, National Standard of Canada.
- .2 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)
- .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete with the following criteria specific to this Section:

1. Hand-formed and hand-placed concrete:
   Slump 80 mm.
   Air entrainment: 5 to 8%.
   Maximum aggregate size: 20 mm.
   Minimum cement content: 335 kg/m3.
   Minimum 28 day compressive strength 32 MPa.
2. Extruded concrete:
   Slump: 0-25 mm.
   Air entrainment: 6 to 9%.
   Maximum aggregate size: 10 mm.
   Fineness modulus: 2.1 to 2.4.
   Minimum cement content: 335 kg/m3.

Minimum 28 day compressive strength 32 MPa.

.2 Joint filler and Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Granular subbase: to Section 31 05 16-Aggregate Materials.

.4 Granular base: to Section 31 05 16-Aggregate Materials.

.5 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

.6 Borrow material: to Section 31 24 13-Roadway Embankments.

PART 3 - EXECUTION

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 24 13-Roadway Embankments.

3.2 GRANULAR SUBBASE AND BASE

.1 Place subbase and minimum of 100mm granular base material to design grade as shown on Contract Drawings.

.2 Compact subbase and base to minimum 95% Modified Proctor density.

.3 Obtain Department Representative's approval of compacted base prior to placing forms or control devices for extruding equipment.

3.3 FORMWORK

.1 Ensure steel forms of approved design and free from twists and warp.

.2 Ensure wood forms of select dressed lumber, straight and free from defects and thoroughly cleaned.

.3 Use flexible forms for all curves less than 60m radius.

.4 After obtaining Department Representative's approval of compacted base, set forms to line and grade as shown on Contract Drawings, free from waves or irregularities in line or grade.

.5 Set special isolation forms as required around catchbasins, manholes, poles or other objects as shown on Contract Drawings or as directed by Department Representative.

.6 Forms to be to shap, lines and full dimensions of work being formed.

.7 Adequately brace forms to maintain specified tolerances after concrete is placed.

.8 Treat forms lightly with approved form release agent and remove surplus agent.

3.4 INSPECTION

.1 Immediately prior to placement of concrete, carefully inspect all formwork to ensure forms are properly set at required horizontal and vertical alignment, sufficiently rigid, clean, surface treated and ready for placement of concrete. Obtain Department Representative's approval of formwork and compacted base.

3.5 CONCRETE PLACEMENT

.1 Place concrete to Section 03 30 00-Cast-In-Place Concrete and the following criteria specific to this Section.

.2 Do not place concrete during rain or on ponded water or frozen base.

.3 Do not place concrete when air temperature appears likely to fall below 5°C within 24 h, unless specified precautions are taken and approved by Department Representative.

.4 Schedule concrete placement to ensure sufficient daylight hours available to permit edging and finishing or provide adequate illumination.

.5 Moisten granular base immediately prior to placing Concrete.

.6 Place concrete within 1.5 h of batching time.

.7 Place concrete in forms, ensuring no segregation of aggregate and consolidate with approved mechanical vibrator or power screed.

.8 Place concrete in continuous operation until entire panel or section completed. Do not place fresh concrete on concrete which has achieved partial set.

.9 Incorporate all castings into concrete at time of placement.

3.6 EXTRUDED SECTIONS

.1 Extruding machine to be fitted with approved template consistent with sections shown on Contract Drawings.

.2 Extruded sections to be true to line, grade and cross-section.

.3 Finished appearance, quality and workmanship to comply with Contract Drawings and this Specification.

.4 Where finished product does not conform to specifications, remove defective product and replace.

.5 Defective extruded work replaced with hand placed concrete to be paid at tendered price for extruded product.

3.7 DRIVEWAY CROSSINGS AND WHEEL CHAIR RAMPS

.1 Construct driveway crossings and wheel chair ramps where shown on Contract Drawings.

3.8 TOLERANCES

.1 Maximum horizontal deviation = 6 mm.
Maximum vertical deviation = 6 mm.
Maximum deflection from horizontal or vertical alignment to be 6 mm in 3 m.

3.9 EXPANSION JOINTS

.1 Form transverse expansion joints at both ends of curb returns and at a maximum spacing of 9 m for sidewalks, 9 m for curb and gutter, at each end of driveway crossings and at tangent points on circular work.

.2 Extend through full depth of concrete.

.3 Fill with 13 mm approved expansion joint material.

.4 Bond break compound may be used in lieu of expansion joint between sidewalk and back of abutting curb and gutter or where applicable between sidewalk and back of abutting utility strip or sidewalk infill.

3.10 CONTROL JOINTS

.1 In sidewalks, construct control joints at maximum 3m intervals.

.2 In curb or curb and gutter construct control joints at maximum 3 m intervals and match with control joints in butting sidewalk.

.3 Cut to minimum depth of concrete section as shown on Contract Drawings.

.4 Use proper tool to make cut while concrete is still green or sawcut after concrete has hardened.

3.11 ISOLATION JOINTS

.1 Form isolation joints around all poles, hydrants, manholes and all structures or fixed objects located within the concrete section by using specified joint filling material.

.2 Form longitudinal isolation joints between sidewalk and abutting curb and gutter, abutting utility strips, abutting structures using 13 mm approved joint filling material.

.3 Use 13 mm remolded hardboard joint material to form isolation joints between sidewalks and abutting walls and structures.

3.12 FINISHING

.1 Finish surface of concrete sidewalks and utility strips to smooth surface with magnesium or wood float and brush or broom to provide uniform non-skid surface.

.2 Broom or brush crossways or as otherwise required to match adjacent finish or as directed by the Department Representative.

.3 Grooves or scoring (dummy joints) used for aesthetic purposes as shown on the Contract Drawings or as directed by Department

Representative, to be marked with proper tools and set 15 mm deep.

.4 Finish driveway Crossings and wheel Chair ramps as shown on Contract Drawings.

.5 Round edges with steel edging tool to a width of 50mm around perimeter of each panel or as shown on Contract Drawings.

.6 Ensure surface of hand-formed curb and gutter is smooth magnesium or wood float finish. Ensure extruded Curb and gutter is smooth finished and hand floated as required to Correct irregularities.

.7 Under no circumstances is concrete to be overworked by trowelling, dusted with dry cement or finished with a mortar coat.

.8 Ensure finished surface as specified.

3.13 SPECIAL EFFECTS .1 Exposed aggregate and colored or stamped concrete as Specified on Contract Drawings.

3.14 PROTECTION .1 Protect freshly finished concrete from dust, rain or frost by using tarpaulins or other suitable protective coverings. Keep clear of finished surface.

.2 Place and maintain suitable barriers to protect finished concrete from equipment, vehicles or pedestrian traffic.

.3 Provide personnel as required to prevent vandalism until concrete has set.

.4 Do not run vehicles or construction equipment on concrete for at least 3 days.

3.15 CURING .1 Apply approved curing compound to all exposed concrete surfaces at rate recommended by manufacturer or alternatively, use moist curing procedures for a minimum of 7 days.

.2 When temperature is below 5°C, maintain all concrete at temperature not less than 10°C for at least 72 h and protect from freezing for at least another 72h or such time as required to ensure proper curing of concrete. Admixtures are not to be used for prevention of freezing.

3.16 PERFORATED DRAIN PIPE .1 Where shown on Contract Drawings or where directed by Department Representative install perforated drain pipe adjacent to sidewalk or curb and gutter: to Section 33 41 00-Storm Utility Drainage Piping.

3.17 ACCEPTANCE .1 Before acceptance of finished concrete remove all irregular, cracked, vandalized or otherwise defective sections and replace in accordance with specifications.

.2 Minimum area of replacement of defective sidewalk is one panel section.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 31 23 10 - Excavating, Trenching and Backfilling.

.4 Section 33 05 13 - Manholes and Catch Basin Structures.

.5 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
- .1 ANSI/AWWA C500-[93], Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
- .2 ANSI/AWWA C517-09, Resilient-Seated Cast-Iron Eccentric Plug Valve.
- .3 ANSI/AWWA C508-01, Swing-Check Valves for Waterworks Service, 50 mm through 600 mm NPS.

.2 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 478M-97, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.

1.3 SYSTEM DESCRIPTION

.1 Pumping system to be factory assembled and disassembled for shipment with mating components clearly identified. Principal items of equipment to include 2 identical submersible sewage pumping units, all internal piping and valves, liquid level controls, lifting chains, guide bars, vents complete with screens, cover, electrical wiring, control panel, kiosk, circuit breakers and motor starters etc.

.2 Equipment and installation to include following:
- .1 Excavation for sewage lift station.
- .2 Connection of power to control panel as indicated.
- .3 Connections to gravity inlet sanitary sewers and discharge force mains.
- .4 Supply and installation of packaged sewage lift station in accordance with manufacturer's instructions.
- .5 Supply and installation of valve chamber.

.3 Wet well sewage lift station:
- .1 Fully automatic, consisting of duplex submersible pumps mounted on rail system.
- .2 Pumps to alternate as lead pump on each cycle.
- .3 Operate both pumps when lag pump "on" water level is reached in wet well. Lag pump to shut off when water level drops to pump "off" water level.

.4 Locate control system in control kiosk.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings for civil, structural, hydraulic, mechanical and electrical elements.

.3 Indicate individual components by manufacturer's model number and accompany with technical and performance characteristics.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for sewage lift station for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Include in this information:

.1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.
.2 Interconnections with numbers and wire sizes.
.3 Pump characteristic curves.
.4 Detailed operation and maintenance instructions.
.5 Spare parts list comprising a complete schedule clearly identified to facilitate re-ordering.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

.4 Divert unused concrete materials from landfill to local facility as approved by Departmental Representative.

.5 Fold up metal banding, flatten and place in designated area for recycling.

.6 Do not dispose of unused asphalt waterproofing materials into landfill. Divert materials to municipal hazardous materials depot approved by Departmental Representative.

.7 Unused asphalt waterproofing material must not be disposed of into the sewer system, into streams, lakes, onto the ground or in any other location where it will pose health or environmental hazard.

1.7 SCHEDULING

.1 Schedule work to minimize interruptions to existing services.

.2 Maintain existing sewage flows during construction.

PART 2 - PRODUCTS

2.1 WET WELL STRUCTURE

.1 Shell:

.1 The shell shall have dimensions, including diameter and depth, as indicated and confirmed in advance of shop drawing. All discrepancies shall be reported to the Department Representative.

.2 The shell shall have a sanitary white gelcoat finish on the interior, backed up with a standard corrosion liner which includes a surfacing veil and two layers of 1.5 oz. chopped strand mat. The reinforcements shall be wetted out with a premium grade isopthalic resin. The glass content of the corrosion liner shall be 20-30% with an overall thickness of 3mm.

.3 The Shell structure shall be filament wound in a helical pattern with a winding angle of 60 -70 degrees from the horizontal axis, to a total thickness of 11mm. Glass content of this filament wound structure shall be between 60% and 70% by weight. External reinforcing ribs shall also be installed using the filament winding process. These ribs are trapezoidal in shape with a 50mm height with approximately 6mm of thickness. Rib spacing shall be shown on shop drawings.

.2 Base:

.1 The FRP base design and fabrication is critical in handling the uplift forces present and to provide adequate mounting for the discharge connections.

.2 The FRP base shall have a minimum thickness withstand a full hydrostatic head outside of station with no fluid inside.

.3 A minimum 40mm x 40mm square solid FRP pad will be provided in the base for bolting of each discharge connection. The 3/4" stainless steel base bolts are installed into these solid pads and glassed over from the back side to prevent any leakage.

.3 Ladder: Station will include a full length ladder to the station floor. This is a marine grade aluminium industrial ladder with non slip treads. Aluminium wall brackets are attached to this ladder approximately every 1.5m in length. The ladder shall also include an extendable grab handle.

.4 Electrical Connection: Threaded PVC couplers are laminated to the station wall to provide sealed connections for electrical cables. A total of 4- 50mm diameter couplers will be installed at the elevation and orientation you require.

.5 Lifting and Hold Down Lugs: For handling and anchoring purposes a

minimum of 2 lifting and 4 hold down lugs shall be included. These lugs shall be of mild steel coated with coal tar epoxy. Lugs shall be installed during the filament winding of the reinforcing ribs and shall be placed under the very bottom and top ribs.

.6 Piping: All discharge pipingshall be 304 Stainless Steel, Schedule 10. Vent piping shall be FRP or PVC ducting. Spools from the discharge connection and the valves on header shall use full face flanges. The discharge header shall be made removable by a set of flanges to the force main pipe. All inlet and outlet nozzles are to be FRP laminated inside and out to the tank wall with external gussets where required. Nozzles are machined to a precise O.D. as per your field requirements. Bolting for all flanges are to be 304 Stainless Steel. All interior piping is gelcoated bright white.

2.2 PUMPS

.1 Furnish two (2) submersible grinder wastewater pumps as indicated on the contract drawings in each station. Each pump shall be supplied with stainless steel lifting chain, shipped separately and installed by the contractor. The safe working load of the lifting chain shall incorporate a 4:1 safety factor.

.2 The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two stainless steel guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal, watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.

.3 Approvals:

.1 The pump/motor assembly shall have CSA approval as one unit, per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings.

.2 An approval of the motor unit only will not be acceptable.

.3 The pump/motor unit is also approved by CSA for service in Class I, Division II, Groups A, B, C or D hazardous locations.

.4 Pump Construction:

.1 Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blowholes or other irregularities. All exposed nuts or bolts shall be of AISI type 304 stainless steel. An approved, sewage resistant coating shall protect all metal surfaces coming into contact with the pumpage, other than stainless steel or brass.

.2 Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result

of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

.3 Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

.5 Motors:

.1 The pump motor shall be a NEMA-B design induction type with a squirrel cage rotor, shell type design and be housed in an air or oil filled, watertight chamber.

.2 The stator windings and leads shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be trickle impregnated with Class H resin and shall be heat-shrink fitted into the stator housing providing for superior heat transfer. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that

.3 The motor shall be designed for continuous duty while handling pumped media of up to 40°C (104°F).

.4 The motor shall be capable of withstanding at least 15 evenly spaced starts per hour.

.5 The rotor bars and short circuit rings shall be made of aluminium.

.6 Pump motor shall have a normally closed in winding heat senor, to monitor the stator temperature. The heat senor shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

.7 The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15.

.8 The motor shall have a voltage tolerance of +/- 10%.

.9 The motor shall be designed for continuous operation in up to a 40°C (104°F) ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C (176°F).

.6 Cable Entry Seal:

.1 The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal.

.2 The cable entry shall consist of a single, cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable and individual wires sealed by epoxy podding.

.3 The assembly shall provide ease of changing the cable when necessaries using the same entry seal.

.7 Cooling System: Motors are sufficiently cooled by the surrounding environment or pumped media. A water cooling jacket is not required.

.8 Volute: Pump volute shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

.9 Impeller:
.1 The impeller shall be recessed impeller to handle ground slurry without clogging or binding and provide unobstructed flow passage.

.10 Paint Standard: The exterior of the pump, including all metal surfaces coming into contact with the pumpage shall be protected by a factory-applied spray coating.

.11 Pump Shaft:
.1 Pump and motor shaft shall be the same unit and shall be made of AISI type 431 or 416 stainless steel throughout.
.2 The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable.
.3 The use of stainless steel sleeves to protect a lesser grade of shaft material will not be considered equal.

.12 Mechanical Seals:
.1 Each pump shall be provided with a tandem mechanical shaft seal system consisting of two, totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pumped liquid and the lubricant chamber, shall contain one stationary and one positively driven rotating silicon-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary carbon -ceramic seal ring and one positively driven rotating carbon seal ring. Each seal interface shall be held in contact by its own spring system.
.2 The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.
.3 The position of both mechanical seals shall depend on the shaft.
.4 Mounting of the lower mechanical seal on the impeller hub will not be acceptable.
.5 For special applications, other seal face materials shall be available.
.6 The following seal types shall not be considered acceptable nor equal to the dual independent seal specified:
.1 shaft seals without positively driven rotating members, or
.2 conventional double mechanical seals containing either a common single or

.3 double spring acting between the upper and lower seal faces.
.4 Cartridge type systems will not be acceptable.
.5 No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

.7 Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity.
.8 The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.
.9 The seal system shall not rely upon the pumped media for lubrication.
.10 The motor shall be able to operate dry without damage while pumping under load.
.11 A seal leak probe shall be installed in the seal chamber to detect water and connect to the control panel for seal leak alarm.

.13 Bearings:
.1 The pump shaft shall rotate on two bearings.
.2 Motor bearings shall be permanently grease or oil lubricated. The upper bearing shall be a single deep groove ball bearing.
.3 The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces.

.14 Performance Guarantee & Standard Tests:
.1 The pump performance shall conform to ISO 9906:1999. The tests are intended to ascertain the performance of the pump and to compare this with the manufacturer's guarantee.
.2 The performance test of the pump(s) shall be carried out to determine the performance of the pump with respect to the discharge rate of flow, total head, power absorbed, etc.
.3 Hydrostatic Test of the pump volute or the complete pump unit shall be conducted when specifically requested by the Department Representative.

.15 Experience:
.1 The pump manufacturer shall have several units of similar type pumps installed and operating for no less than five years in Canada.
.2 The pump supplier shall maintain a temporary pump replacement service available in the event of an emergency.
.3 The pump supplier shall have a have a local (within British Columbia) parts and labor service by factory trained technicians.

2.3 PUMP CONTROL SYSTEM .1 See Division 16

2.4 PIPING AND VALVES .1 Stainless steel pipe, fittings and joints: as indicated, Grade SS 304.

.2 Plug valves: to ANSI/AWWA C117-09.

.3 Check valves: Class 125, swing check type, spring loaded lever, stainless steel shaft, to ANSI/AWWA C508.

2.5 ELECTRICAL CONTROL PANEL AND WIRING

.1 See Division 16.

PART 3 - EXECUTION

3.1 EXCAVATION BACKFILLING AND COMPACTION

.1 Excavate, backfill and compact in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

3.2 CONCRETE

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete 33 05 13 - Manholes and Catch Basin Structures.

3.3 EQUIPMENT INSTALLATION

.1 Install equipment, piping and controls in accordance with manufacturers' recommendations.

3.4 FIELD QUALITY CONTROL

.1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Departmental Representative.

.2 Test in presence of Departmental Representative and representative from equipment supplier.

.3 Provide labour and ancillary equipment necessary to fulfill tests.

.4 Test to demonstrate that:
- .1 Pumps and equipment run free from heating, or vibration.
- .2 Operation meets requirements of these specifications.
- .3 Pumps and pumping are free and clear of debris and obstructions.

.5 Replace equipment found defective. Repeat test until equipment is accepted by Departmental Representative.

3.5 DEMONSTRATION

.1 Operating Personnel Training
- .1 Provide on-site training by qualified personnel for designated operating personnel prior to final commissioning. Training to be in accordance with training plan approved by Departmental Representative.
- .2 Provide training for 3 designated personnel on all routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.
- .3 Provide safety precaution procedures for all systems.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 31 23 10-Excavating, Trenching and Backfilling.

.3 Section 33 41 00-Storm Utility Drainage Piping.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 48/A 48M, Standard Specification for Gray Iron Castings.
- .2 ASTM C 117, Standard Test Method for Materials Finer than 75-µm Sieve in Mineral Aggregates by Washing.
- .3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM C 139, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
- .5 ASTM C 478M, Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
- .6 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A23.1/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
  - .2 CSA-A3002, Masonry and Mortar Cement.
- .3 CAN/CSA-A165 Series, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
- .4 CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.
- .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete:
- .1 to Section 03 30 00-Cast-In-Place Concrete.
- .2 concrete to be minimum 20 MPa or as specified otherwise on Contract Drawings.

.2 Concrete reinforcement: to Section 03 20 00-Concrete Reinforcing.

.3 Precast manhole sections: to ASTM C 478M, complete with ladder rungs.

.4 Precast "Tee" Sections: precast "Tee" sections constructed as an integral component of mainline pipe will be acceptable where shown on Contract Drawings as an approved alternative.

.5 Manhole lids: to be precast reinforced concrete designed to withstand H20 loading.

.6 Cast iron frame and cover: as shown on Contract Drawings.
- .1 Frame and cover must conform to ASTM A48 and be designed to withstand H20 loading.
- .2 Frame and cover must bear manufacturer identification on castings.

.7 Ladder rungs to be:
1. As shown on Contract Drawings.
2. To conform to ASTM C-497, C-478 load test
3. 20 mm cold rolled steel, hot dipped after bending to CSA G164, welded to reinforcing bars and cast with manhole sections or epoxy grouted into manhole walls.
4. 20 mm aluminum alloy #6351-T6 (CSA-S157 and NBC 1977), complete with polyethylene anchor insulating sleeves and installed in 25 mm or 26 mm precast or drilled holes in manhole sections.
5. Polypropylene encased steel ladder rungs: polypropylene ASTM-D-4101 steel core to be ½ inch dia grade 60 per ASTM A615M.
6. Distance from top of manhole cover to top rung to be maximum 500 mm where no handhold provided. Maximum distance may be extended to 660 mm where handhold provided.
7. In compliance with all requirements of Workers' Compensation Board.

.8 Safety platform: to be installed as shown on Contract Drawings in all manholes in excess of 6 m deep.

.9 Precast catch basin sections: to ASTM C478M.

.10 Catchbasin leads to be minimum 200 mm diameter and of PVC DR35.

.11 Catchbasin lids: to be precast reinforced concrete designed to

withstand H20 loading.

.12 Cast iron catchbasin frame and grate: as shown on Contract Drawings.
1. Frame and grate must conform to ASTM A48 and be designed to withstand H20 loading.
2. Frame and grate must bear manufacturers identification on casting.

.13 Joints: made watertight using rubber rings to ASTM C443 or cement mortar.

.14 Mortar:
.1 Aggregate: to CSA A82.56.
.2 Masonry Cement: to CAN/CSA-A8.

.15 Adjusting rings: to ASTM C 478.

.16 Concrete Brick: to CAN3-A165 Series.

.17 Drop manhole pipe: to be as shown on Contract Drawings.

.18 Lawn drains to be: as shown on Contract Drawings.

.19 Concrete bags to be: Jute, burlap or synthetic bag of suitable size and texture filled to 2/3 capacity with mixture of 1 part Portland cement to 2 parts sand, thoroughly mixed, and weighing approximately 27 kg.

.20 Concrete blocks: to be H type concrete construction blocks conforming to latest ASTM Specifications.

.21 Prebenched manhole bases:
1. Where precast manhole sections are incorporated into precast base by bonding to concrete benching, use precast reinforced concrete manhole sections to ASTM C478 complete with ladder rungs above benching.
2. Where base benching is cast monolithically with manhole walls, reinforce wall and joint sections as specified in ASTM C478.
3. Precast concrete base section minimum thickness to be 120 mm, measured from underside of base to lowest point in concrete channeling.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL .1 Excavating and backfilling in accordance with Section 31 23 10-Excavating, Trenching and Backfilling.

3.2 CONCRETE WORK .1 Place concrete reinforcement in accordance with Section 03 20 00-Concrete Reinforcing.

.2 Do concrete work in accordance with Section 03 30 00-Cast-In-Place Concrete.

3.3 MANHOLE INSTALLATION

.1 Install manholes as shown on Contract Drawings, concurrently with pipe laying.

.2 Ensure excavation free of water prior to placing concrete.

.3 Place minimum 100mm of 25mm bedding gravel compacted to minimum 95% Modified Proctor density in compliance with ASTM D1557.

.4 Construct base to ensure first precast riser section is set plumb.

.5 Set all inlet and outlet pipes to specified alignments and elevations.

.6 Connect concrete pipe into manhole using spigot or bell precast into manhole wall or, alternatively, grout pipe into pre-formed rough core in manhole wall using fast-setting grout.

.7 Connect PVC pipe into manhole using “manhole adapter ring” or approved equal.

.8 Ensure placement of concrete does not disturb connecting pipes.

.9 Set remaining precast riser sections plumb with joints consisting of cement mortar or gaskets to ASTM C443.

.10 Where possible, for channeling using half-sections of pipe or suitable fittings. Bench to direct flow parallel to main flow of sewer. From top of benching as high as crown of sewer pipe. Finish concrete to smooth surface using steel trowel.

.11 Brace capped inlets or stubs to withstand testing head.

.12 Set frames by firmly embedding in mortar on minimum of 1, maximum of 3 courses of bricks or precast concrete riser rings, or cast-in-place form system with due regard to maximum distance to first step.

.13 “Butter” inside and outside faces of bricks with mortar to ensure neat even finish. Grout inside, outside and between courses of bricks or grade rings with mortar to ensure neat even finish. Pre-wet all joints before placing mortar.

.14 Plug lifting holes in pipe.

.15 Install drop structures where required to Contract Drawings.

.16 Paint manhole covers if specified on Contract Drawings.

.17 Ensure frames conform to design contour of pavement or existing surface.

.18 Pre-fabricated Corrugated Steel Pipe Manholes to be installed as shown on the Contract Drawings and to manufacturers specifications.

3.4 CLEANOUT INSTALLATION

.1 Install cleanouts as shown on Contract Drawings, to standards and

installation procedures described in 3.3.

3.5 CATCHBASIN INSTALLATION .1 Install catchbasins as Shown on Contract Drawings, to general standards and installation procedures described in 3.3.

.2 Place minimum of 100 mm bedding gravel under base, compact to 95% Modified Proctor density.

.3 Install catchbasin leads in accordance with Section 33 41 00-Storm Utility Drainage Piping.

3.6 ENDWALL INSTALLATION .1 Install reinforced concrete endwalls as shown on Contract Drawings or as shown otherwise on Contract Drawings and in accordance with Section 03 20 00-Concrete Reinforcing and Section 03 30 00-Cast-In-Place Concrete.

.2 Precast concrete endwalls may be installed where shown on Contract Drawings as an approved alternative.

3.7 GRILLAGE TRASH SCREENS .1 Where specified, install grillage trash screens as shown on Contract Drawings.

3.8 ADJUSTING TOPS OF EXISTING UNITS .1 Remove existing gratings, frames and store for re-use at locations specified.

.2 Precut units:
.1 Raise or lower precast units by adding or removing precast sections as required.
.2 When amount of raise is less than 300 mm use standard manhole bricks, precast riser rings or Cast-in place form system.

.3 Cast-in-Place units:
.1 Raise cast-in-place units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.
.2 Lower cast-in-place units with straight wall by removing concrete to elevation indicated for rebuilding.
.3 Install additional manhole ladder rungs in adjusted portion of units as required.
.4 Re-use existing gratings, frames.

.4 Re-set gratings and frames to required elevation on not more than 3 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.

.5 Ensure adjustments conform to requirements regarding distance to first step.

3.9 REMOVE EXISTING UNITS .1 Remove existing structures where shown on Contract Drawings. Backfill in accordance with Section 31 23 10-Excavating, Trenching and Backfilling.

3.10 LEAKAGE TEST .1 Perform leakage testing of sanitary manholes in accordance with Section 33 31 13- Sanitary Utility Sewerage Piping.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 31 23 10-Excavating, Trenching and Backfilling.

.3 Section 33 41 00-Storm Utility Drainage Piping.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 48/A 48M, Standard Specification for Gray Iron Castings.
- .2 ASTM C 117, Standard Test Method for Materials Finer than 75-µm Sieve in Mineral Aggregates by Washing.
- .3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM C 139, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
- .5 ASTM C 478M, Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
- .6 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A23.1/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
  - .2 CSA-A3002, Masonry and Mortar Cement.
- .3 CAN/CSA-A165 Series, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
- .4 CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.
- .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete:
- .1 to Section 03 30 00-Cast-In-Place Concrete.
- .2 concrete to be minimum 20 MPa or as specified otherwise on Contract Drawings.

.2 Concrete reinforcement: to Section 03 20 00-Concrete Reinforcing.

.3 Precast manhole sections: to ASTM C 478M, complete with ladder rungs.

.4 Precast "Tee" Sections: precast "Tee" sections constructed as an integral component of mainline pipe will be acceptable where shown on Contract Drawings as an approved alternative.

.5 Manhole lids: to be precast reinforced concrete designed to withstand H20 loading.

.6 Cast iron frame and cover: as shown on Contract Drawings.
- .1 Frame and cover must conform to ASTM A48 and be designed to withstand H20 loading.
- .2 Frame and cover must bear manufacturer identification on castings.

.7 Ladder rungs to be:
1. As shown on Contract Drawings.
2. To conform to ASTM C-497, C-478 load test
3. 20 mm cold rolled steel, hot dipped after bending to CSA G164, welded to reinforcing bars and cast with manhole sections or epoxy grouted into manhole walls.
4. 20 mm aluminum alloy #6351-T6 (CSA-S157 and NBC 1977), complete with polyethylene anchor insulating sleeves and installed in 25 mm or 26 mm precast or drilled holes in manhole sections.
5. Polypropylene encased steel ladder rungs: polypropylene ASTM-D-4101 steel core to be ½ inch dia grade 60 per ASTM A615M.
6. Distance from top of manhole cover to top rung to be maximum 500 mm where no handhold provided. Maximum distance may be extended to 660 mm where handhold provided.
7. In compliance with all requirements of Workers' Compensation Board.

.8 Safety platform: to be installed as shown on Contract Drawings in all manholes in excess of 6 m deep.

.9 Precast catch basin sections: to ASTM C478M.

.10 Catchbasin leads to be minimum 200 mm diameter and of PVC DR35.

.11 Catchbasin lids: to be precast reinforced concrete designed to withstand H20 loading.

.12 Cast iron catchbasin frame and grate: as shown on Contract Drawings.
1. Frame and grate must conform to ASTM A48 and be designed to withstand H20 loading.
2. Frame and grate must bear manufacturers identification on casting.

.13 Joints: made watertight using rubber rings to ASTM C443 or cement mortar.

.14 Mortar:
.1 Aggregate: to CSA A82.56.
.2 Masonry Cement: to CAN/CSA-A8.

.15 Adjusting rings: to ASTM C 478.

.16 Concrete Brick: to CAN3-A165 Series.

.17 Drop manhole pipe: to be as shown on Contract Drawings.

.18 Lawn drains to be: as shown on Contract Drawings.

.19 Concrete bags to be: Jute, burlap or synthetic bag of suitable size and texture filled to 2/3 capacity with mixture of 1 part Portland cement to 2 parts sand, thoroughly mixed, and weighing approximately 27 kg.

.20 Concrete blocks: to be H type concrete construction blocks conforming to latest ASTM Specifications.

.21 Prebenched manhole bases:
1. Where precast manhole sections are incorporated into precast base by bonding to concrete benching, use precast reinforced concrete manhole sections to ASTM C478 complete with ladder rungs above benching.
2. Where base benching is cast monolithically with manhole walls, reinforce wall and joint sections as specified in ASTM C478.
3. Precast concrete base section minimum thickness to be 120 mm, measured from underside of base to lowest point in concrete channeling.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL .1 Excavating and backfilling in accordance with Section 31 23 10-Excavating, Trenching and Backfilling.

3.2 CONCRETE WORK .1 Place concrete reinforcement in accordance with Section 03 20 00-Concrete Reinforcing.

.2 Do concrete work in accordance with Section 03 30 00-Cast-In-Place Concrete.

3.3 MANHOLE INSTALLATION

.1 Install manholes as shown on Contract Drawings, concurrently with pipe laying.

.2 Ensure excavation free of water prior to placing concrete.

.3 Place minimum 100mm of 25mm bedding gravel compacted to minimum 95% Modified Proctor density in compliance with ASTM D1557.

.4 Construct base to ensure first precast riser section is set plumb.

.5 Set all inlet and outlet pipes to specified alignments and elevations.

.6 Connect concrete pipe into manhole using spigot or bell precast into manhole wall or, alternatively, grout pipe into pre-formed rough core in manhole wall using fast-setting grout.

.7 Connect PVC pipe into manhole using “manhole adapter ring” or approved equal.

.8 Ensure placement of concrete does not disturb connecting pipes.

.9 Set remaining precast riser sections plumb with joints consisting of cement mortar or gaskets to ASTM C443.

.10 Where possible, for channeling using half-sections of pipe or suitable fittings. Bench to direct flow parallel to main flow of sewer. From top of benching as high as crown of sewer pipe. Finish concrete to smooth surface using steel trowel.

.11 Brace capped inlets or stubs to withstand testing head.

.12 Set frames by firmly embedding in mortar on minimum of 1, maximum of 3 courses of bricks or precast concrete riser rings, or cast-in-place form system with due regard to maximum distance to first step.

.13 “Butter” inside and outside faces of bricks with mortar to ensure neat even finish. Grout inside, outside and between courses of bricks or grade rings with mortar to ensure neat even finish. Pre-wet all joints before placing mortar.

.14 Plug lifting holes in pipe.

.15 Install drop structures where required to Contract Drawings.

.16 Paint manhole covers if specified on Contract Drawings.

.17 Ensure frames conform to design contour of pavement or existing surface.

.18 Pre-fabricated Corrugated Steel Pipe Manholes to be installed as

shown on the Contract Drawings and to manufacturers specifications.

3.4 CLEANOUT INSTALLATION .1 Install cleanouts as shown on Contract Drawings, to standards and installation procedures described in 3.3.

3.5 CATCHBASIN INSTALLATION .1 Install catchbasins as Shown on Contract Drawings, to general standards and installation procedures described in 3.3.

.2 Place minimum of 100 mm bedding gravel under base, compact to 95% Modified Proctor density.

.3 Install catchbasin leads in accordance with Section 33 41 00-Storm Utility Drainage Piping.

3.6 ENDWALL INSTALLATION .1 Install reinforced concrete endwalls as shown on Contract Drawings or as shown otherwise on Contract Drawings and in accordance with Section 03 20 00-Concrete Reinforcing and Section 03 30 00-Cast-In-Place Concrete.

.2 Precast concrete endwalls may be installed where shown on Contract Drawings as an approved alternative.

3.7 GRILLAGE TRASH SCREENS .1 Where specified, install grillage trash screens as shown on Contract Drawings.

3.8 ADJUSTING TOPS OF EXISTING UNITS .1 Remove existing gratings, frames and store for re-use at locations specified.

.2 Precut units:
- .1 Raise or lower precast units by adding or removing precast sections as required.
- .2 When amount of raise is less than 300 mm use standard manhole bricks, precast riser rings or Cast-in place form system.

.3 Cast-in-Place units:
- .1 Raise cast-in-place units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.
- .2 Lower cast-in-place units with straight wall by removing concrete to elevation indicated for rebuilding.
- .3 Install additional manhole ladder rungs in adjusted portion of units as required.
- .4 Re-use existing gratings, frames.

.4 Re-set gratings and frames to required elevation on not more than 3 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.

.5 Ensure adjustments conform to requirements regarding distance to first step.

3.9 REMOVE EXISTING UNITS .1 Remove existing structures where shown on Contract Drawings. Backfill in accordance with Section 31 23 10-Excavating, Trenching and Backfilling.

3.10 LEAKAGE TEST .1 Perform leakage testing of sanitary manholes in accordance with Section 33 31 13- Sanitary Utility Sewerage Piping.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for water mains, hydrants, valves, valve boxes, and valve chambers, including service connections.

1.2 RELATED SECTIONS

1. Section 01 33 00 - Submittal Procedures.
2. Section 31 23 10 - Excavating, Trenching and Backfilling.
3. Section 33 05 13-Manholes and Catch Basin Structures
4. Section 03 20 00-Concrete Reinforcing
5. Section 03 30 00-Cast-In-Place Concrete.

1.3 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA), current addition

- .1 ANSI/AWWA B300-10, Hypochlorites.
- .2 ANSI/AWWA B301-10, Liquid Chlorine.
- .3 ANSI/AWWA C104/A21.4-16, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- .4 ANSI/AWWA C105/A21.5-10, Polyethylene Encasement for Ductile-Iron Pipe Systems.
- .5 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.
- .6 ANSI/AWWA C110/A21.10-12, Ductile-Iron and Gray Iron Fittings, 75 mm through 1200 mm, for Water.
- .7 ANSI/AWWA C151/A21.51-02, Ductile-Iron Pipe, Centrifugally Cast, for Water.
- .8 ANSI/AWWA C153/A21.53-11, Ductile-Iron Compact Fittings for Water Service.
- .9 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
- .10 ANSI/AWWA C504-15, Rubber-Seated Butterfly Valves.
- .11 ANSI/AWWA C600-10, Installation of Ductile-Iron Water Mains, and Their Appurtenances.
- .12 ANSI/AWWA C602-11, Cement-Mortar Lining of Water Pipelines - 100 mm and Larger.
- .13 ANSI/AWWA C651-14, Disinfecting Water Mains.
- .14 ANSI/AWWA C800-14, Underground Service Line Valves and Fittings (Also Included: Collected Standards for Service Line Materials).
- .15 ANSI/AWWA C900-16, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 100 mm - 300 mm, for Water Distribution.

.2 American Society for Testing and Materials International, (ASTM)

.3 American Water Works Association (AWWA)/Manual of Practice
.1 AWWA M17-2016, Installation, Field Testing, and Maintenance of Fire Hydrants.

.4 Canadian Standards Association (CSA International)

1.4 MATERIAL CERTIFICATION

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Products having CSA certification to be used where readily available. Certification by Standards Council of Canada approved independent third body that products conform to CSA standards in acceptable in lieu of CSA certification.

.3 At least 2 weeks prior to commencing work, submit manufacturer's recent test data and certification that materials to be incorporated into works are representative and meet requirements of this Section. Include manufacturer's drawings where pertinent.

1.5 RECORD DRAWINGS

1. Provide record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions.

1.6 SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions to Department Representative for approval and adhere to interruption schedule as approved by the Department Representative.

.3 Notify the Department Representative minimum of 24 hours in advance of interruption in service.

.4 Do not interrupt water service for more than 3 hours and confine this period between 09:00 and 16:00 h local time unless otherwise authorized.

.5 Notify fire department of any planned or accidental interruption of water supply to hydrants.

.6 Provide "Out of Service" sign on hydrant not in use.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Only one type of pipe material will be allowed throughout contract unless specified otherwise or shown otherwise on Contract Drawings, excluding main pipe within chambers which shall be steel, and leads to fire hydrants which shall be ductile iron or PVC.

.2 All products are specified by reference to approved specifications and/or standards. Refer to Supplementary Specifications and/or Contract Drawings for specified or approved manufacturers or trade names

2.2 MAINLINE PIPE, JOINTS AND FITTINGS

.1 Ductile iron pipe:
- .1 Pipe: to AWWA C151, to Pressure Class or Special Thickness Class specified on Contract Drawings,and standard cement mortar lined to AWWA C104.'
- .2 Joints: Single rubber gasket for push-on bell and spigot type joint and/or mechanical pipe joints: to AWWA C111 Tyton.

.2 Polyvinyl Chloride (PVC) Pressure Pipe:
- .1 Pipe:
  - .1 Pipe to be manufactured to specifications AWWA C900 to pressuring rating specified on Contract Drawings. Pipes to be certified by Canadian Standards Association for pipe size ranges below:
    - Pipes 100 to 1200mm dia. - CSA B137.3.
  - .2 ULC listed.
  - .3 Cast iron pipe equivalent outside diameter.
  - .4 To be compatible with specified mechanical joint and push-on joint fittings and valves without use of special adapters.
    - .2 Joints: Push-on integrally thickened bell and spigot type to ASTM D 3139 with single elastomeric gasket to ASTM F477.

.3 High Density Polyethylene Pipe:
- .1 Pipe:
  - .1 To AWWA C906 pressure class specified in Contract Documents.
  - .2 Iron pipe size equivalent outside diameter.
  - .3 To be Compatible with specified mechanical joint fittings and valves without special adapters.
  - .4 Joints: Heat butt fusion to ASTM D2657 and in accordance with manufacturers' recommendations.
  - .5 Fittings:

.1 Fabricated HDPE mitred fittings to AWWA C906 suitable for pressure rating specified on Contract Drawings.
.2 Moulded HDPE fittings to ASTM 3261 suitable for pressure rating specified and fusion to main pipe, dimensions as specified on Contract Drawings.
.3 Flanged joints to AWWA C906 flat faced stub end and loose hot-dip galvanized ductile iron ASTM A536) backup ring drilling to ANSI B16.1, ANSI B16.5, or AWWA C207, class suitable for pressure rating specified on Contract Drawings.
.4 Nuts and bolts as specified for “Fittings” in this section.

.4 Fittings:
.1 Gray-iron (cast iron) fittings to ANSI/AWWA C110/A21.1O-93 suitable for 1035 kPa minimum pressure rating or higher as specified on Contract Drawings. Where specified in Contract Documents, to be cement mortar lined and externally seal coated, both to AWWA C 104.
.2 Ductile iron fittings to AWWA C110 suitable for pressure rating of 2415 kPa, cement mortar lined to AWWA C104.
.3 Compact ductile iron fittings to ANSI/AWWA C153/A21.53-94 suitable for pressure rating of 2415 kPa, cement mortar lined to AWWA C104.
.4 PVC injection-molded fittings shall be C900, DR18, Class 150 conforming to AWWA C-907 and CAN/CSA-Bi 37.3-93.
.5 PVC extruded fittings shall be Class 150, DR 18 conforming to AWWA C900-89
.6 Single rubber gasket for push-on bell and spigot type joint and/or mechanical pipe joints; to AWWA C111. All push-on joint hubs to be equipped with tie-rod lugs.
.7 Flanged Joints:
.1 Flat faced conforming to the face dimension and drilling of ANSI B16.1, Class 125
.2 On AWWA C 110 fittings to AWWA Cl 10 with minimum pressure rating 1035 kPa or higher as specified on Contract Drawings.
.3 On AWWA C153 fittings to AWWA C153 withminimum pressure rating of 1723 kPa or higher as specified on Contract Drawings.
.8 Flange gaskets to be manufactured from black natural rubber 3.175 mm thick with layer of cotton

on both sides.

.9 Bolts and nuts:
- .1 Bolts to be carbon steel, Grade B to ASTM A307, heavy hex style, zinc plated to ASTM B633 or cadmium plated to ASTM B766. Bolt sizes to AWWA C110.
- .2 Nuts and washers: Nuts to be carbon steel,Grade A to ASTM A563. Washers to be flat hardened steel to ASTM F436. Nuts and washers to be zinc plated to ASTM B633 or cadmium plated to ASTM B766.

.10 Tie Rods and Nuts:
- .1 Tie rods to be continuous threaded, quenched and tempered alloyed steel to ASTM A354,Grade BC. To be zinc plated to ASTM B633 or cadmium plated to ASTM B766. Tie rod sizes to be minimum 19 mm diameter or greater as shown on Contract Drawings.
- .2 Nuts and internally threaded couplings to be heavy hex finish to ASTM A563. Washers to be flat hardened steel to ASTM F436. All to be zinc plated to ASTM B633 or cadmium plated to ASTM B766.

.11 Fabricated steel pipe fittings: to AWWA C208 and AWWA C207 if flanged, interior and exterior protected with hot applied coal tar enamel to AWWA C203 or liquid epoxy coating to AWWA C210.

.12 Couplings and Flanged Coupling Adapters:
- .1 General Requirements:
  - .1 Suitable for pressure class specified on Contract Drawings.
  - .2 Flanges and full face flange gaskets where applicable to Clauses 2.2.4.7 and 2.2.4.8 of this Section.
  - .3 To AWWAC219
  - .4 Anti-corrosion coating of interior and exterior centre sleeve and end rings to AWWA C219, AWWA C213, AWWA C210, or AWWA C550 as specified in Contract Documents.
  - .5 Compression gaskets to AWWA C219.
  - .6 Bolts and nuts high strength low alloy steel to AWWA Cl11, stainless steel to ASTM F593 or F738 for bolts and ASTM F594 or F836M for heavy hex nuts, as specified on Contract Drawings. Rolled threads, fit and dimensions to AWWA Cl11.
  - .7 Ductile iron castings to ASTM A536, Grade 65-45-12.
- .2 Plain end or transition couplings as specified on Contract Drawings.

.3 Flanged coupling adapters as specified in Contract Documents.

.13 Joint Restraint Devices: General Requirements:

.1 Ductile iron castings to ASTM A536.

.2 Anti-corrosion coating of ductile iron castings to AWWA C219, AWWA C21O, C213 or C55O as specified on Contract Drawings.

.3 Bolts and nuts high strength low alloy steel to AWWA C111 or as specified on Contract Drawings, stainless steel to ASTM F593 or F738 for bolts and ASTM F594 or F836 for heavy hex nuts. Rolled threads, fit and dimensions to AWWA C111.

.4 Tie rods to 2.2.4.10 of this Section.

.5 Restrainers for ductile iron pipe with mechanical joint fittings as specified in Contract Documents.

.6 Restrainers for PVC pipe with mechanical joint fittings as specified on Contract Drawings.

.7 Restrainers for ductile iron pipe with push-on joint fittings with tie rod lugs as specified on Contract Drawings.

.8 Restrainers for PVC with push-on joint fittings with tie rod lugs as specified on Contract Drawings.

.9 Restrainers for mechanical joints or push-on joints in ductile iron pipe as specified on Contract Drawings.

.10 Restrainers for bell joints in PVC pipe to 2.2.2 of this Section.

.11 Joint restraint devices for PVC watermain to be Underwriter Laboratories of Canada (UL) or Factory Mutual (FM) approved.

.14 Tapping sleeves for branch connections 75 mm and larger:

.1 General Requirements:

.1 Location, type and pressure class as specified on Contract Drawings. (Exterior condition of existing water mains as found in the field may alter type and/or materials. Refer to General Conditions, Clause ii, Concealed or Unknown Conditions.)

.2 To AWWA C219 for sleeve and gasketmaterials and generally for design, manufacture and performance.

.3 Flanges and flange gaskets to clauses 2.2.4.7 and 2.2.4.8 of this Section and AWWA C207 and AWWA C208 for fabricated carbon steel sleeves. Flange gaskets for use with epoxy coated flanges

to be annular ribbed type.

.4 Anti-corrosion coating of fabricated carbon steel and ductile iron sleeve assemblies to AWWA C213 (Fusion-Bonded Epoxy) or shop coated to AWWA C219 if field applied dressings are specified on Contract Drawings.

.5 Bolts and nuts high strength low alloy steel to AWWA Cl11 or as specified on Contract Drawings, stainless steel to ASTM F593 or F738 for bolts and ASTM F594 or F836 for heavy hex nuts. Rolled threads, fit and dimensions to AWWA C111.

.6 Ductile iron castings to ASTM A536, grade 65-45-12.

.7 Flanged branches for welding to steel pipe mains to AWWA C207 and AWWA C208.

.8 Branches shall include a threaded test plug 19 mm NPS minimum if tapping machine to be used does not have provision for pressure testing.

.2 Tapping sleeves for cast iron, ductile iron, asbestos cement, PVC to AWWA C900, pre-stressed concrete pressure pipe or steel mains for taps other than size-on size:

.1 Split assembly to incorporate an annular gasket cemented or mechanically held in place on the branch end or split assembly incorporating ring seal and wrap around sleeve length gasket liner.

.2 Acceptable models: as specified in Contract Documents.

.3 Tapping sleeves for size on size taps on cast iron, ductile iron, asbestos cement, PVC to AWWA C900, pre-stressed concrete pressure pipe or steel:

.1 Split assembly incorporating ring seal and wrap around sleeve length gasket/liner.

.2 Acceptable models: as specified on Contract Drawings.

.4 Tapping sleeves for size on size tap on ductile iron pipe and PVC to AWWA C900 only. Acceptable models: as specified on Contract Drawings.

.15 Repair clamps shall be constructed of 18-8 stainless steel passivated for corrosion resistance. Stainless steel components shall be Type 304 or 304L. All surfaces including weld areas shall be thoroughly cleaned of scale, grease or other contaminants. Welding must be performed in a

controlled environment to prevent sensitization. Nuts and bolts shall be Type 304 18-8 stainless steel 5/8 X 11 NC rolled thread lubricated to prevent galling. Gasket shall be SBR (Buna) rubber per ASTM D2000.

.7 Pre-stressed Concrete Pressure Pipe
- .1 Pipe to AWWA C300, C301 and C303
- .2 Joints: push-on bell and spigot joints complete with rubber gasket.

.8 Steel Pipe:
- .1 To AWWA C200 wall thickness as specified in Contract Documents electrically welded. Steel to ASTM A36.
- .2 Steel pipe flanges to AWWA C207. Dimensions for fabricated steel water pipe fittings to AWWA C208.
- .3 Finishes - exterior and interior: hot applied coal tar enamel to AWWA C203 or liquid epoxy coating to AWWA C210.

2.3 VALVE AND VALVE BOXES

.1 Mainline Valves - General Requirements:
- .1 Valves to open counter-clockwise .
- .2 All valves to have manufacturer's name, year of manufacture, size and working pressure on the bonnet or body .
- .3 Valves 400 mm and larger to have by-pass sized to AWWAC500.
- .4 Gate valves 400 mm and larger to have gear operators.

.2 Mainline Gate valves:
- .1 Locations of solid wedge or double disc valves and resilient-seated valves as shown on Contract Drawings.
- .2 To AWWA C500: 75 to 300 mm to working pressure 1380 kPa; 400 mm and larger to working pressure 1035 kPa, gray cast iron or cast ductile iron body, bronze mounted solid wedge, or double disc, nonrising stem, hub or flanged ends.
- .3 To AWWA C509: 75 to 300 mm to working pressure 1380 kPa; Gray cast iron or ductile iron body,resilient seated, non-rising stem, hub or flanged ends.
- .4 Stem seal to be O-ring type.
- .5 Hydrant valves - to be as specified for mainline gate valves .
- .6 Valves to be complete with 50 mm square operating nut for underground service.
- .7 Acceptable manufacturers are as specified in Contract Documents.

.3 Mainline butterfly valves: Butterfly valves: to AWWA C504 Class 150B, as specified in Contract Drawings.

.4 Blowdown or Blow-Off Valves: 50 mm to AWWA C800 for working pressure 1035 kPa threaded ends, 75 mm to 300 mm as specified for mainline gate valves.

.5 Air Release, Air/Vacuum and Combination Air Valves:
- .1 Gray cast iron or ductile iron body.
- .2 Threaded or flanged connections.
- .3 Maximum working pressure 2070 kPa.
- . 4 To AWWA C512.

.6 Mainline Valve Boxes:
- .1 To be as specified on Contract Drawings: telescoping, cast iron, top flange type service box:
  - .1 Rectangular type to be as specified on Contract Drawings.
  - .2 Circular type to be as specified on Contract Drawings.
- .2 Valve box riser pipe to be 150 mm diameter PVC DR 35 or better.

.7 Service Valve Boxes:
- .1 Curb stop valve boxes (300 mm from property line)on 25 mm diameter or smaller services to be telescoping assembly comprised of threaded castiron top with bronze pentagon centre plug, 25 NPS iron pipe, cast iron base allowing threaded insertion of 25 NPS pipe and accommodation for curb stop valve (cast iron base section may thread onto curb stop valve) and 14 mm diameter steel operating rod attached to curb stop valve with bronze cotter pin, as specified on Contract Drawings .
- . 2 Curb stop valve boxes (300 mm from property line) on 32 mm dia. to 50 mm dia. services to beassembly specified in 2.3.7.1 except with 19 mm dia. steel operating rod, or as specified on Contract Drawings .
- . 3 Curb stop valve boxes (300 mm from property line)alternative on 19 mm dia. to 50 mm dia. services without operating rods to be assembled as specified for Mainline Valve Boxes - 2.3.6.1.2 and 2.3.6.2 .
- .4 Curb stop valve boxes (300 mm from property line) on services 75 mm dia. and larger as specified for Mainline Valve Boxes .
- .5 Corporation stop valve boxes (at mainline tees or tappings) on services 75 mm dia. and larger as specified for Mainline Valve Boxes.

.8 Check Valves:
.1 To AWWA C508: 50 to 300 mm to working pressure1200 kPa; 400 to 500 mm to working pressure 1035 kPa; gray cast iron or ductile cast iron body, clear waterway type, metal to metal seat, mechanical joint ends to AWWA C111 or flanged ends to AWWAC110.

2.4 VALVE AND LARGE METER CHAMBERS

.1 Applicability: for mainline butterfly valves or mainline gate valves 400 mm and larger and for meters 200 mm and larger.

.2 As specified on Contract Drawings, valve chambers for pressure reducing valves, meters and backflow prevention devices may have special and additional requirements and features.

.3 Materials and installation for Cast-in-place chambers to Section 33 05 13-Manholes and Catch Basin Structures.

.4 Concrete and reinforcing steel: to Section 03 20 00-Concrete Reinforcing and Section 03 30 00-Cast-In-Place Concrete.

.5 Precast concrete sections to ASTM C478M. Ladder rungs be cast integral with unit; field installation not permitted. Precast concrete lids to H-20 loading conditions.

.6 Jointing materials:
.1 Manufacturer's rubber ring gaskets,
.2 Mastic joint filler,
.3 Cement mortar or,
. 4 Combination of above types.

.7 Mortar: aggregate to CAN/CSA AS2.56, masonry cement to CAN/CSA A8.

.8 Ladder rungs for valve chambers: minimum 20 mm diameter, for 76 mm minimum embedment in precast or cast-in-place concrete, minimum rung length 250 mm, minimum projection 100 mm, maximum vertical spacing 300 mm, minimum design liveload 1334N, cold rolled steel to CAN/CSA-G40.20, hot-dip galvanized after fabrication to CAN/CSA G164 or aluminum alloy #6061-T6 to CAN3-S157 and NBC 1977. Rungs to be safety pattern. Hand holds at top entry to conform to minimum design liveload and dimensions.

.9 Valve chamber frames and covers: as specified on Contract Drawings.

.10 Mechanical and Electrical: as specified on Contract Drawings.

2.5 SERVICE CONNECTIONS, PIPE, JOINTS AND FITTINGS

.1 Pipe diameter 19 mm to 75 mm to be Polyethylene to AWWA C901, Pressure Class 160 tubing certified to CSA B 137.1 or Type K annealed copper, to ASTM BSSM.

.2 Pipe diameter 100 mm and larger to be of material specified for mainline pipe .

.3 Service saddles:

.1 Tapping threads to be tapered to AWWA CSOO.

.2 Saddles for ductile iron pipe:

.1 Saddles for 19 to 50 mm services to have a ductile iron body to ASTM A536 .

.2 Anti-corrosive coating to AWWA C219, AWWA C210, or AWWA C213, as specified in Contract Documents.

.3 Two high strength low alloy steel straps to AWWA C111, or Type 304 stainless steel Ubolt straps, with minimum width per strap of 50 mm, as specified on Contract Drawings.

.4 Saddles for PVC pipe to AWWA C900/905:

.1 To provide full support around circumference of pipe; saddles with lugs or U-bolt straps that may gouge or deform the pipe are not allowed.

.2 Saddles for 19 to 50 mm services as specified on Contract Drawings:

.1 Bronze body to ASTM B62 and two stainless steel straps to ANSI T304 with minimum width per strap of 50 mm.

.2 Ductile iron body to ASTM A536:

.1 Anti-corrosive coating to AWWA C219, AWWA C210, or AWWA C213, as specified in Contract Documents.

.2 Two high strength low alloy steel straps to AWWA C111, or Type 304 stainless steel U-bolt straps, with minimum width per strap of 50 mm, as specified on Contract Drawings .

.3 All-stainless steel broadband saddle to ANSI T304; 19 and 25 mm services to have single bolt and minimum band width of 125 mm; 37 and 50 mm services to have double bolt and minimum width of 190 mm.

.4 For services 75 mm and larger use tapping sleeves to Clause 2.2.4.14 of this Section.

.5 Copper tubing joints to be flared or compression type suitable for 1100 kPa working pressure.

2.6 HYDRANTS

.1 Hydrants to: AWWA C502, standard specifications for dry barrel Fire Hydrants for ordinary waterworks service; typical fire hydrant detail drawing and B.C. Standard for Fire

Hydrants with following supplementary details:

.1 Shut-Off: compression type or slide gate as per supplementary specifications or contract documents.

.2 Inlet Connection: to be 150 mm nominal diameter, bell type with harness lugs.

.3 Bury Length: nominal bury length as shown on Contract Drawings.

.4 Delivery Classification: two hose nozzles and one pump nozzle. Each outlet nozzle to be locked or screwed in place to safeguard against blowing out, turning or backing out.

.5 Diameter
:hose nozzles to be 65 mm nominal diameter.
:pump nozzles to be 100 mm nominal diameter.

.6 Hose and Pump Nozzle Threads:

.1 Hose nozzle to B.C. standard for Fire Hydrants (76.20 mm outside diameter and S threads per 25.4mm)

.2 Pump nozzle to be 117.475 mm outside diameter and 6 threads per 25.4 mm.

.3 As an alternate pump nozzle may be specified in Municipal Supplementary Specifications as an alternate dimension thread ratio or a "quick connect" STORZ type.

.7 Nozzle Cap Gasket: to be provided with each nozzle cap.

.8 Opening Direction: counter-clockwise.

.9 Operating Nut and Cap Nuts: to B.C. Standard for fire hydrants. Pentagonal 1 W' point to flat.

.10 Working parts to be removable without disturbing barrel or base of hydrant and without excavation. Main operating stem to be non-rising. Hydrant to be so designed that its top section may, without excavation, be rotated at any angle relative to the inlet pipe if desired and bolted or locked in place without decreasing its strength or causing it to leak when under pressure.

.11 Hydrants to be subjected to hydrostatic pressure test of 2070 kPa in compliance with AWWA C502. Provide "Affidavit of Compliance" if requested by the Department Representative.

.5 Colour: as specified on Contract Drawings.

.6 Approved standard 150 mm Fire Hydrants are as specified on Contract Drawings or Municipal Supplementary Specifications.

2.7 UNDERGROUND SERVICE LINE VALVES AND FITTINGS

.1 Underground service line valves and fittings 19 to 50mm to AWWA CSOO suitable for 1035 kPa working pressure.

.2 Corporation Stops:

.1 19 to 50 mm: bronze to ASTM B62, AWWA thread

inlet, compression type outlet.
.2 To be as specified on Contract Drawings.
.3 Curb Stops:
.1 19 and 25 mm to be bronze to ASTM 862; inverted key, ball or cylinder type construction utilizing rubber O-ring seals.
.2 37 and 50 mm to be bronze to ASTM 862; ball or cylinder type construction utilizing rubber O-ring seals.
.3 To be full flow, full port, as specified on Contract Drawings.
.4 Fittings: to be compression type for underground services.
.5 All fitting and valve connections on polyethylene to have solid fluted stiffening liners manufactured from stainless steel to ANSI T304 designed for the appropriate type and inside dimension of pipe, warranted by the manufacturer for that use.
.4 Underground service line valves 75 mm and larger to 2.3.1 and 2.3.2 of this Section.

2.8 GRANULAR PIPE BEDDING AND SURROUND MATERIAL
1. As shown on Contract Drawings.
2. Refer to Section 31 05 16-Aggregate Materials.

2.9 BACKFILL MATERIAL
1. As shown on Contract Drawings.
2. Refer to Section 31 05 16-Aggregate Materials.

PART 3 - EXECUTION

3.1 PREPARATION
.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Remove defective materials from site.

3.2 TRENCHING
.1 Do trenching work in accordance with Section 31 23 10 - Excavating Trenching and Backfilling.
.2 Trench alignment and depth as shown on Contract Drawings.
.3 Trench depth to provide cover over pipe of not less than 1.0 m from finished grade unless shown otherwise on Contract Drawings.

3.3 CONCRETE BEDDING AND ENCASEMENT
.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
.1 Place concrete to details as indicated.
.2 Do not backfill over concrete within 24 hours after placing.

3.4 GRANULAR BEDDING

.1 Fill over-excavation below design elevation of bottom of specified bedding with granular bedding placed and compacted in accordance with Section 31 23 10. Drain rock may be used for backfill of over-excavation only with the Department Representative's approval.

.2 Place granular bedding material across full width of trench bottom in uniform layers to depth shown on Contract Drawings.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe. Do not use blocks when bedding pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to minimum 95% Modified Proctor Density in compliance with ASTM D1557. (All following references to density imply in compliance with ASTM D1557).

.6 Place ductile iron watermain pipe or copper water services on prepared flat bottomed trench free of rock in excess of 50 mm without bedding and backfill with approved native or imported material and compact as specified. Use hand tools to compact material under 'haunch' area of pipe and around fittings and other materials.

.7 Use imported bedding material when native material is deemed unsuitable for backfill by Contract Administrator or when trench has been excavated in rock.

.8 Use imported bedding material when using pipe materials Other than ductile iron or copper.

.9 Use imported bedding when proposed work is installed through paved areas, when native material is deemed unsuitable for backfill by the Department Representative when trench has been excavated in rock.

3.5 PIPE INSTALLATION

.1 Handle pipe in accordance with pipe manufacturer's recommendations. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.2 Lay and join pipes to manufacturer's instructions and specifications except as noted otherwise herein. PVC pipe to AWWA M23 and C605; ductile iron pipe to AWWA C600.

.3 Horizontal tolerance: plus or minus 50 mm from specified

alignment. Vertical tolerance: plus or minus 25 mm from specified grade.

.4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends up-grade.

.6 Do not exceed maximum joint deflection specified in AWWA C600 nor maximum joint deflection recommended by pipe manufacturer. Joint deflection not permitted for PVC pipe. Deflections in PVC pipelines in excess of those allowed above to be achieved using high deflection PVC couplings rated for 1380 kPa operating pressure.

.7 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of water and foreign materials.

.8 Position and join pipes with equipment and methods specified in 3.6.2.

.9 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe or its coating and leave smooth end at right angles to axis of pipe.

.10 Joints:

- .1 Install gaskets as recommended by manufacturer.
- .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .3 Align pipes carefully before joining.
- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflections after joint has been made to avoid joint damage.
- .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .9 For ductile iron pipe do not install bronze wedges or other conductivity devices unless specified on Contract Drawings.

.10 Butt-fuse high density polyethylene in strict accordance with manufacturer's instruction by manufacturer or by manufacturer trained personnel.

.11 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as specified otherwise.

.12 When any stoppage of work occurs, restrain pipes in an approved manner to prevent "creep" during down time.

.13 Recheck components assembled above ground after placing in trench to ensure that no movement of joints has taken place.

.14 Test and/or bleed points consisting of Corporation cocks, sized to achieve minimum flushing velocities of 0.8 m/s in accordance with AWWA C651. to be provided where shown on Contract Drawings or as required by Contractor for pressure testing and flushing.

3.6 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations shown on Contract Drawings.

.2 Support valves located in valve boxes by means of either concrete or pressure treated and end treated wood blocks, located between valve and solid ground. Maximum length of pipe on each end of valve to be 1m. Valves not to be supported by pipe.

.3 Support valves located in valve chambers by means of either concrete blocks or fabricated steel pipe stands as shown on Contract Drawings.

.4 Valves to be installed in vertical position with actuating stem plumb.

3.7 VALVE CHAMBERS

.1 Use cast-in-place or precast units as shown on Contract Drawings. Precast units to be in accordance with Section 33 05 13-Manholes and Catch Basin Structures.Cast-in-Place units to be in accordance with Section 03 20 00-Concrete Reinforcing and Section 03 30 00 Cast-In-Place Concrete.

.2 Construct units as shown on Contract Drawings, plumb and with valve chamber openings centred over valve nut, true to alignment and grade. Valve chambers not to reston pipe.

.3 Place reinforcing steel and miscellaneous metals required to be embedded in concrete to details shown on Contract Drawings and in accordance with Section 03 30 00 Cast-In-Place Concrete.

.4 Cast bottom slabs for precast units directly on undisturbed ground where shown on Contract Drawings, set precast concrete slab on 100 mm minimum of compacted granular

material.

.5 Set bottom section of precast unit in bed of cement mortar and bond to bottom slab. Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar, or combination thereof.

.6 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.

.7 Plug lifting holes with precast concrete plugs set in nonshrink non-staining grout or non-shrink, non-staining mortar.

.8 Set frame and cover to required elevation on at least two and not more than four courses of brick or precast concrete riser rings. Make brick or riser ring joints and join brick or riser rings to frame with cement mortar, parge and trowel smooth.

.9 Cover to be marked as specified on Contract Drawings

.10 Clean valve chambers of debris and foreign materials; remove fins and sharp projections.

.11 Set valve boxes centrally over valve nut. Set valve boxes and any other boxes around appurtenances and complete backfill within 24 h of setting appurtenance

.12 Install sump drainer assemblies to manufacturer's instructions and to AWWA C510 and AWWA C511 .

3.8 UNDER-CROSSING

.1 Excavate working pit to dimensions shown on Contract Drawings, outside right-of-way to be crossed.

.2 Excavate working pit to not less than 0.6 m below lowest invert of encasing pipe.

.3 Dewater excavation .

.4 Dewater area of under-crossing .

.5 Install heavy timber or steel frame backstop.

.6 Place encasing pipe to exact line and grade shown on Contract Drawings. Encasing pipe to cross under obstruction at angle shown on Contract Drawings.

.7 Install encasing pipe by jacking, boring or tunnelling methods approved by the Department Representative.

.8 Encasing pipe not to be in tension.

.9 Joints for encasing pipe to be welded to AWWA C206.

.10 Submit shop drawings showing proposed method of installation of carrier pipe.

.11 For ductile iron carrier pipe only, install continuous zinc strip sacrificial anode electrically bonded to carrier pipe shown on Contract Drawings. Install sacrificial anodes for encasing pipe as shown on Contract Drawings.

.12 Insert carrier pipe into encasing pipe, in end with largest open area, after placing levelling pad.

.13 Use approved chromatid copper arsenate salt treated blocking method or fabricated high density polyethylene casing spacers to maintain carrier pipe in true alignment and uniform separation from encasing pipe.

.14 Clearance between blocks or casing spacers and encasing pipe to be maximum 15 mm when carrier pipe is in position.

.15 Join carrier pipe one length at a time outside encasing pipe. Push or pull carrier pipe into position.

.16 Couplings of carrier pipe not to rest on leveling pad when carrier pipe is in position.

.17 Place 20 MPA concrete cradle around carrier pipe after it is positioned. Cradle to be minimum of 225 mm and maximum of 300 mm above leveling pad.

.18 Fill open annular space at each end of encasing pipe with burlap bags filled with 20 MPA concrete.

3.9 SERVICE CONNECTIONS INSTALLATION

.1 Install service connections to 3.6 and as shown on Contract Drawings as directed by the Department Representative.

.2 Construct service connections at right angles to watermain unless otherwise directed. Locate curb stops as shown on Contract Drawings.

.3 Complete service connections before pressure testing of water main.

.4 Tappings in cast iron or ductile iron mains 200 mm or greater in diameter may be threaded without service clamps provided specified pipe wall thickness is sufficient to conform to ANSI/ASME B1.20.1 for at least 3 threads as shown in Appendix A to AWWA C151.

.5 Tappings in cast iron or ductile iron mains smaller in diameter than 200 mm; or cast iron or ductile iron mains with wall thickness which will not allow at least 3 full threads; or tap sizes beyond those shown in the following table are to be made using double strap saddles to 2.5.3 of this Section or tapping sleeves to 2.2.14 of this Section.

Pipe Diameter (mm)	Maximum Tap Without Clamp (mm)	Maximum Tap With Clamp (mm)
100	19	25
150	25	32
200	25	50
250	25	50
300	32	75

.6 Tappings in PVC mains to AWWA C900/C905 pipe to be with service saddles. Nuts on service saddle straps to be tightened to torque range specified by manufacturer and in no case in excess of that torque. Use core-out type bit, provide coupons to Department Representative.

.7 Tap main as shown on Contract Drawings, not closer to a joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m, whichever is greater. No two adjacent connections on same pipe length to be on same plane of pipe.

.8 Leave corporation stop valves fully open.

.9 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.

.10 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.

.11 Install curb stop with curb stop valve box on services50 mm or less in diameter. Equip larger services with a gate valve and cast iron valve box. Set box plumb over stop or valve and adjust top flush with final grade elevation. Leave curb stop or service valves fully closed.

.12 Place temporary location marker at ends of plugged orcapped unconnected water lines. Each marker to consist of 40 x 90 mm stake extending from pipe end at pipe level to 500 mm above grade. Mark and paint blue exposed portion of stake with designation "WATER".

3.10 TAPPING SLEEVE INSTALLATION

.1 Thoroughly clean the exterior of the main to be tapped. Grind or file any protrusions or irregularities in the pipe exterior which may interfere with uniform seating of gaskets or clamping bands. In accordance with Section 10 of

AWWA C651, dust interior surface of the tapping sleeve annulus with calcium hypochlorite powder before attaching to the main.

3.11 HYDRANTS

.1 Install hydrant assemblies at locations shown Contract Drawings.

.2 Install hydrant assemblies in accordance with AWWA Manual of Practice No. M17 and in accordance with Contract Drawings.

.3 Set hydrants plumb, with hose nozzles parallel with edge of pavement or curb line, with pumper nozzle facing roadway at right angles to road centreline and with body flange set at elevation of 50 to 150 mm above final grade.

.4 Place concrete thrust blocks as shown and as specified ensuring that drain holes are unobstructed.

.5 To provide proper draining for each hydrant, excavate a pit as shown and backfill with coarse gravel or crushed stone to a level 150 mm above drain holes.

.6 For hydrants not in service, place an orange painted sign, 30 cm x 30 cm, lettered "Not In Service" on the main port. Remove when water main is accepted by the Department Representative.

3.12 THRUST BLOCKS

.1 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers hydrants and fittings and undisturbed ground as shown on Contract Drawings or as directed by DCC Representative.

.2 Place 6 mil polyethylene between interface of concrete and fitting.

.3 Where shown on Contract Drawings, joint restraint devices to 2.2.13 of this Section.

.4 Do concrete work in accordance with Section 03 30 00-Cast-In-Place Concrete.

.5 Keep joints and couplings free of concrete.

.6 Do not backfill over concrete within 24 h after placing

3.13 CORROSION PROTECTIONS

.1 Where specified, provide corrosion protection measures as shown on Contract Drawings.

3.14 PIPE SURROUND

.1 Upon completion of pipe laying and after the Department Representative has inspected work in place, surround and cover pipes as shown on Contract Drawings.

.2 Hand place surround material in uniform layers simultaneously on both sides of pipe. Do not dump material within 1 m of exposed pipe.

.3 Compact each layer from pipe invert to underside of backfill to minimum 95% Modified Proctor Density

.

.4 Install concrete encasement where shown on Contract Drawings or as directed by Department Representative. For PVC mainline or service pipe install high deflection PVC coupling 0.3 m minimum to 0.5 m maximum from end of encasement. For ductile iron mainline or service pipe ensure hub joint occurs 0.3 m minimum to 0.5mmaximum from end of encasement.

3.15 BACKFILL

.1 Place and compact backfill material in accordance with Section 31 23 10-Excavating, Trenching and Backfilling

.2 Backfill requirements, including type of material and compaction requirements as shown on Contract Drawings.

3.16 GENERAL PROCEDURE FLUSHING, TESTING AND DISINFECTION

.1 All cleaning, flushing, pressure and leakage testing, disinfection and final flushing to be done by Contractor. Costs are included in payment for items described in Clause 1.3, Measurement for Payment.

.2 Perform all tests in presence of Department Representative. Notify Department Representative 24 h in advance of proposed test.

.3 Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least 5 days after placing concrete or 2 days if high early strength concrete is used.

.4 Obtain Department Representative approval prior to discharging flushing water to sewers or drainage ditches.

.5 Comply with Section 01 35 43-Environmental Procedures

.6 Provide Department Representative with all required approvals.

3.17 CLEANING AND PRELIMINARY FLUSHING

.1 Before flushing and pressure testing, ensure waterworks system is completely finished except tie-ins to existing watermains and make arrangements with the Department Representative for scheduling of testing and disinfection of mains. Testing and disinfection to be witnessed by the Department Representative.

.2 Isolation of existing water system where required will be performed by Department. Do not operate any existing valves without Department Representative's authorization.

.3 Water may be supplied from fire hydrants upon application for a Hydrant Use Permit and presentation of valid test certificate for reduced pressure principle backflow prevention device conforming to AWWA C511.

.4 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water sources. Minimum velocity to be 0.8 m/s and/or in accordance with AWWA C651. Continue flushing at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

3.18 TESTING PROCEDURES

.1 Upon completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, make section ready for testing. Carry out testing in accordance with 3.19.2 following.

.2 Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Submit pipeline to a test of 1.5 x working pressure applied at highest elevation in each section, with a minimum of 1380 kPa applied at lowest point of test section. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 litres per millimetre diameter of pipe per kilometre per(24 hour period. Minimum duration of test period to be 2-hours. Maximum test pressures should not exceed those specified in CSA 8137.3 - Table 9.

.3 Perform pressure and leakage testing of ductile iron piping to AWWA C600 and AWWA M41.

.4 Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23 and AWWA C605.

.5 Perform testing of welded steel piping to AWWA C206; no leakage allowed.

.6 Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirement is achieved.

3.19 DISINFECTION GENERAL

.1 After Department Representative has certified that pipes and appurtenances have passed all specified tests, flush and disinfect pipes and appurtenances. Disinfect and flush in accordance with 3.21 following.

3.20 DISINFECTION AND FLUSHING PROCEDURES

.1 Do not use granular hypochlorite for disinfection of PVC pipe with solvent welded joints, as there is an explosive reaction potential.

.2 Retain water containing not less than 25 mg/L free chlorine in water system for a period of at least 24 h, in accordance with AWWA C651, Continuous Feed Method. Submit outline of proposed disinfection procedure accompanied by marked up schematic drawing to Department Representative for approval 48 h in advance of commencement of disinfection.

.3 Allow water from existing distribution system, isolated by reduced pressure principle backflow prevention device or other approved source of supply, to flow at constant, measured rate into newly laid watermain. In absence of a meter, rate may be approximated by methods such as placing Pilot gauge in discharge, measuring time to fill container of known volume, or measuring trajectory of

discharge and using formula presented in AWWA C651.

.4 At a point not more than 3 m downstream from beginning of new main, ensure water entering new main receives dose of chlorine fed at constant rate such that water will have not less than 25 mg/L free chlorine. To assure that this concentration is provided, measure chlorine concentration at regular intervals as specified in AWWA C651.

.5 Amount of chlorine required to produce 25 mg/L concentration in 30 m of pipe of various sizes is given in following table:

Pipe Size (mm)	100 Percent Chlorine (kg)	1% Chlorine Solution (Litres)
100	0.006	0.61
150	0.014	1.36
200	0.024	2.46
250	0.039	3.86
300	0.054	5.45
400	0.098	9.85

.6 Allow flow of water containing chlorine to continue until entire main, all service connections, extremities and hydrants to be treated are filled with 25 mg/L chlorine solution. To ensure that this concentration has been attained throughout, measure free chlorine residual at a number of points and extremities along main. Retain chlorinated water in main for at least 24 h. During this time operate all valves, curb stops and hydrants in section treated in order to disinfect them thoroughly.

.7 At end of this 24 h period, treated water to contain no less than 10 mg/L free chlorine throughout main. If chlorine content is less than 10 mg/L repeat chlorination procedure until specifications are met.

.8 After completion of chlorination, flush chlorinated water from system, hydrants and services until chlorine concentration in remaining water is less than 0.3 mg/L chlorine residual.

.9 Upon completion of disinfection and flushing, Contractor to remove test and bleed point apparatus and backfill and complete any other work required for placing of waterworks system in service.

3.21 CONNECTIONS TO EXISTING MAINS .1 Connections to existing waterworks systems will be made by Contractor. Make all necessary arrangements with the Department Representative to schedule work to prevent construction delays.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for gravity sewers.

1.2 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 01 78 00-Closeout Submittals.

.3 Section 03 30 00-Cast-In-Place Concrete.

.4 Section 31 05 16-Aggregate Materials.

.5 Section 31 23 10-Excavating, Trenching and Backfilling.

.6 Section 33 05 13-Manholes and Catch Basin Structures.

1.3 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
- .1 ANSI/AWWA C111/A21.11-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.2 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 12-02, Standard Practice for Installing Vitrified Clay Pipe Lines.
- .2 ASTM C 14M-99, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
- .3 ASTM C 76M-02, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
- .4 ASTM C 117-95, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.
- .5 ASTM C 136-01, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .6 ASTM C 425-02, Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
- .7 ASTM C 428-97, Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
- .8 ASTM C 443M-02, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
- .9 ASTM C 663-98, Standard Specification for Asbestos Cement Storm Drain Pipe.
- .10 ASTM C 700-02, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- .11 ASTM C 828-01, Standard Test Method for Low-pressure Air Test of Vitrified Clay Pipe Lines.
- .12 ASTM D 698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
- .13 ASTM D 1869-95(R2000), Standard Specification for Rubber

Rings for Asbestos Cement Pipe.

.14 ASTM D 2680-01, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.15 ASTM D 3034-00, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.16 ASTM D 3350-02, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 CAN/CGSB-34.9-M94, Pipe, Asbestos Cement, Sewer.

.4 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000-98, Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).

.1 CAN/CSA-A5-F98, Portland Cement.

.2 CAN/CSA-A257 Series-M92(R1998, Standards for Concrete Pipe.

.3 CSA-B70-02, Cast Iron Soil Pipe, Fittings, and Means of Joining.

.4 CSA B1800-02, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).

.1 CSA B182.1-02, Plastic Drain and Sewer Pipe and Pipe Fittings.

.2 CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).

.3 CSA B182.6-02, Profile Polyethylene Sewer Pipe and Fittings for Leak-Proof Sewer Applications.

.4 CSA B182.11-02, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

1.4 DEFINITIONS

.1 Pipe section is defined as length of pipe between successive manholes and/or between manhole and any other structure which is part of sewer system.

1.5 MATERIAL CERTIFICATION

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Products having CSA certification to be used where readily available. Certification by Standards Council of Canada approved independent third body that products conform to CSA standards in acceptable in lieu of CSA certification.

.3 At least 2 weeks prior to commencing work, submit manufacturer's

recent test data and certification that materials to be incorporated into works are representative and meet requirements of this Section. Include manufacturer's drawings where pertinent.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufactures recommendations.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Divert unused concrete materials from landfill to local facility as approved by Department Representative.

.3 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.

.4 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.5 Dispose of unused asbestos cement pipe in accordance with regulations governing the disposal of hazardous materials.

.6 Fold up metal banding, flatten and place in designated area for recycling.

1.9 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions to Department Representative for approval and adhere to approved schedule.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE

.1 Non-reinforced circular concrete pipe and fittings: to ASTM C 14M maximum diameter 900 mm, strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM C 443M.

.2 Reinforced circular concrete pipe and fittings: to ASTM C 76M for all pipe greater than 900mm dia., strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM C 443M.

.3 Lifting holes:

.1 Pipe 900mm and less diameter: no lift holes.

.2 Pipe greater than 900mm diameter: lift holes not to exceed two in piece of pipe.

.3 Provide pre-fabricated plugs to effectively seal lift holes water tight after installation of pipe.

.4 Pretesting:
.1 Concrete sanitary sewer pipe to be "pretested" by manufacturer at plant as follows:
.1 Visually inspect pipe for chips, cracks, porous concrete or any other defects which would impair joint sealing and durability. No such defects permitted.
.2 Assemble pipe in line, pressurize test section to 25 kPa (3.5 psi)and coat pipe with aqueous solution. While pipe is under pressure inspect for visible leakage. No leakage permitted.
.3 Pressurize test section to 20kPa (3psi). Allow air pressure and temperature to stabilize before shutting off air supply and start of test timing.
.4 If pressure remains constant or drops less than 7 kPa (1psi) in 30 seconds, pipes in test section are acceptable.
.5 Pipe satisfying all four requirements shall be classified as "TESTED" and labeled as such. All "TESTED" concrete pipe will be deemed suitable for sanitary sewer installation.
.6 An alternative vacuum test may be used if approved by Department Representative.

2.2 PLASTIC PIPE

.1 Polyvinyl chloride pipe up to 675mm in diameter, DR35. Pipe to have minimum pipe stiffness (F/Y) of 320 kPa at 5.0% deflection, ASTM D2412. Pipe to be manufactured to specification for pipe size ranges as follows:
.1 100mm dia. – 375mm dia. to ASTM D3034
.2 450mm dia. – 1200mm dia. to ASTM F679.

.2 Pipes to be certified by Canadian Standards Association to standards for pipe size ranges below.
.1 100mm dia. – 1200mm dia. to CSA B182.2

.3 Joint: Pipe to include integral bell and spigot ends with stiffened wall section and formed groove for a rubber gasket; joints to conform to ASTM D3212, gaskets to ASTM F477.

.4 Normal pipe length joint to joint to be 4.0 m.

.5 Maximum installed deflection not to exceed 7.5% of the base inside diameter.

2.3 SERVICE CONNECTIONS

.1 Sanitary sewer service connections to be 100mm minimum diameter; maximum diameter as specified on Contract Drawings.

.2 Sanitary sewer service connections 100mm and 150mm diameter to be PVC type DR28 sewer pipe.

.3 100mm and 150mm DR28 PVC sanitary service connection pipe to

have a minimum pipe stiffness of 625kPa. Pipe to be manufactured to ASTM D3034 and certified by Canadian Standards Association to CSA B182.2

.4 Sanitary sewer service connections greater than 150mm diameter to be of size and material specified on Contract Drawings and to conform to applicable specifications for mainline pipe.

.5 Manufactured connections to non-reinforced or reinforced concrete mainline pipe to be made using sanded PVC pipe male end stub with integral bell by either:

.1 Stub grouted into neatly chipped hole in pipe wall by concrete pipe manufacturer. Grout to be Portland cement based grout.

.2 Stub epoxy resin cemented into neatly cored hole in pipe wall by concrete pipe manufacturer.

.6 Stub and bell orientation to be 45˚ to centerline of mainline to pipe (wyes) for concrete pipe less than 1050mm diameter. Orientation may be 90˚ to centerline of mainline pipe (tees) for concrete pipe 1050mm diameter or larger. No section of service stubs to protrude past inside of concrete pipe wall.

.7 Manufactured wye connections to PVC mainline pipe to be made with extrusion moulded PVC or fabricated PVC fittings manufactured to ASTM D3034 and CSA B182.2

.8 Field installed tees and wyes:

.1 In-situ installation of tees and wyes into concrete or PVC mainline pipe shall be made with approved PVC swaddle installed to the manufacturers specifications into a neatly cored hole in the pipe wall.

.2 Connections to ribbed PVC pipe to be made with a preformed tee and wye fitting when connection is up to two sizes smaller than mainline pipe. For these pipes, in-situ installation of tees or wyes involving cutting across pipe ribs not permitted. For connections more than two sizes smaller than mainline pipe, an insertable tee for ribbed PVC pipe is permitted. When an insertable is used, hole cut into mainline pipe to cut as few ribs as possible.

.9 PVC service connection pipe and fitting joints: push-on type comprised of integral bell with single elastomeric gasket to ASTM D3212 and ASTM F477. Normal pipe laying length joint to joint to be 4.0m.

.10 Pipe and fitting joints for service connection pipe materials other than PVC type PSM sewer pipe to be as specified for applicable mainline pipe.

2.4 CONCRETE

.1 Concrete mixes and materials required for bedding cradles, encasement, and incidental uses: to Section 03 30 00 - Cast-in-Place Concrete.

.2 Concrete to be minimum 20 MPa.

2.5 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material in accordance with Section 31 05 16 - Aggregate Materials

.2 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

2.6 BACKFILL MATERIAL

.1 As shown on Contract Drawings.

.2 In accordance with Section 31 05 16-Aggregate Materials.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Do not allow contents of sewer or sewer connection to flow into trench.

.3 Trench alignment and depth as shown on Contract Drawings.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete. Place concrete to details as indicated.

.2 Position pipe on concrete blocks to facilitate placing of concrete.

.1 When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 h after placing.

3.4 GRANULAR BEDDING

.1 Fill over-excavation below design elevation of bottom of specified bedding with granular bedding placed and compacted. Drain rock may be used for backfill of over-excavation only with Department Representative's approval.

.2 Place granular bedding material across full width of trench bottom in uniform layers not exceeding 150mm compacted thickness to depth as shown on Contract Drawings.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% Modified Proctor Density in compliance with ASTM D1557. (All following references to density imply in compliance with ASTM D1557).

3.5 INSTALLATION

.1 Handle pipe in accordance with manufacturer's recommendations.
- .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.2 Lay and join pipes to manufactureer's instructions and specifications except as noted otherwise herein. Concrete pipe as specified herein, PVC pipe to CSA B182.11.

.3 Horizontal tolerances: ± 50 mm from specified alignment
Vertical tolerances: ± 10 mm from specified grade. Reverse grade is not acceptable.

.4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Pipes on curved alignments:
- .1 Concrete pipe and ribbed profile PVC plastic pipe. Do not exceed permissible joint defection recommend by pipe manufacturer.
- .2 Smooth PVC pipe: for 100 mm to 300 mm sizes conform to required curvature by bending pipe barrel. In no case shall radius of curvature to be less than 300 times outside diameter of pipe barrel. Joint defection not permitted for smooth profile PVC pipe.

.7 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Do not allow water to flow through pipes during construction except as may be permitted by Department Representative.

.8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.9 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe and leave smooth end at right angles to axis of pipe.

.10 Joints:
- .1 Install gaskets as recommended by manufacturer.
- .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain

concentricity until gasket is properly positioned.

.3 Align pipes before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as specified otherwise.

.12 When any stoppage of Work occurs, restrain pipes as directed by Department Representative, to prevent "creep" during down time.

.13 Plug lifting holes with approved prefabricated plugs, to pipe suppliers recommendations for sealing methods.

.14 Make watertight connections to manholes.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

.2 Core neat circular holes in walls of existing manholes. Do not hammer or ship except as approved by Department Representative.

3.6 PIPE SURROUND

.1 Upon completion of pipe laying, and after Department Representative has inspected work in place, surround and cover pipes as shown on Contract Drawings.

.2 Hand place surround material in uniform layers not exceeding 150mm compacted thickness simultaneously on each side of pipe. Do not dump material within 1 m of pipe.

.3 Compact each layer from pipe invert to underside of backfill to minimum 95% Modified Proctor Density.

3.7 CONNECTIONS TO EXISTING MAINLINE PIPES

.1 Use prefabricated saddles or approved field connection materials and techniques to connect service pipes to existing mainline sewer pipe.

.2 Where feasible, make connections to existing non-reinforced or reinforced concrete mainline pipe by coring or sawing circular holes in existing pipe walls. Where not feasible, make as follows:

.1 Break in to pipe by drilling small diameter holes, spaced at approximately 50 mm along pipe axis, using a drill or chipping gun. Use hammer to strike concrete adjacent to centre holes to create small core, and similarly expand core to suit outside dimensions of stub.

.2 Core dimensions to allow maximum 20 mm clearance around stub at any point.

.3 Trim stub to conform closely to shape of pipe interior when installed.

.4 Insert stub into core, ensuring that no portion of stub protrudes beyond interior of pipe.

.5 Prepare non-shrink, fast-setting cementious grout to “dry pack” consistency. Pack grout tightly into void between stub and pipe.

.6 Hand finish interior and exterior grout surfaces to smooth surface.

.7 Allow sufficient time for strength development of grout prior to installation of connecting pipe or trench backfill.

.3 For new connections to existing PVC mainline sewers, drill hole in mainline to exact dimension of new connection. Use saddle or insertable tee for connections more than two sizes smaller than mainline. Insertable tees may be used for all types of gravity mains provided insertable tee designed for applicable pipe thickness is used.

.4 For new connections to existing ribbed PVC pipe mainline sewers use performed tee or wye fitting when connection is up to two sizes smaller than mainline pipe. For these pipes, in-situ installation of tees or wyes involving cutting across pipe ribs not permitted. For connections more than two sizes smaller than mainline pipe, an insertable tee for ribbed PVC pipe is permitted. When an insertable tee is used, hole cut into mainline pipe to cut as few ribs as possible.

3.8 BACKFILL

.1 Place backfill in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.

.2 Backfill requirements, including type of material and compaction requirements, as shown on Contract Drawings.

3.9 SERVICE CONNECTIONS

.1 Install service connections to 3.5 and as shown on Contract Drawings.

.2 Install inspection chamber at specified location set plumb and to specified elevation. If inspection chamber located in driveway, lane or paved surface install cover or lid as shown on Contract Drawings.

.3 Place location marker at ends of plugged or capped unconnected sewer lines.
.1 Each marker: 40 x 90 mm stake extending from pipe end at pipe level to 0.6 m above grade.
.2 Paint exposed portion of stake red with designation SAN SWR LINE in black.

.4 Sawcut adjacent curb on alignment of service connection and paint red.

3.10 CLEANING AND FLUSHING

.1 Before flushing and testing, ensure sewer system is completely finished and make arrangements with Department Representative for scheduling of testing.

.2 Water may be supplied from Department fire hydrants upon application for a Hydrant Use Permit.

.3 Obtain Department approval prior to discharging flushing water to sewers or drainage ditches.

.4 Comply Section 01 35 43-Environmental Procedures in regard to discharge of flushing water.

.5 Provide Department Representative with all required approvals prior to discharging flushing water.

.6 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water sources. Continue flushing at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

3.11 LEAKAGE TESTING - GENERAL

.1 Upon completion of cleaning and flushing of each section, carry out leakage testing as follows:

.1 Video inspection.
.2 Low pressure air test.
.3 Rubber ball test, lamp test, mandrel test if deemed necessary by Department Representative.
.4 Individual joint test, if deemed necessary by Department Representative.

.2 Perform testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.

.3 Perform tests in presence of Department Representative. Notify Department Representative 24 h in advance of proposed tests.

3.12 VIDEO INSPECTION

.1 The Contractor shall video inspect completed sanitary sewers under 900 mm in diameter following completion of installation. The video inspection report shall be in the form specified by the Department Representative. Copies of the video tapes and written report shall be forwarded to the Department Representative when available.

.1 Should video inspection indicate apparent deficiencies, Department Representative may direct Contractor to perform additional testing as follows.

.2 Additional testing may include passing rubber ball, mandrel or test plug having a minimum dimension of 95% of diameter of sewer pipe completely through pipes and appurtenances. A light test may be performed in lieu of ball test at discretion of Department Representative.

3.13 LOW PRESSURE AIR TEST

.1 Low pressure air test to include testing of sewer main and service connections in each section. Test manholes by low pressure air.

.2 Wet inside perimeter of concrete pipes in test section, then increase pressure in test section prior to conducting air tests. Then increase pressure in test section to 24 kPa above average groundwater pressure and observe rate of pressure drop.

.3 Maintain 25 kPa above average ground water pressure for at least 5.0 minutes before commencing internal air pressure test. Regulate air pressure to prevent pressure inside test section from exceeding 35 kPa above average ground water pressure.

.4 Commence test period when pressure decreases to 24.0 kPa above average groundwater pressure and end when pressure decreases to 20.5 kPa above average groundwater pressure. Do not add air to test section during test period. If test period is less than:

2 minutes and 32 seconds for 100 mm pipe
3 minutes and 50 seconds for 150 mm pipe
5 minutes and 06 seconds for 200 mm pipe
6 minutes and 22 seconds for 250 mm pipe

7 minutes and 39 seconds for 300 mm pipe
8 minutes and 56 seconds for 350 mm pipe
9 minutes and 35 seconds for 375 mm pipe
10 minutes and 12 seconds for 400 mm pipe
11 minutes and 34 seconds for 450 mm pipe
12 minutes and 45 seconds for 500 mm pipe
13 minutes and 45 seconds for 525 mm pipe

sewer shall be deemed to have failed test. Retest upon completion of repairs to any leaks.

3.14 RUBBER BALL/ MANDREL/ LAMP TEST

.1 Pass rubber ball, mandrel or test plug having a minimum dimension of 95% of diameter of sewer pipe completely through pipes and appurtenances. A lamp test may be performed in lieu of ball test where specified by Department Representative.

3.15 INDIVIDUAL JOINT TEST

.1 Perform joint testing of installed pipe sections in accordance with ASTM C1103.

.2 Perform joint test as soon as possible following installation of pipes each side of joint if directed by Department Representative.

.3 Restrain pipe sections to prevent longitudinal movement due to pressure within joint void.

.4 Inflate bladders to provide firm contact on pipe interior on each sied of joint, thereby isolating joint from rest of pipeline.

.5 Introduce between 30 to 70 kPa air pressure into joint.

.6 If test pressure drops by less than 7 kPa in approximately 5 seconds, joint is acceptable. This test is considered a “Go/No Go” test.

.7 If pipe joint fails test, reposition pipes, replace or repair and retest joint until test is acceptable.

3.16 INSTALLATION STANDARD

.1 Repair all deficiencies and visible leaks.

.2 Repair procedures and materials subject to approval of Department Representative.

.3 Department Representative reserves right to require Contractor to replace defective installations at Contractor’s sole cost.

.4 Test Procedures, including video inspection, to be repeated and repairs made until satisfactory results are obtained.

.5 Acceptable Ponding:
.1 Connections: 10mm maximum ponding over 3m length of pipeline.
.2 Mainline PVC sewers:

.1 100mm to 200mm diameter: 10mm maximum ponding over 3m length of pipe
.2 250mm to 300mm diameter: 15mm maximum ponding over 3m length of pipeline
.3 Greater than 300mm diameter: 20mm ponding over 3m length of pipeline.

.3 Mainline Concrete sewers:
.1 300mm diameter: 15mm maximum ponding over a 5m length of pipeline
.2 Greater than 300mm diameter: 20mm maximum ponding over a 5m length of pipeline.

3.17 CONNECTIONS TO EXISTING MAINS

.1 Make connections to existing sanitary sewer systems unless shown otherwise on Contract Drawings. Notify Department Representative minimum 48 h in advance of scheduled connection.

.2 Make connection in presence of Department Representative. To prevent damage to existing utilities, excavate last 300 mm over utility by hand.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for sewage force mains.

1.2 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 03 20 00-Concrete Reinforcing.

.3 Section 03 30 00-Cast-In-Place Concrete.

.4 Section 31 05 16-Aggregate Materials.

.5 Section 31 23 10-Excavating, Trenching and Backfilling.

.6 Section 33 05 13-Manholes and Catch Basin Structures.

1.3 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
- .1 ANSI/AWWA C104/A21.4, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- .2 ANSI/AWWA C111/A21.11, Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .3 ANSI/AWWA C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
- .4 ANSI/AWWA C207, Steel Pipe Flanges for Waterworks Service, Sizes 100 mm Through 3,600 mm.
- .5 ANSI/AWWA C600, Installation of Ductile-Iron Water Mains, and Their Appurtenances.
- .6 ANSI/AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 100 mm-300 mm, for Water Distribution.

.2 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM C 117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .3 ASTM D 698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m^3).
- .4 ASTM D 2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- .5 ASTM D 2310, Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
- .6 ANSI/ASTM D2992, Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fitting.
- .7 ASTM D 2996, Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber- Reinforced Thermosetting Resin Pipe).

.8 ASTM D 3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
- .3 CAN/CGSB-34.1, Asbestos-Cement Pressure Pipe.
- .4 CGSB 41-GP-25M, Pipe, Polyethylene, for the Transport of Liquids.

.4 Canadian Standards Association (CSA International)
- .1 CSA-B70, Cast Iron Soil Pipe, Fittings, and Means of Joining.
- .2 CSA B137 Series, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
  - .1 CSA B137.1, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.
  - .2 CSA B137.3, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.

.5 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act, 1999 (CEPA)

.6 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act, 1992 (TDGA)

1.4 SUBMITTALS

.1 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.2 Certification to be marked on pipe.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Divert unused [metal] materials from landfill to metal recycling facility as approved by Department Representative.

.3 Divert unused concrete materials from landfill to local facility as approved by Department Representative.

.4 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.

.5 Dispose of unused asbestos cement pipe in accordance with regulations governing disposal of hazardous materials.

.6 Place materials defined as hazardous or toxic in designated containers.

.7 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.8 Fold up metal banding, flatten and place in designated area for recycling.

1.6 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions and adhere to schedule approved by Department Representative.

.3 Notify Department Representative a minimum of 24 h in advance of interruption in service.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Ductile iron pipe:
- .1 Pipe: to AWWA C151 to Pressure Class or Special Thickness Class specified in Contract Drawings and cement mortar lined to AWWA C104.
- .2 Joints: Single rubber gasket for puch-on bell and spigot type joint and/or mechanical pipe joints AWWA C111.

.2 Polyvinyl chloride (PVC) pipe: to CSA-B137.3.
- .1 Pipe to be manufactured to one of the following specifications for pipe size ranges as follows:
  - AWWA C900 (100mm – 300mm)
  - AWWA C905 (350mm – 1200mm)
  - ASTM D2241 (40mm – 600mm)

  Pressure Class rating of all pipes to be specified in Contract Documents. All pipes to be certified by Canadian Standards Association – CSA B137.3.
- .2 Outside diameter to be CAST iron Pipe equivalent or Iron Pipe Size.
- .3 To be compatible with specified mechanical joint and push-on joint fittings and valves without use of special adapters.

.3 Joints: Push-on integrally thickened bell and spigot type to ASTM D3139 with single elastomeric gasket to ASTM F477.

.4 High Density Polyethylene Pipe (HDPE):
- .1 Pipe:
  - .1 to AWWA C906 pressure class specified in Contract Documents.
  - .2 Iron pipe size equivalent outside diameter.
  - .3 To be compatible with specified mechanical joint fittings and valves without special adapters.
- .2 Joints: heat butt fusion to ASTM D2657 and in accordance with manufacturer's recommendations.

.3 Fittings:
- .1 Fabricated HDPE mitred fittings to AWWA C906 suitable for pressure rating specified and fusion to main pipe, dimensions as specified in Contract Documents.
- .2 Moulded HDPE fittings to ASTM D3261 suitable for pressure rating specified and fusion to main pipe, dimensions as specified in Contract Documents.
- .3 Flanged joints to AWWA C906 flat faced stub end and loose hot-dip galvanized ductile iron (ASTM A536) back up ring drilling to ANSI B16.1, ANSI B16.5 or AWWA C207, class suitable for pressure rating specified in Contract Documents.
- .4 Nuts and bolts as specified for "Fittings" in this section.

.5 Fittings:
- .1 Gray-iron (cast iron) fittings to AWWA C110 suitable for pressure rating specified in Contract Documents. Where specified in Contract Documents, to be cement mortar lined and externally seal coated, both to AWWA C 104.
- .2 Ductile iron fittings to AWWA C110 suitable for pressure rating of 2415 kPa, cement mortar lined to AWWA C104.
- .3 Compact ductile iron fittings to AWWA C153 suitable for pressure rating of 2415 kPa, cement mortar lined to AWWA C104.
- .4 PVC injection-molded fittings shall be C900, DR18, Class 150 conforming to AWWA C-907 and CAN/CSA-B137.3.
- .5 PVC extruded fittings shall be Class 150, DR 18 conforming to AWWA C900-89
- .6 Single rubber gasket for push-on bell and spigot type joint and/or mechanical pipe joints; to AWWA C111. All push-on joint hubs to be equipped with tie-rod lugs.
- .7 Flanged Joints:
  - .1 Flat faced conforming to the face dimension and drilling of ANSI B16.1, Class 125
  - .2 On AWWA C110 fittings to AWWA C110 with minimum pressure rating 1035 kPa or higher as specified in Contract Documents.
  - .3 On AWWA C153 fittings to AWWA C153 with minimum pressure rating of 1723 kPa or higher as specified in Contract Documents.
- .8 Flange gaskets to be manufactured from black natural rubber 3.175 mm thick with layer of cotton on both sides.
- .9 Bolts and nuts:
  - .1 Bolts to be carbon steel, Grade B to ASTM A307, heavy hex style, zinc plated to ASTM

B633 or cadmium plated to ASTM B766. Bolt sizes to AWWA 0110.

.2 Nuts and washers: Nuts to be carbon steel, Grade A to ASTM A563. Washers to be flat hardened steel to ASTM F436. Nuts and washers to be zinc plated to ASTM B633 or cadmium plated to ASTM B766.

.10 Tie Rods and Nuts:

.1 Tie rods to be continuous threaded, quenched and tempered alloyed steel to ASTM A354,Grade BC. To be zinc plated to ASTM B633 or cadmium plated to ASTM B766. Tie rod sizes to be minimum 19 mm diameter or greater as shown on Contract Drawings.

.2 Nuts and internally threaded couplings to be heavy hex finish to ASTM A563. Washers to be flat hardened steel to ASTM F436. All to be zinc plated to ASTM B633 or cadmium plated to ASTM B766.

.11 Fabricated steel pipe fittings: to AWWA C208 and AWWA C207 if flanged, interior and exterior protected with hot applied coal tar enamel to AWWA 0203 or liquid epoxy coating to AWWA 0210.

.12 Couplings and Flanged Coupling Adapters:

.1 General Requirements:

.1 Suitable for pressure class specified in Contract Documents.

.2 To AWWAC219

.3 Anti-corrosion coating of interior and exterior centre sleeve and end rings to AWWA C219, AWWA C213, AWWA C210, or AWWA C550 as specified in Contract Documents.

.4 Compression gaskets to AWWA C219.

.5 Bolts and nuts high strength low alloy steel to AWWA Cl11, stainless steel to ASTM F593 or F738 for bolts and ASTM F594 or F836M for heavy hex nuts, as specified in Contract Documents. Rolled threads, fit and dimensions to AWWA Cl11.

.6 Ductile iron castings to ASTM A536, Grade 65-45-12.

.2 Plain end or transition couplings as specified in Contract Documents.

.3 Flanged coupling adapters as specified in Contract Documents.

.13 Joint Restraint Devices: General Requirements:

.1 Ductile iron castings to ASTM A536.

.2 Anti-corrosion coating of ductile iron castings to AWWAC219, AWWAC21O, C2i3 orC55O as specified in Contract Documents.

.3 Bolts and nuts high strength low alloy steel to AWWA C111 or as specified in Contract Documents,

stainless steel to ASTM F593 or F738 for bolts and ASTM F594 or F836 for heavy hex nuts. Rolled threads, fit and dimensions to AWWA Cl11.

.4 Tie rods to 2.1.5.10 of this Section.

.5 Restrainers for ductile iron pipe with mechanical joint fittings as specified in Contract Documents.

.6 Restrainers for PVC pipe with mechanical joint fittings as specified in Contract Drawings.

.7 Restrainers for ductile iron pipe with push-on joint fittings with tie rod lugs as specified in Contract Documents.

.8 Restrainers for PVC with push-on joint fittings with tie rod lugs as specified in Contract Drawings.

.9 Restrainers for mechanical joints or push-on joints in ductile iron pipe as specified in Contract Drawings.

.10 Joint restraint devices for PVC forcemain to be Underwriter Laboratories of Canada (UL) or Factory Mutual (FM) approved.

.6 Pre-stressed Concrete Pressure Pipe

.1 Pipe to AWWA C300, C301 and C303

.2 Joints: push-on bell and spigot joints complete with rubber gasket.

.7 Steel Pipe:

.1 To AWWA C200 wall thickness as specified in Contract Documents electrically welded. Steel to ASTM A36.

.2 Steel pipe flanges to AWWA C207. Dimensions for fabricated steel water pipe fittings to AWWA C208.

.3 Finishes - exterior and interior: hot applied coal tar enamel to AWWA C203 or liquid epoxy coating to AWWA C210.

2.3 VALVE AND VALVE BOXES

.1 Mainline Valves - General Requirements:

.1 Valves to open counter-clockwise .

.2 All valves to have manufacturer's name, year of manufacture, size and working pressure on the bonnet or body .

.3 Valves 400 mm and larger to have by-pass sized to AWWAC500.

.4 Gate valves 400 mm and larger to have gear operators.

.2 Gate valves:

.1 Locations of solid wedge and resilient-seated valves as shown on Contract Drawings.

.2 To AWWA C500: 75 to 300 mm to working pressure 1380 kPa; 400 mm and larger to working pressure 1035 kPa, gray cast iron or cast ductile iron body, bronze mounted solid wedge, nonrising stem, hub or flanged ends.

.3 To AWWA C509: 75 to 300 mm to working pressure 1380 kPa; Gray cast iron or ductile iron body, resilient seated, non-rising stem, hub or flanged ends.
.4 Stem seal to be O-ring type.
.5 Valves to be complete with 50 mm square operating nut for underground service.
.6 Acceptable manufacturers are as specified in Contract Documents.

.4 Blowdown Valves: 75 mm to 300 mm as specified for gate valves.

.5 Air Release, Air/Vacuum and Combination Air Valves:
.1 Gray cast iron or ductile iron body.
.2 Threaded or flanged connections.
.3 Maximum working pressure 2070 kPa.
. 4 To AWWA C512.
. 5 For sewage service.

.6 Valve Boxes:
.1 To be as specified on Contract Drawings: telescoping, cast iron, top flange type service box:
.1 Rectangular type to be as specified on Contract Drawings.
.2 Circular type to be as specified on Contract Drawings.
.2 Valve box riser pipe to be 150 mm diameter PVC DR 35 or better.

"

2.4 VALVE CHAMBERS

.1 Applicability: for gate valves 400 mm and larger. As specified on Contract Drawings, valve chambers for motorized valves or other devices may have special and additional requirements and features.

.3 Materials and installation for Cast-in-place chambers to Section 33 05 13-Manholes and Catch Basin Structures.

.4 Concrete and reinforcing steel: to Section 03 20 00-Concrete Reinforcing and Section 03 30 00-Cast-In-Place Concrete.

.5 Precast concrete sections to ASTM C478M. Ladder rungs be cast integral with unit; field installation not permitted. Precast concrete lids to H-20 loading conditions.

.6 Jointing materials:
.1 Manufacturer's rubber ring gaskets,
.2 Mastic joint filler,
.3 Cement mortar or,
. 4 Combination of above types.

.7 Mortar: aggregate to CAN/CSA AS2.56, masonry cement to CAN/CSA A8.

.8 Ladder rungs for valve chambers: minimum 20 mm diameter, for 76 mm minimum embedment in precast or cast-in-place concrete, minimum rung length 250 mm, minimum projection 100 mm, maximum vertical spacing 300 mm, minimum design liveload 1334N, cold rolled steel to CAN/CSA-G40.20, hot-dip galvanized after fabrication to CAN/CSA G164 or aluminum alloy #6061-T6 to CAN3-S157 and NBC 1977. Rungs to be safety pattern. Hand holds at top entry to conform to minimum design liveload and dimensions.

.9 Valve chamber frames and covers: as specified in Contract Drawings.

.10 Mechanical and Electrical: as specified on Contract Drawings.

2.5 PIPE BEDDING AND SURROUND MATERIALS

1. As shown on Contract Drawings.

2. Refer to Section 31 05 16-Aggregate Materials.

2.6 BACKFILL MATERIAL

1. As shown on Contract Drawings.

2. Refer to Section 31 05 16-Aggregate Materials.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Remove defective materials from site.

3.2 TRENCHING

.1 Do trenching work in accordance with Section 31 23 10 - Excavating Trenching and Backfilling.

.2 Trench alignment and depth as shown on Contract Drawings.

.3 Trench depth to provide cover over pipe of not less than 1.0 m from finished grade unless shown otherwise on Contract Drawings.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
.1 Place concrete to details as indicated.

.2 Do not backfill over concrete within 24 hours after placing.

3.4 GRANULAR BEDDING

.1 Fill over-excavation below design elevation of bottom of specified bedding with granular bedding placed and compacted in accordance with 3.5.2 and 3.5.5. Drain rock may be used for backfill of over-excavation only with Department Representative's approval.

.2 Place granular bedding material across full width of trench bottom in uniform layers to depth shown on Contract Drawings.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe. Do not use blocks when bedding pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to minimum 95% Modified Proctor Density in compliance with ASTM D1557. (All following references to density imply in compliance with ASTM D1557).

.6 Place ductile iron forcemain pipe or copper water services on prepared flat bottomed trench free of rock in excess of 50 mm without bedding and backfill with approved native or imported material and compact as specified. Use hand tools to compact material under 'haunch' area of pipe and around fittings and other materials.

.7 Use imported bedding material when native material is deemed unsuitable for backfill by Contract Administrator or when trench has been excavated in rock.

.8 Use imported bedding material when using pipe materials Other than ductile iron or copper.

.9 Use imported bedding when proposed work is installed through paved areas, when native material is deemed unsuitable for backfill by Department Representative or when trench has been excavated in rock.

3.5 PIPE INSTALLATION

.1 Handle pipe in accordance with pipe manufacturer's recommendations. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.2 Lay and join pipes to manufacturer's instructions and specifications except as noted otherwise herein. PVC pipe to AWWA M23; ductile iron pipe to AWWA C600 and C151, high density polyethylene pipe to ASTM D2774 and D2321.

.3 Horizontal tolerance: plus or minus 50 mm from specified alignment. Vertical tolerance: plus or minus 25 mm from specified grade.

.4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends up-grade.

.6 Do not exceed maximum joint deflection specified in AWWA C600 nor maximum joint deflection recommended by pipe manufacturer. Joint deflection not permitted for PVC pipe. Deflections in PVC pipelines to be achieved using high defection PVC couplings rated for 1380 kPa

operating pressure. For HDPE pipe; pipe cold bending allowed to a minimum radius of 50 times nominal pipe size without special fittings.

.7 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of water and foreign materials.

.8 Position and join pipes with equipment and methods specified in 3.6.2.

.9 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe or its coating and leave smooth end at right angles to axis of pipe.

.10 Joints:

- .1 Install gaskets as recommended by manufacturer.
- .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .3 Align pipes carefully before joining.
- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .9 For ductile iron pipe do not install bronze wedges or other conductivity devices unless specified on Contract Drawings.
- .10 Butt-fuse high density polyethylene in strict accordance with manufacturer's instruction by manufacturer or by manufacturer trained personnel.
- .11 Ensure flanged joints at ambient temperature of surrounding soil at time they are bolted together. Re-tighten flange bolts 24 hours after initial flange bolt tightening.
- .12 Ensure all polyethylene pipe at temperature of surrounding soil when it is back filled and compacted.
- .13 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as specified otherwise.
- .14 When any stoppage of work occurs, restrain pipes in an approved manner to prevent "creep" during down time.
- .15 Recheck components assembled above ground after placing in trench to ensure that no movement of joints has taken place.
- .16 Test and/or bleed points consisting of Corporation cocks, sized to achieve minimum flushing velocities of 0.8 m/s in accordance with AWWA C651. to be provided where shown

on Contract Drawings or as required by Contractor for pressure testing and flushing.

3.6 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations shown on Contract Drawings.

.2 Support valves located in valve boxes by means of either concrete or pressure treated and end treated wood blocks, located between valve and solid ground. Maximum length of pipe on each end of valve to be 1m. Valves not to be supported by pipe.

.3 Support valves located in valve chambers by means of either concrete blocks or fabricated steel pipe stands as shown on Contract Drawings.

.4 Valves to be installed in vertical position with actuating stem plumb.

3.7 VALVE CHAMBERS

.1 Use cast-in-place or precast units as shown on Contract Drawings. Precast units to be in accordance with Section 33 05 13-Manholes and Catch Basin Structures.Cast-in-Place units to be in accordance with Section 03 20 00-Concrete Reinforcing and Section 03 30 00 Cast-In-Place Concrete.

.2 Construct as shown on Contract Drawings, plumb and with valve chamber openings centred over valve nut, true to alignment and grade. Valve chambers not to rest on pipe.

.3 Place reinforcing steel and miscellaneous metals required to be embedded in concrete to details shown on Contract Drawings and in accordance with Section 03 30 00 Cast-In-Place Concrete.

.4 Cast bottom slabs for precast units directly on undisturbed ground where shown on Contract Drawings, set precast concrete slab on 100 mm minimum of compacted granular material.

.5 Set bottom section of precast unit in bed of cement mortar and bond to bottom slab. Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar, or combination thereof.

.6 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.

.7 Plug lifting holes with precast concrete plugs set in nonshrink non-staining grout or non-shrink, non-staining mortar.

.8 Set frame and cover to required elevation on at least two and not more than four courses of brick or precast concrete riser rings. Make brick or riser ring joints and join brick or riser rings to frame with

cement mortar, parge and trowel smooth.

.9 Cover to be marked as specified on Contract Drawings

.10 Clean valve chambers of debris and foreign materials; remove fins and sharp projections.

.11 Set valve boxes centrally over valve nut. Set valve boxes and any other boxes around appurtenances and complete backfill within 24 h of setting appurtenance

.12 Install sump drainer assemblies to manufacturer's instructions and to AWWA C510 and AWWA C511 .

3.8 THRUST BLOCKS

.1 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers hydrants and fittings and undisturbed ground as shown on Contract Drawings or as directed by Department Representative.

.2 Place 6 mil polyethylene between interface of concrete and fitting.

.3 Where shown on Contract Drawings, joint restraint devices to 2.2.13 of this Section or other approved restraining devices may be used in place of thrust blocks. Thrust blocks not required for HDPE systems at reducers and fittings where jointing system is pullout resistant. Bolted, sleeve type coupling or connection to other materials lacking equivalent pullout resistance to employ thrust block to prevent HDPE pipe movement.

.4 Do concrete work in accordance with Section 03 30 00-Cast-In-Place Concrete.

.5 Keep joints and couplings free of concrete.

.6 Do not backfill over concrete within 24 h after placing

3.9 CORROSION PROTECTIONS

.1 Where specified, provide corrosion protection measures as shown on Contract Drawings.

3.10 PIPE SURROUND

.1 Upon completion of pipe laying and after Department Representative has inspected work in place, surround and cover pipes as shown on Contract Drawings.

.2 Hand place surround material in uniform layers simultaneously on both sides of pipe. Do not dump material within 1 m of exposed pipe.

.3 Compact each layer from pipe invert to underside of backfill to minimum 95% Modified Proctor Density.

.4 Install concrete encasement where shown on Contract

Drawings or as directed by Department Representative. For PVC forcemain install high deflection PVC coupling 0.3 m minimum to 0.5 m maximum from end of encasement. For ductile iron forcemain ensure hub joint occurs 0.3 m minimum to 0.5m maximum from end of encasement.

.5 Forcemain identification: yellow PVC marker tape to be placed at top of pipe zone. Marker tape to be continuous, 75 mm wide and lettered permanently with “SEWAGE FORCEMAIN” at 1.0 m intervals along tape. Alternately this letting can be applied directly to the pipe in 75 mm high letters at 1.0m intervals. Pipe to be installed with letting facing upward.

3.11 BACKFILL

.1 Place and compact backfill material in accordance with Section 31 23 10-Excavating, Trenching and Backfilling

.2 Backfill requirements, including type of material and compaction requirements as shown on Contract Drawings.

3.12 GENERAL PROCEDURE FLUSHING AND TESTING

.1 All cleaning, flushing, and pressure testing, to be done by Contractor. Costs are included in payment for items described in Clause 1.3, Measurement for Payment.

.2 Perform all tests in presence of Department Representative. Notify Department Representative 24 h in advance of proposed test.

.3 Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least 5 days after placing concrete or 2 days if high early strength concrete is used.

.4 Obtain Department approval prior to discharging flushing water to sewers or drainage ditches.

.5 Comply with Section 01 35 43-Environmental Procedures

.6 Provide Department Representative with all required approvals.

3.13 CLEANING AND FLUSHING

.1 Before flushing and pressure testing, ensure forcemain is completely finished and make arrangements with Department Representative for scheduling of testing.

.2 Isolation of existing system where required will be performed by Department. Do not operate any existing valves without Department Representative's authorization.

.3 Water may be supplied from fire hydrants upon application for a Hydrant Use Permit and presentation of valid test certificate for reduced pressure principle backflow prevention device conforming to AWWA C511.

.4 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water sources. Minimum velocity to be 0.8 m/s and/or in accordance with AWWA C651. Continue flushing at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

3.14 PRESSURE TESTING PROCEDURES

.1 Upon completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, make section ready for testing. Carry out testing in accordance with 3.14.2 following.

.2 Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Submit pipeline to a test of 1.5 x working pressure applied at highest elevation in each section. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 litres per millimetre diameter of pipe per kilometre per 24 hour period. Minimum duration of test period to be 2-hours.

.3 Perform pressure and leakage testing of ductile iron piping to AWWA C600.

.4 Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23. Test pressures should not exceed those specified in CSA B137.3.

.5 Perform testing of welded steel piping to AWWA C206;no leakage allowed.

.6 Perform pressure testing on HDPE to manufacturer's procedures to account for expansion of pipe during testing requirement is achieved.

.7 Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirement is achieved.

3.15 CONNECTIONS TO EXISTING MAINS

.1 Connections to existing sanitary sewer systems to be made by Contractor unless shown otherwise on Contract Drawings. Notify Department Representative minimum 48 h in advance of scheduled connection.

.2 Make connection in presence of Department Representative. To prevent damage to existing utilities, excavate at least 300 mm over utility by hand.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for fiber reinforced plastic (FRP) sewage storage tank.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 31 23 10 - Excavating Trenching and Backfilling.

.3 Section 31 05 16 - Aggregate Materials.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
.1 ASTM C 117-[95], Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
.2 ASTM C 136-[01], Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
.3 ASTM D 698-[00a], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
.2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association, (CSA International)
.1 CAN/CSA-B66-05, Prefabricated Septic Tanks and Sewage Holding Tanks.

1.4 DESIGN REQUIREMENTS

.1 Design FRP sewage holding tank in accordance with CAN/CSA-B66-05, and to carry all handling stresses and anticipated service loads.

.2 Contractor to locate and confirm all existing service connection locations and elevations, existing utilities, and potential areas of conflict prior to construction and notify the Department Representative of any discrepancies.

.3 Tank to have minimum total working capacity of 80,000 L.

.4 Design to be in accordance with applicable local, provincial, and federal standards and codes for sewage storage tanks.

.5 Design to resist uplift assuming water table is at the surface.

1.5 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures

.2 Shop drawings to indicate:
- .1 Design calculations for items designed by manufacturer.
- .2 Methods of handling and erection.
- .3 Openings, sleeves, inserts, lifting lugs, and related reinforcement.

.3 Each drawing submission shall bear stamp and signature of qualified professional engineer licensed in the Province of British Columbia, Canada.

1.6 QUALIFICATIONS

.1 Manufacturers of FRP storage tanks elements shall be certified by CSA as meeting requirements of CAN/CSA-B66-05.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

PART 2 - PRODUCTS

2.1 MANUFACTURE

.1 The FRP storage tank shall have 2 coats of epoxy enamel (2-component) sanitary white finish on the interior, backed up with a standard corrosion liner which includes a surfacing veil and two layers of 1.5 oz. chopped strand mat. The reinforcements shall be wetted out with a premium grade isopthalic resin. The glass content of the corrosion liner shall be 20-30% with a minimum overall thickness of 3mm.

2. The FRP storage tank shall be filament wound in a helical pattern with a winding angle of 60 -70 degrees from the horizontal axis. Glass content of the filament wound structure shall be between 60% and 70% by weight. External reinforcing ribs shall also be installed using the filament winding process at spacing as determined by the manufacturer. Rib spacing shall be shown on shop drawings.

2.2 FINISHES

.1 Finish tanks to commercial grade.

2.3 ACCESS

.1 Provide lockable manhole access to surface to facilitate cleaning and inspection.

2.4 TANK BEDDING AND SURROUND MATERIAL

.1 Granular material to Section 31 05 16 - Aggregate Materials and as indicated on the contract drawings.

2.5 BACKFILL MATERIAL

.1 As indicated and in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Place bedding and surround material in unfrozen condition.

.2 Do excavation in accordance with Section 31 23 10- Excavating, Trenching and Backfilling.

.3 Place tank bedding material in accordance with details as indicated.

.4 Install tank as in accordance with manufacturers requirements.

.5 Make inlet and outlet joints of septic tank watertight

.6 Conduct leakage test on septic tank in presence of Department Representative before backfilling. Fill tank to level of effluent pipe, and allow to stand for 24 hours. Allowable leakage is zero.

.7 Do backfilling in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for storm sewer.

1.2 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 03 30 00-Cast-in-Place Concrete.

.3 Section 31 05 16-Aggregate Materials.

.4 Section 31 23 10-Excavating, Trenching and Backfilling.

.5 Section 33 05 13-Manholes and Catch Basin Structures.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM C 14M, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
- .2 ASTM C 76M, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
- .3 ASTM C 117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .4 ASTM C 136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .5 ASTM C 443M, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
- .6 ASTM C 506M, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.
- .7 ASTM C 507M, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe (Metric).
- .8 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
- .9 ASTM D 1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- .10 ASTM D 2680, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .11 ASTM D 3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .12 ASTM F 405, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
- .13 ASTM F 667, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
- .14 ASTM F 794, Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
.2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
.3 CAN/CGSB-34.9, Asbestos-Cement Sewer Pipe.

.3 Canadian Standards Association (CSA International)
.1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).
.1 CAN/CSA-A5, Portland Cement.
.2 CAN/CSA-A257 Series-[M92(R1998)], Standards for Concrete Pipe.
.3 CSA B1800-[02], Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
.1 CSA B182.2, PVC Sewer Pipe and Fittings (PSM Type).
.2 CSA B182.4, Profile PVC Sewer Pipe and Fittings.
.3 CSA B182.11, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.
.4 CSA-G401, Corrugated Steel Pipe Products.

1.4 MATERIAL CERTIFICATION

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Products having CSA certification to be used where readily available. Certification by Standards Council of Canada approved independent third body that products conform to CSA standards in acceptable in lieu of CSA certification.

.3 At least 2 weeks prior to commencing work, submit manufacturer's recent test data and certification that materials to be incorporated into works are representative and meet requirements of this Section. Include manufacturer's drawings where pertinent.

1.5 SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services. Maintain existing flow during construction.

.2 Submit schedule of expected interruptions to Department Representative for approval and adhere to interruption schedule as approved by Department Representative.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Divert unused concrete materials from landfill to local facility as approved by Department Representative.

.3 Divert unused aggregate materials from landfill to facility for reuse as

approved by Department Representative.

.4 Handle and dispose of hazardous materials in accordance with the Regional and Municipal regulations.

.5 Dispose of unused asbestos cement pipe in accordance with regulations governing the disposal of hazardous materials.

.6 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE

.1 Non-reinforced circular concrete pipe and fittings: to ASTM C 14M maximum diameter 900 mm, strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM C 443M.

.2 Reinforced circular concrete pipe and fittings: to ASTM C76M for all pipe greater than 900 mm diameter, strength class as shown on Contract Drawings, designed for flexible rubber gasket joints to ASTM C 443M.

.3 Reinforced circular concrete pipe and fittings: to ASTM C506M.

.4 Reinforced concrete elliptical pipe: to ASTM C507M.

.5 Lifting holes:
- .1 Pipe 900mm and less diameter: no lift holes.
- .2 Pipe greater than 900mm diameter: lift holes not to exceed two in piece of pipe.
- .3 Provide pre-fabricated plugs to effectively seal lift holes after installation of pipe.

2.2 CORRUGATED STEEL PIPE

.1 Corrugated steel pipe and couplers: to CSA-G401.
- .1 Gaskets: to ASTM D 1056.

2.3 PLASTIC PIPE, MAINLINE SMOOTH PROFILE AND PERFORATED DRAIN TILE

.1 Polyvinyl chloride pipe up to 675mm in diameter, DR35. Pipe to have minimum pipe stiffness (F/Y) of 320 kPa at 5.0% deflection, ASTM D2412. Pipe to be manufactured to specification for pipe size ranges as follows:
- .1 100mm dia. – 375mm dia. to ASTM D3034
- .2 450mm dia. – 1200mm dia. to ASTM F679.

.2 Pipes to be certified by Canadian Standards Association to standards for pipe size ranges below.
- .1 100mm dia. – 1200mm dia. to CSA B182.2

.3 Joint: Pipe to include integral bell and spigot ends with stiffened wall section and formed groove for a rubber gasket; joints to conform to

ASTM D3212, gaskets to ASTM F477.

.4 Normal pipe length joint to joint to be 4.0 m.

.5 Maximum installed deflection not to exceed 7.5% of the base inside diameter.

2.4 SERVICE CONNECTIONS

.1 Storm sewer service connections to be 100mm minimum diameter; maximum diameter as specified on Contract Drawings.

.2 Storm sewer service connections 100mm and 150mm diameter to be PVC type DR28 sewer pipe.

.3 100mm and 150mm DR28 PVC storm service connection pipe to have a minimum pipe stiffness of 625kPa. Pipe to be manufactured to ASTM D3034 and certified by Canadian Standards Association to CSA B182.2

.4 Storm sewer service connections greater than 150mm diameter to be of size and material specified on Contract Drawings and to conform to applicable specifications for mainline pipe.

.5 Manufactured connections to non-reinforced or reinforced concrete mainline pipe to be made using sanded PVC pipe male end stub with integral bell by either:

.1 Stub grouted into neatly chipped hole in pipe wall by concrete pipe manufacturer. Grout to be Portland cement based grout.

.2 Stub epoxy resin cemented into neatly cored hole in pipe wall by concrete pipe manufacturer.

.6 Stub and bell orientation to be 45˚ to centerline of mainline 2pipe (wyes) for concrete pipe less than 1050mm diameter. Orientation may be 90˚ to centerline of mainline pipe (tees) for concrete pipe 1050mm diameter or larger. No section of service stubs to protrude past inside of concrete pipe wall.

.7 Manufactured wye connections to PVC mainline pipe to be made with extrusion moulded PVC or fabricated PVC fittings manufactured to ASTM D3034 and CSA B182.2

.8 Field installed tees and wyes:

.1 In-situ installation of tees and wyes into concrete or PVC mainline pipe shall be made with approved PVC swaddle installed to the manufacturers specifications into a neatly cored hole in the pipe wall.

.2 Connections to ribbed PVC pipe to be made with a preformed tee and wye fitting when connection is up to two sizes smaller than mainline pipe. For these pipes, in-situ installation of tees or wyes involving cutting across pipe ribs not permitted. For connections more than two sizes smaller than mainline pipe, an insertable tee for ribbed PVC pipe is permitted. When an insertable is used, hole cut into mainline pipe to cut

as few ribs as possible.

.9 PVC service connection pipe and fitting joints: push-on type comprised of integral bell with single elastomeric gasket to ASTM D3212 and ASTM F477. Normal pipe laying length joint to joint to be 4.0m.

.10 Pipe and fitting joints for service connection pipe materials other than PVC type PSM sewer pipe to be as specified for applicable mainline pipe.

2.5 CONCRETE

.1 Concrete mixes and materials required for bedding cradles, encasement, and incidental uses: to Section 03 30 00 - Cast-in-Place Concrete.

.2 Concrete to be minimum 20 MPa.

2.6 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material in accordance with Section 31 05 16 - Aggregate Materials

.2 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

2.7 BACKFILL MATERIAL

.1 As shown on Contract Drawings.

.2 In accordance with Section 31 05 16-Aggregate Materials.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Department Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 Do not allow contents of sewer or sewer connection to flow into trench.

.3 Trench alignment and depth as shown on Contract Drawings.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete. Place concrete to details as indicated.

.2 Position pipe on concrete blocks to facilitate placing of concrete.

.1 When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 h after placing

3.4 GRANULAR BEDDING

.1 Fill over-excavation below design elevation of bottom of specified bedding with granular bedding placed and compacted. Drain rock may be used for backfill of over-excavation only with Department Representative's approval.

.2 Place granular bedding material across full width of trench bottom in uniform layers not exceeding 150mm compacted thickness to depth as shown on Contract Drawings.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% Modified Proctor Density in compliance with ASTM D1557. (All following references to density imply in compliance with ASTM D1557).

3.5 INSTALLATION

.1 Handle pipe in accordance with manufacturer's recommendations.
- .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.2 Lay and join pipes to manufactureer's instructions and specifications except as noted otherwise herein. Concrete pipe as specified herein, PVC pipe to CSA B182.11.

.3 Horizontal tolerances: ± 50 mm from specified alignment
Vertical tolerances: ± 10 mm from specified grade. Reverse grade is not acceptable.

.4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Pipes on curved alignments:
- .1 Concrete pipe and ribbed profile PVC plastic pipe. Do not exceed permissible joint defection recommend by pipe manufacturer.
- .2 Smooth PVC pipe: for 100 mm to 300 mm sizes conform to required curvature by bending pipe barrel. In no case shall radius of curvature to be less than 300 times outside diameter of pipe barrel. Joint defection not permitted for smooth profile PVC pipe.

.7 Keep jointing materials and installed pipe free of dirt, water and other foreign materials. Do not allow water to flow through pipes during construction except as may be permitted by Department Representative.

.8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.9 Cut pipes as required, as recommended by pipe manufacturer, without damaging pipe and leave smooth end at right angles to axis of pipe.

.10 Joints:
- .1 Install gaskets as recommended by manufacturer.
- .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .3 Align pipes before joining.
- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as specified otherwise.

.12 When any stoppage of Work occurs, restrain pipes as directed by Department Representative, to prevent "creep" during down time.

.13 Plug lifting holes with approved prefabricated plugs, to pipe suppliers recommendations for sealing methods.

.14 Make watertight connections to manholes.
- .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .2 Core neat circular holes in walls of existing manholes. Do not hammer or ship except as approved by Department Representative.

3.6 PIPE SURROUND

.1 Upon completion of pipe laying, and after Department Representative has inspected work in place, surround and cover pipes as shown on Contract Drawings.

.2 Hand place surround material in uniform layers not exceeding 150mm compacted thickness simultaneously on each side of pipe. Do not dump material within 1 m of pipe.

.3 Compact each layer from pipe invert to underside of backfill to minimum 95% Modified Proctor Density.

3.7 CONNECTIONS TO EXISTING MAINLINE PIPES

.1 Use prefabricated saddles or approved field connection materials and techniques to connect service pipes to existing mainline sewer pipe.

.2 Where feasible, make connections to existing non-reinforced or reinforced concrete mainline pipe by coring or sawing circular holes in existing pipe walls. Where not feasible, make as follows:

- .1 Break in to pipe by drilling small diameter holes, spaced at approximately 50 mm along pipe axis, using a drill or chipping gun. Use hammer to strike concrete adjacent to centre holes to create small core, and similarly expand core to suit outside dimensions of stub.
- .2 Core dimensions to allow maximum 20 mm clearance around stub at any point.
- .3 Trim stub to conform closely to shape of pipe interior when installed.
- .4 Insert stub into core, ensuring that no portion of stub protrudes beyond interior of pipe.
- .5 Prepare non-shrink, fast-setting cementious grout to “dry pack” consistency. Pack grout tightly into void between stub and pipe.
- .6 Hand finish interior and exterior grout surfaces to smooth surface.
- .7 Allow sufficient time for strength development of grout prior to installation of connecting pipe or trench backfill.

.3 For new connections to existing PVC mainline sewers, drill hole in mainline to exact dimension of new connection. Use saddle or insertable tee for connections more than two sizes smaller than mainline. Insertable tees may be used for all types of gravity mains provided insertable tee designed for applicable pipe thickness is used.

.4 For new connections to existing ribbed PVC pipe mainline sewers use performed tee or wye fitting when connection is up to two sizes smaller than mainline pipe. For these pipes, in-situ installation of tees or wyes involving cutting across pipe ribs not permitted. For connections more than two sizes smaller than mainline pipe, an insertable tee for ribbed PVC pipe is permitted. When an insertable tee is used, hole cut into mainline pipe to cut as few ribs as possible.

.1 Place backfill in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.

.2 Backfill requirements, including type of material and compaction requirements, as shown on Contract Drawings.

.3 Under paving and walks, compact backfill to at least 95% Modified Proctor Density.

3.9 SERVICE CONNECTIONS

.1 Install service connections to 3.5 and as shown on Contract Drawings.

.2 Install inspection chamber at specified location set plumb and to specified elevation. If inspection chamber located in driveway, lane or paved surface install cover or lid as shown on Contract Drawings.

.3 Place location marker at ends of plugged or capped unconnected sewer lines.

.1 Each marker: 40 x 90 mm stake extending from pipe end at pipe level to 0.6 m above grade.

.2 Paint exposed portion of stake green with designation STM SWR LINE in black.

.4 Sawcut adjacent curb on alignment of service connection and paint green.

3.10 CLEANING AND FLUSHING

.1 Before flushing and testing, ensure sewer system is completely finished and make arrangements with Department Representative for scheduling of testing.

.2 Water may be supplied from Department fire hydrants upon application for a Hydrant Use Permit.

.3 Obtain Department approval prior to discharging flushing water to sewers or drainage ditches.

.4 Comply Section 01 35 43-Environmental Procedures in regard to discharge of flushing water.

.5 Provide Department Representative with all required approvals prior to discharging flushing water.

.6 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water sources. Continue flushing at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

3.11 VIDEO INSPECTION

.1 The Contractor shall video inspect completed storm sewers under 900 mm in diameter following completion of installation. The video inspection report shall be in the form specified by the Department Representative. Copies of the video tapes and written report shall be forwarded to the Department Representative when available.

.2 Should video inspection indicate apparent deficiencies, Department Representative may direct Contractor to perform additional testing as follows.

.3 Additional testing may include passing rubber ball, mandrel or test plug having a minimum dimension of 95% of diameter of sewer pipe completely through pipes and appurtenances. A light test may be performed in lieu of ball test at discretion of Department Representative.

3.12 INSTALLATION STANDARD

.1 Repair all deficiencies and visible leaks.

.2 Repair procedures and materials subject to approval of Department Representative.

.3 Department Representative reserves right to require Contractor to replace defective installations at Contractor's sole cost.

.4 Test Procedures, including video inspection, to be repeated and repairs made until satisfactory results are obtained.

.5 Acceptable Ponding:

- .1 Connections: 10mm maximum ponding over 3m length of pipeline.
- .2 Mainline PVC sewers:
  - .1 300mm diameter or less: 20mm maximum ponding over 3m length of pipe
  - .2 Greater than 300mm diameter: 30mm ponding over 3m length of pipeline.
- .3 Mainline Concrete sewers:
  - .1 300mm diameter: 20mm maximum ponding over a 5m length of pipeline
  - .2 Greater than 300mm diameter: 30mm maximum ponding over a 5m length of pipeline.

3.13 CONNECTIONS TO EXISTING MAINS

.1 Make connections to existing storm sewer systems unless shown otherwise on Contract Drawings. Notify Department Representative minimum 48 h in advance of scheduled connection.

.2 Make connection in presence of Department Representative. To prevent damage to existing utilities, excavate last 300 mm over utility by hand.

3.15 PERFORATED DRAIN PIPE

.1 Where shown on Contract Drawings or where directed by Department Representative install perforated drain pipe adjacent to sidewalk or cub and gutter.

.2 Drain pipe to be 100 mm minimum.

.3 Connect to catchbasins.

.4 Install other perforated drain pipes as shown on Contract Drawings.

.5 Install sweep bend and cap at ground grade at upstream end of run.

.6 Install with perforations downward.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for asphalt concrete paving for roads.

1.2 RELATED SECTIONS

1. Section 01 33 00-Submittal Procedures.

2. Section 31 05 16-Aggregate Materials.

1.3 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO)
- .1 AASHTO M320, Standard Specification for Performance Graded Asphalt Binder.
- .2 AASHTO R29, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
- .3 AASHTO T245, Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

.2 Asphalt Institute (AI)
- .1 AI MS2 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.3 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C 117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C 123, Standard Test Method for Lightweight Particles in Aggregate.
- .4 ASTM C 127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
- .5 ASTM C 128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
- .6 ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .7 ASTM C 136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .8 ASTM C 207, Standard Specification for Hydrated Lime for Masonry Purposes.
- .9 ASTM D 995, Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .10 ASTM D 2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- .11 ASTM D 3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
- .12 ASTM D 4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
.3 CAN/CGSB-16.3, Asphalt Cements for Road Purposes.

1.4 PRODUCT DATA

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit manufacturer's test data and certification that asphalt cement meets requirements of this Section.

.3 Submit asphalt concrete mix design and trial mix test results to Department Representative for review at least 4 weeks prior to beginning Work.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.

.4 Divert unused asphalt from landfill to facility capable of recycling materials.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Asphalt cement: to CAN/CGSB-16.3-M90, grade: 80-100.

.2 Reclaimed asphalt pavement:
.1 Crushed and screened so that 100% of RAP material passes 37.5 mm screen before mixing.

.3 Aggregates: in accordance with Section 31 05 16 - Aggregate Materials: General following requirements:
.1 Crushed stone or gravel consisting of hard, durable angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
.2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117.
.3 Table

Sieve Designation	% Passing	
	Lower Course #1	Upper Course #1
25mm	100	--
19mm	--	--
12.5	70-85	100
9.5	--	--
4.75	40-65	55-75
2.36	32-53	38-58
1.18	26-44	28-47
0.600	18-36	20-36
0.300	10-26	10-26
0.150	4-17	4-17
0.075	3-8	3-8

.4 Coarse aggregate: aggregate retained on 4.75mm sieve and fine aggregate is aggregate passing 4.75mm sieve when tested to ASTM C 136.

.5 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75mm sieve and stockpile separately from coarse aggregate.

.6 Do not use aggregates having known polishing characteristics in mixes for surface courses.

.7 Sand equivalent: ASTM D 2419 Min: 40.

.8 Magnesium Sulphate soundness: to ASTM C 88 Max% loss by mass after five cycles:
- .1 Coarse aggregate: 15%.
- .2 Fine aggregate: 18%.

.9 Los Angeles abrasion: Grading B, to ASTM C 131 Max % loss by mass:
- .1 Coarse aggregate, upper course: 25%
- .2 Coarse aggregate, lower course: 35%.

.10 Absorption: to ASTM C 127 Max % by mass:
- .1 Coarse aggregate, upper course: 1.75%.
- .2 Coarse aggregate, lower course: 2.00%.

.11 Loss by washing: to ASTM C 117 Max % passing 0.075 mm sieve:
- .1 Coarse aggregate, upper course: 1.5
- .2 Coarse aggregate, lower course: 2.0

.12 Flat and elongated particles: to ASTM D 4791, (with length to thickness ratio greater than 3): Max% by mass:
- .1 Coarse aggregate, upper course: 10%.
- .2 Coarse aggregate, lower course: 10%.

.13 Crushed fragments: at least 60% of particles by mass within each of following sieve designation ranges, to have at least 2 freshly fractured face. Material to be tested according to ASTM C 136 and ASTM C117. Determination of amount of fractured material will be inaccordance with Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "B", which determines fractured faces by mass.

Passing		Retained on
25 mm	to	12.5mm
12.5 mm	to	4.75mm

.14 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

.4 Mineral filler:
- .1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
- .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.

.3 Mineral filler to be dry and free flowing when added to aggregate.

2.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:
- .1 Minimum drum diameter: 1200mm.
- .2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
- .1 Boxes with tight metal bottoms.
- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:
- .1 Lutes or rakes with covered teeth for spreading and finishing operations.
- .2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Department Representative may be used instead of tamping irons.
- .3 Straight edges, 3.0m in length, to test finished surface.

2.3 MIX DESIGN

.1 Mix design provided by the Contractor (to be developed by testing laboratory) for approval by Department Representative.

.2 Mix to contain maximum 20% by mass of RAP. Department Representative may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.

.3 Design of mix: by Marshall method to requirements below.
- .1 Compaction blows on each face of test specimens: 75.

.2 Mix physical requirements:

Property		Pavement Course	
Marshall Stability at 60°C	kN min	6.4	lower course
		5.5	upper course
		5.5	fine
Flow Value	mm	2-4	
Air Voids in Mixture	%	3-6	lower course
		3-5	upper course
		3-5	fine
Void in Mineral Aggregate	% min	13	lower course 1
		14	lower course 2
		14	upper course 1
		15	upper course 2
		15	fine
Index of Retained Stability		75	

.3 Measure physical requirements as follows:
.1 Marshall load and flow value: to ASTM D1559.
.2 Air voids: to ASTM D3203.
.3 Index of Retained Stability: measure in accordance with Marshall Immersion Test (ASTM D1559).
.4 Do not change job-mix without prior approval of Department Representative. When change in material source proposed, new job-mix formula to be reviewed by Department Representative.

PART 3 - EXECUTION

3.1 PLANT AND MIXING REQUIREMENTS

.1 Batch and continuous mixing plants:
.1 To ASTM D 995.
.2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Do not load frozen materials into bins.
.3 Feed cold aggregates to plant in proportions to ensure continuous operations.
.4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
.5 Before mixing, dry aggregates to moisture content not greater than 0.5% by mass or to lesser moisture content if required to meet mix design requirements.
.6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.
.7 Store hot screened aggregates in manner to minimize segregation and temperature loss.
.8 Heat asphalt cement and aggregate to mixing temperature directed by Department Representative. Do not heat asphalt cement above 160 degrees C.
.9 Maintain temperature of materials within 5 degrees C of

specified mix temperature during mixing.

.10 Mixing time:

.1 In batch plants, both dry and wet mixing times as directed by Department Representative. Continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30s or more than 75s.

.2 In continuous mixing plants, mixing time as directed by Department Representative but not less than 45s.

.3 Do not alter mixing time unless directed by Department Representative.

.11 Where RAP is to be incorporated into mix:

.1 Feed from separate cold feed bin specially designed to minimize consolidation of material. Provide 37.5mm scalping screen on cold feed to remove oversized pieces of RAP.

.2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti rollback device to prevent material from sliding backward on feed belt.

.3 Combine RAP and new aggregates in proportions as directed by Department Representative. Dry mix thoroughly, until uniform temperature within plus or minus 5 degrees C of mix temperature, as directed by Department Representative Consultant is achieved prior to adding new asphalt cement. Do not add new asphalt cement where temperature of dried mix material is above 160 degrees C.

.2 Dryer drum mixing plant:

.1 To ASTM D 995.

.2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.

.3 Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

.4 Where RAP is to be incorporated into mix, dryer drum mixer is to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180 degrees C.

.5 Feed RAP from separate cold feed bin designed to minimize r econsolidation of material.

.6 Meter total flow of aggregate and RAP by an electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate RAP and asphalt entering mixer remain constant.

.7 Provide for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.

.8 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved. Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time. Difference between

this value and amount shown by plant computer system to d iffer by not more than plus or minus 2%.

.9 Make provision for conveniently sampling full flow of materials from cold feed.

.10 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.

.11 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.

.12 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each week, if required.

.13 Mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer to be less than 0.5%.

.3 Temporary storage of hot mix:

.1 Provide mix storage of sufficient capacity to permit c ontinuous operation and designed to prevent segregation.

.2 Do not store asphalt mix in storage bins in excess of 12 hour.

.4 Mixing tolerances:

.1 Permissible variation in aggregate gradation from job mix (percent of total mass).

.75 mm sieve and larger	5.5
2.36 mm sieve	4.5
0.600 mm sieve	3.5
0.150 mm sieve	2.5
0.075 mm sieve	1.5

.2 Permissible variation of asphalt cement from job mix: 0.3%.

.3 Permissible variation of mix temperature at discharge from plant: 5 degrees C.

3.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:

.1 Minimum drum diameter: 1200mm.

.2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
- .1 Boxes with tight metal bottoms.
- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:
- .1 Lutes or rakes with covered teeth for spreading and finishing operations.
- .2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Department Representative may be used instead of tamping irons.
- .3 Straight edges, 3.0m in length, to test finished surface.

3.3 PREPARATION

.1 Reshape granular road bed, if required.

.2 When paving over existing asphalt surface, clean pavement surface. When leveling course is not require, patch and correct depressions and other irregularities to approval of Department Representative before beginning paving operations.

.3 Adjust existing castings to new elevations and protect from asphaltic mix.

.4 When matching new pavement with existing pavement make vertical cut between existing pavement and new pavement as shown on Contract Drawings.

.5 Apply prime coat and/or tack coat in accordance with Section 32 12 14-Asphalt Prime Coats and/or Section 32 12 15-Asphalt Tack Coats prior to paving.

.6 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required. Elevate truck bed and thoroughly drain. No excess solution to remain in truck bed.

.3 Schedule delivery of material for placing in daylight, unless Department Representative approves artificial light.

.4 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by Department Representative, but not less than 125 degrees C.

3.5 PLACING

.1 Obtain Department Representative's approval of base and existing surface and tack coat and prime coat prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as shown on Contract Drawings.

.3 Placing conditions:
- .1 Place asphalt mixtures only when air temperature is above 5 degrees C. Place overlay pavement only when air temperature is above 10 degrees C.
- .2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
- .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as shown on Contract Drawings:
- .1 Levelling courses to thicknesses required but not exceeding 100mm.
- .2 Lower course in layers of 100mm each.
- .3 Surface course in layers of maximum 60mm each.

.5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.6 Spread and strike off mixture with self propelled mechanical finisher.
- .1 Construct longitudinal joints and edges true to line markings. Position and operate paver to follow established line closely.
- .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
- .3 Maintain constant head of mix in auger chamber of paver during placing.
- .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
- .5 Correct irregularities in alignment left by paver by trimming directly behind machine.
- .6 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot

mix. Do not broadcast material over such areas.

.7 Do not throw surplus material on freshly screeded surfaces.

.7 When hand spreading is used:

.1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly. Do not broadcast material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt. Control temperature to avoid burning material. Do not use tools at higher temperature than temperature of mix being placed.

3.6 COMPACTING

.1 Roll asphalt continuously to density not less than 97% of 75 blow Marshall density to ASTM D1559 with no individual test less than 95%.

.2 General:

.1 Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be pneumatic tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. For subsequent rolling do not exceed 5 km/h for static steel-wheeled and 8 km/h for pneumatic tired rollers.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.5 Overlap successive passes of roller by minimum of 200mm and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.10 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.11 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.3 Breakdown rolling:

.1 Commence breakdown rolling immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators for this work.

.4 Second rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has be thoroughly compacted.

.5 Finished rolling:

.1 Accomplish finish rolling with steel wheel rollers while material is still warm enough for removal of roller marks.

.2 Conduct rolling operations in close sequence.

3.7 JOINTS

.1 General:

.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 600mm.

.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to

paving of adjacent lane.

.1 For airfield runway paving, avoid cold joint construction in mid 30 m of runway.

.2 If cold joint can not be avoided, tack face with thin coat of hot asphalt prior to continuing paving.

.3 Overlap previously laid strip with spreader by 100mm.

.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.

.5 Roll longitudinal joints directly behind paving operation.

.6 When rolling with static roller over onto previously placed lane in order that 100 to150 mm of drum width rides on newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until thoroughly compacted neat joint is obtained.

.7 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade. Location of feather joints as indicated.

.5 Construct butt joints as indicated.

.6 Wherever practical, locate joints under future traffic markings (paint lines.)

3.8 PAVEMENT PATCHING

.1 Ensure temporary and permanent pavement patching done by handwork conforms to all standards specified for machine place asphaltic concrete.

.2 Subbase and base preparation as specified in Section 32 11 19 and 32 11 23, respectively, unless shown otherwise on Contract Drawings.

3.9 SIDEWALKS, DRIVEWAYS AND CURBS

.1 Hot-mix asphalt concrete sidewalks, driveways and curbs as shown on Contract Drawings.

.2 Machine place where practical.

.3 Ensure placement by handwork conforms to all standards specified for machine placed asphaltic concrete.

.4 Other than requirements relating specifically to Portland cement concrete, ensure hot-mix asphalt concrete sidewalks and curbs comply with all requirements of Section 32 16 15-Concrete Walks, Curbs and Gutters.

.5 Ensure hot-mix asphalt concrete driveways comply with all requirements of Section 32 12 16-Asphalt Paving.

3.8 FINISH TOLERANCES	.1	Finished asphalt surface to be within 6mm of design elevation but not uniformly high or low.
	.2	Finished asphalt surface not to have irregularities exceeding 6mm when checked with 3 m straight edge placed in any direction.
	.3	Water ponding not permitted.
	.4	Against concrete gutter, finished asphalt surface to be higher than the gutter by not more than 6mm.
3.9 DEFECTIVE WORK	.1	Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
	.2	Repair areas showing checking, rippling, or segregation.
	.3	Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.
3.10 CLEAN-UP	.1	Remove lids or covers from all castings and clean any prime, tack coat or hot-mix asphaltic concrete from frames, lids and covers of all castings.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 31 23 10-Excavating, Trenching and Backfilling.

.3 Section 33 41 00-Storm Utility Drainage Piping.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 48/A 48M, Standard Specification for Gray Iron Castings.
- .2 ASTM C 117, Standard Test Method for Materials Finer than 75-µm Sieve in Mineral Aggregates by Washing.
- .3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM C 139, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
- .5 ASTM C 478M, Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
- .6 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A23.1/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
  - .2 CSA-A3002, Masonry and Mortar Cement.
- .3 CAN/CSA-A165 Series, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
- .4 CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.
- .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete:
- .1 to Section 03 30 00-Cast-In-Place Concrete.
- .2 concrete to be minimum 20 MPa or as specified otherwise on Contract Drawings.

.2 Concrete reinforcement: to Section 03 20 00-Concrete Reinforcing.

.3 Precast manhole sections: to ASTM C 478M, complete with ladder rungs.

.4 Precast "Tee" Sections: precast "Tee" sections constructed as an integral component of mainline pipe will be acceptable where shown on Contract Drawings as an approved alternative.

.5 Manhole lids: to be precast reinforced concrete designed to withstand H20 loading.

.6 Cast iron frame and cover: as shown on Contract Drawings.
- .1 Frame and cover must conform to ASTM A48 and be designed to withstand H20 loading.
- .2 Frame and cover must bear manufacturer identification on castings.

.7 Ladder rungs to be:
1. As shown on Contract Drawings.
2. To conform to ASTM C-497, C-478 load test
3. 20 mm cold rolled steel, hot dipped after bending to CSA G164, welded to reinforcing bars and cast with manhole sections or epoxy grouted into manhole walls.
4. 20 mm aluminum alloy #6351-T6 (CSA-S157 and NBC 1977), complete with polyethylene anchor insulating sleeves and installed in 25 mm or 26 mm precast or drilled holes in manhole sections.
5. Polypropylene encased steel ladder rungs: polypropylene ASTM-D-4101 steel core to be ½ inch dia grade 60 per ASTM A615M.
6. Distance from top of manhole cover to top rung to be maximum 500 mm where no handhold provided. Maximum distance may be extended to 660 mm where handhold provided.
7. In compliance with all requirements of Workers' Compensation Board.

.8 Safety platform: to be installed as shown on Contract Drawings in all manholes in excess of 6 m deep.

.9 Precast catch basin sections: to ASTM C478M.

.10 Catchbasin leads to be minimum 200 mm diameter and of PVC DR35.

.11 Catchbasin lids: to be precast reinforced concrete designed to

withstand H20 loading.

.12 Cast iron catchbasin frame and grate: as shown on Contract Drawings.
1. Frame and grate must conform to ASTM A48 and be designed to withstand H20 loading.
2. Frame and grate must bear manufacturers identification on casting.

.13 Joints: made watertight using rubber rings to ASTM C443 or cement mortar.

.14 Mortar:
.1 Aggregate: to CSA A82.56.
.2 Masonry Cement: to CAN/CSA-A8.

.15 Adjusting rings: to ASTM C 478.

.16 Concrete Brick: to CAN3-A165 Series.

.17 Drop manhole pipe: to be as shown on Contract Drawings.

.18 Lawn drains to be: as shown on Contract Drawings.

.19 Concrete bags to be: Jute, burlap or synthetic bag of suitable size and texture filled to 2/3 capacity with mixture of 1 part Portland cement to 2 parts sand, thoroughly mixed, and weighing approximately 27 kg.

.20 Concrete blocks: to be H type concrete construction blocks conforming to latest ASTM Specifications.

.21 Prebenched manhole bases:
1. Where precast manhole sections are incorporated into precast base by bonding to concrete benching, use precast reinforced concrete manhole sections to ASTM C478 complete with ladder rungs above benching.
2. Where base benching is cast monolithically with manhole walls, reinforce wall and joint sections as specified in ASTM C478.
3. Precast concrete base section minimum thickness to be 120 mm, measured from underside of base to lowest point in concrete channeling.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL .1 Excavating and backfilling in accordance with Section 31 23 10-Excavating, Trenching and Backfilling.

3.2 CONCRETE WORK .1 Place concrete reinforcement in accordance with Section 03 20 00-Concrete Reinforcing.

.2 Do concrete work in accordance with Section 03 30 00-Cast-In-Place Concrete.

3.3 MANHOLE INSTALLATION

.1 Install manholes as shown on Contract Drawings, concurrently with pipe laying.

.2 Ensure excavation free of water prior to placing concrete.

.3 Place minimum 100mm of 25mm bedding gravel compacted to minimum 95% Modified Proctor density in compliance with ASTM D1557.

.4 Construct base to ensure first precast riser section is set plumb.

.5 Set all inlet and outlet pipes to specified alignments and elevations.

.6 Connect concrete pipe into manhole using spigot or bell precast into manhole wall or, alternatively, grout pipe into pre-formed rough core in manhole wall using fast-setting grout.

.7 Connect PVC pipe into manhole using “manhole adapter ring” or approved equal.

.8 Ensure placement of concrete does not disturb connecting pipes.

.9 Set remaining precast riser sections plumb with joints consisting of cement mortar or gaskets to ASTM C443.

.10 Where possible, for channeling using half-sections of pipe or suitable fittings. Bench to direct flow parallel to main flow of sewer. From top of benching as high as crown of sewer pipe. Finish concrete to smooth surface using steel trowel.

.11 Brace capped inlets or stubs to withstand testing head.

.12 Set frames by firmly embedding in mortar on minimum of 1, maximum of 3 courses of bricks or precast concrete riser rings, or cast-in-place form system with due regard to maximum distance to first step.

.13 “Butter” inside and outside faces of bricks with mortar to ensure neat even finish. Grout inside, outside and between courses of bricks or grade rings with mortar to ensure neat even finish. Pre-wet all joints before placing mortar.

.14 Plug lifting holes in pipe.

.15 Install drop structures where required to Contract Drawings.

.16 Paint manhole covers if specified on Contract Drawings.

.17 Ensure frames conform to design contour of pavement or existing surface.

.18 Pre-fabricated Corrugated Steel Pipe Manholes to be installed as shown on the Contract Drawings and to manufacturers specifications.

3.4 CLEANOUT INSTALLATION

.1 Install cleanouts as shown on Contract Drawings, to standards and

installation procedures described in 3.3.

3.5 CATCHBASIN INSTALLATION .1 Install catchbasins as Shown on Contract Drawings, to general standards and installation procedures described in 3.3.

.2 Place minimum of 100 mm bedding gravel under base, compact to 95% Modified Proctor density.

.3 Install catchbasin leads in accordance with Section 33 41 00-Storm Utility Drainage Piping.

3.6 ENDWALL INSTALLATION .1 Install reinforced concrete endwalls as shown on Contract Drawings or as shown otherwise on Contract Drawings and in accordance with Section 03 20 00-Concrete Reinforcing and Section 03 30 00-Cast-In-Place Concrete.

.2 Precast concrete endwalls may be installed where shown on Contract Drawings as an approved alternative.

3.7 GRILLAGE TRASH SCREENS .1 Where specified, install grillage trash screens as shown on Contract Drawings.

3.8 ADJUSTING TOPS OF EXISTING UNITS .1 Remove existing gratings, frames and store for re-use at locations specified.

.2 Precut units:
.1 Raise or lower precast units by adding or removing precast sections as required.
.2 When amount of raise is less than 300 mm use standard manhole bricks, precast riser rings or Cast-in place form system.

.3 Cast-in-Place units:
.1 Raise cast-in-place units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.
.2 Lower cast-in-place units with straight wall by removing concrete to elevation indicated for rebuilding.
.3 Install additional manhole ladder rungs in adjusted portion of units as required.
.4 Re-use existing gratings, frames.

.4 Re-set gratings and frames to required elevation on not more than 3 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.

.5 Ensure adjustments conform to requirements regarding distance to first step.

3.9 REMOVE EXISTING UNITS .1 Remove existing structures where shown on Contract Drawings. Backfill in accordance with Section 31 23 10-Excavating, Trenching and Backfilling.

3.10 LEAKAGE TEST .1 Perform leakage testing of sanitary manholes in accordance with Section 33 31 13- Sanitary Utility Sewerage Piping.

----------END OF SECTION----------

PART 1 GENERAL

1.1 Section Includes

.1 Materials and installation for subsoil drainage piping.

1.2 Related Sections

.1 Section 31 23 10 Excavation, Trenching and Backfilling

1.3 References

.1 Canadian Standards Association (CSA International)

.1 CSA B1800, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).

.2 CSA B182.1-02, Plastic Drain and Sewer Pipe and Pipe Fittings.

.3 CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).

.4 CSA B182.11-02, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

1.4 Definitions

.1 Pipe section is defined as length of pipe between successive manholes and/or between manhole and any other structure which is part of sewer system.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with the manufacturer's recommendations.

1.6 Waste Management and Disposal

.1 Remove from site and dispose of packaging materials at appropriate disposal facilities.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations, and Division 2 specifications.

.4 Dispose of unused asbestos cement pipe in accordance with regulations governing disposal of hazardous materials and Division 2 specifications.

PART 2 PRODUCTS

2.1 Subsoil Drain Piping

.1 Perforated rigid drainage pipe: Polyvinyl Chloride (PVC) to CSA-B182.2.

.2 Standard Dimensional Ratio (SDR): 35.

.3 Pipe stiffness: 320 kPa at 5% deflection, ASTM D2412.

.4 Fitting: solid hub by hub.

.5 Size: 150mm [6"] unless otherwise noted.

2.2 Cleanout

.1 Extended ferrule, Dura-Coated cast iron body with gas and water tight ABS countersunk plug.

PART 3 EXECUTION

3.1 Preparation

.1 Clean and dry pipes and fittings before installation.

.2 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.2 Excavation

.1 Do excavation work in accordance with Section 31 23 10.

3.3 Pipe Bedding and Cover

.1 Subsoil drain shall be laid to on 150 mm drain gravel and covered with 250mm of drain gravel measured from the top of pipe, unless otherwise shown or specified. Do not place material in frozen conditions.

.2 Shape bed true to grade to provide continuous uniform bearing surface for pipe. Do not use blocks when bedding pipe.

.3 Shape transverse depressions in bedding as required to suit joints.

.4 Fill excavation below design elevation to bottom of specified bedding in accordance with Section 31 23 33 with backfill material.

3.4 Installation

.1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.2 Handle pipe using methods approved by the Departmental Representative. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.2 Correct pipe which is not in true alignment and grade or pipe which shows differential settlement after installation great than 10 mm in 3 meters.

.3 Subsoil drain shall be laid continuous and even falls of not less than 0.5% unless otherwise noted.

.4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Do not exceed maximum joint deflection recommended by pipe manufacturer.

.6 Do not allow water to flow through pipe during construction, except as may be permitted by the Departmental Representative.

.7 Install plastic pipe and fittings in accordance with CSA B182.11.

.8 Make watertight connections to manholes and catch basin. Use shrinkage compensating grout when suitable gaskets are not available. Stabilize pipe at openings made in rock pit manhole with shrinkage compensating grout.

.9 All changes in direction shall be made with solid hub by hub fittings. Vertical drops shall be solid with a minimum of 100mm [4"] gravel curtain around pipe. Branches will be taken off with Y's and catch basin connections shall be made with one length of cast iron pipe.

.10 Provide cleanouts at changes in direction, extended to terminate flush with grade.

.11 Where noted on drawing, provide geotextile materials.

END OF SECTION

PACIFIC RIM NATIONAL PARK

WASHROOM BUILDINGS

APPENDIX 1

HAZARDOUS BUILDING MATERIALS ASSESSMENT

Hazardous Building Materials Assessment

39 Buildings at the Pacific Rim
National Park, BC

Stantec

Prepared for:
PWGSC – Public Works and
Government Services Canada
219 – 800 Burrard Street
Vancouver, BC V6Z 2V8

Prepared by:
Stantec Consulting Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6
Tel: (604) 436-3014
Fax: (604) 436-3752

Project No.: 123220330.600

October 6, 2015

Table of Contents

EXECUTIVE SUMMARY I

1.0 INTRODUCTION **1**
1.1 UNDERSTANDING OF THE PROJECT 1

2.0 SCOPE AND METHODOLOGY **1**
2.1 ASBESTOS 2
2.1.1 Sample Results Interpretation 3
2.1.2 Potential Asbestos-Containing Vermiculite Insulation 4
2.1.3 Asbestos Sampling Quality Assurance/Quality Control 4
2.2 LEAD 4
2.3 POLYCHLORINATED BIPHENYLS 5
2.4 MERCURY 6
2.5 MOULD 6
2.5.1 Mould Reference Guidelines 6
2.6 OZONE-DEPLETING SUBSTANCES 7
2.7 SILICA 7

3.0 ASSESSMENT LIMITATIONS **7**
3.1 ASBESTOS 8
3.2 LEAD 9
3.3 POLYCHLORINATED BIPHENYLS 9
3.4 MERCURY 9
3.5 MOULD 9
3.6 OZONE DEPLETING SUBSTANCES 10
3.7 SILICA 10

4.0 FINDINGS **10**

5.0 GENERAL RECOMMENDATIONS **11**
5.1 ASBESTOS 11
5.2 LEAD 12
5.3 POLYCHLORINATED BIPHENYLS 13
5.4 MERCURY 13
5.5 MOULD 14
5.6 OZONE DEPLETING SUBSTANCES 14
5.7 SILICA 14

6.0 CLOSURE **15**

LIST OF APPENDICES

APPENDIX A	BUILDING LIST	A.1
APPENDIX B	FINDINGS AND RECOMMENDATIONS—4-PLEX	B.1
APPENDIX C	FINDINGS AND RECOMMENDATIONS—8-PLEX	C.1
APPENDIX D	FINDINGS AND RECOMMENDATIONS—UCUELET LAUNDRY AND STORAGE	D.1
APPENDIX E	FINDINGS AND RECOMMENDATIONS—NEW ADMINISTRATION AND GENERATOR SHED	E.1
APPENDIX F	FINDINGS AND RECOMMENDATIONS—WEST COAST TRAIL PATROL CABINS (CAMPER CREEK, TSUQUADRA, TSOCOWIS)	F.1
APPENDIX G	FINDINGS AND RECOMMENDATIONS—CHEEWHAT PATROL CABIN	G.1
APPENDIX H	FINDINGS AND RECOMMENDATIONS—GARAGE AND SHED AT AIRPORT	H.1
APPENDIX I	FINDINGS AND RECOMMENDATIONS—GREEN POINT BEAR CACHE AND FIREWOOD SHED	I.1
APPENDIX J	FINDINGS AND RECOMMENDATIONS—GREEN POINT THEATER	J.1
APPENDIX K	FINDINGS AND RECOMMENDATIONS—GREEN POINT WASHROOM 1 AND 4	K.1
APPENDIX L	FINDINGS AND RECOMMENDATIONS—GREEN POINT ENTRANCE KIOSK	L.1
APPENDIX M	FINDINGS AND RECOMMENDATIONS—HAMILTON HOUSE (AND SHEDS)	M.1
APPENDIX N	FINDINGS AND RECOMMENDATIONS—MAINTENANCE BUILDING	N.1
APPENDIX O	FINDINGS AND RECOMMENDATIONS—MAINTENANCE BUILDING SHEDS	O.1
APPENDIX P	FINDINGS AND RECOMMENDATIONS—NETTLE PATROL CABIN	P.1
APPENDIX Q	FINDINGS AND RECOMMENDATIONS—PACHENA INFO CENTER	Q.1
APPENDIX R	FINDINGS AND RECOMMENDATIONS—PORT RENFREW INFO CENTER	R.1
APPENDIX S	FINDINGS AND RECOMMENDATIONS—PORT RENFREW WARDEN STATION	S.1

APPENDIX T FINDINGS AND RECOMMENDATIONS—INTERPRETIVE WORKSHOP T.1

APPENDIX U FINDINGS AND RECOMMENDATIONS—RESOURCE CONSERVATION BUILDING U.1

APPENDIX V FINDINGS AND RECOMMENDATIONS—KWISITIS VISITOR CENTER V.1

APPENDIX W FINDINGS AND RECOMMENDATIONS—PACIFIC RIM VISITOR CENTER W.1

APPENDIX X FINDINGS AND RECOMMENDATIONS—WICKANINNISH BEACH WASHROOM X.1

APPENDIX Y FINDINGS AND RECOMMENDATIONS—PACIFIC RIM VISITORS CENTER WASHROOM Y.1

APPENDIX Z FINDINGS AND RECOMMENDATIONS—LONG BEACH NORTH WASHROOM Z.1

APPENDIX AA FINDINGS AND RECOMMENDATIONS—LONG BEACH SOUTH WASHROOM AA.1

APPENDIX BB FINDINGS AND RECOMMENDATIONS—INCINERATOR BEACH WASHROOM BB.1

Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) to conduct hazardous building materials assessments within 39 buildings (subject buildings) throughout the Pacific Rim National Park in Tofino, Ucluelet and Port Renfrew, BC. A list of the buildings assessed is included in Appendix A.

The purpose of the assessment was to check for potential hazardous building materials that may require special attention in accordance with the requirements of the Canada Labour Code, Part II (Canada Labour Code), the current version of British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97), as well as the Parks Canada Asbestos Management Guide (January 2014) and the Parks Canada Asbestos Management Standard (January 2014).

The hazardous building materials considered included asbestos-containing materials (ACMs), lead-containing materials including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould or moisture affected building materials, and silica.

Based on Stantec's visual assessment and on the laboratory analyses performed on samples collected, hazardous building materials were identified within many of the subject buildings.

A summary of our findings and recommendations is presented below. It should be noted that this summary is subject to the same restrictions and limitations as presented in Section 3 (Assessment Limitations) and Section 6 (Closure) of this report. The information provided is to be read in conjunction with the remainder of this report.

NOTE: Where particular hazardous building materials are not listed in the following table, they were not identified in that particular building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
4-Plex	Asbestos • Black window pane caulking on windows throughout all Units is asbestos-containing. • Ceiling texture coat in all Units is asbestos-containing. • Brown and orange square pattern sheet flooring in kitchens within all Units is asbestos-containing. • Grey square pebble pattern sheet flooring in the Unit 1 kitchen sink, under the brown and orange square pattern sheet flooring of the kitchen and in all units in the bathroom by the water heater. • Drywall joint compound on walls throughout all Units is asbestos-containing. Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The four fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in four fluorescent light fixtures. Mould • Moisture-impacted plywood was observed on the ceiling of the second floor balcony. Silica • Silica is presumed to be present in ceiling tiles and concrete within the subject building,
8-Plex	Asbestos • Tan/cream hexagon patterned sheet flooring in first floor kitchen and closet and second floor washrooms of Units 1, 3, 4 and 7 is asbestos-containing. • Heat shields in Unit 2 behind incandescent light fixtures on the first floor by the stairwell, and on the second floor in both bedrooms and hallway, are asbestos-containing. • Brown pebble pattern sheet flooring in Unit 2 on first floor by stairwell is asbestos-containing. • Brown hexagon patterned sheet flooring in first floor kitchen and closet and second floor washrooms of Units 5, 6, 8 and Unit 2 kitchen is asbestos-containing. Lead • Brown colored paint on the interior doors of Unit 1, 3, 4, 5, 6, 7, and 8 is lead-containing. • Yellow colored paint on the interior doors and frames of Unit 2 and 3 is lead-containing. • Brown colored paint on the interior bathroom walls of Unit 2 is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. Silica • Silica is presumed to be present in concrete of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Ucluelet Laundry and Storage	Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The two fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in two fluorescent light fixtures. Silica • Silica is presumed to be present in concrete of the subject building.
New Administration and Generator Shed	Lead • Lead is expected to be present in solder used on copper domestic pipes. PCBs • Approximately 85 fluorescent light fixtures throughout the New Administration building were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in approximately 85 fluorescent light fixtures throughout the New Administration building. Silica • Silica is presumed to be present in concrete of the subject buildings.
West Coast Trail Patrol Cabins (Camper Creek, Tsuquadra, Tsocowis)	Asbestos • Black door pane caulking on the sliding glass door in the mud room is asbestos-containing. • Black mastic around stack penetration in roof at the Tsocowis Cabin. As this suspected ACM could not be sampled due to lack of safe roof access it should be presumed to be asbestos-containing (PACM). Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. Mould • Moisture-impacted plywood was observed on the ceiling of Camper Creek Patrol Cabin. Silica • Silica is presumed to be present in concrete of the subject buildings.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Cheewhat Patrol Cabin	Lead • Red colored paint on the first floor, second floor and stairs of the cabin is lead-containing. • White colored paint on the exterior window and door frames is lead-containing. • Brown colored paint on the exterior siding is lead-containing. • Brown colored paint on the interior trim is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. Mould • Moisture-impacted wood panel was observed on the ceiling of the first floor. Silica • Silica is presumed to be present in concrete of the subject building.
Garage at Airport	Asbestos • Cement panel on interior walls and ceiling Northeast corner of building by washroom. • Tan floor tile underneath plywood in southeast corner is asbestos-containing. • Clear duct mastic on stack on north side of building sitting on the floor is asbestos-containing. Lead • Beige colored paint on the interior walls is lead-containing. • White colored paint on the interior walls is lead-containing. • Green colored paint on the exterior doors is lead-containing. • Green colored paint on the exterior window frames is lead-containing. • Blue colored paint on the exterior west door is lead-containing. • White colored paint on the exterior siding under the newer is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The majority of the approximately 20 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 20 fluorescent light fixtures. • In addition one suspected mercury-containing thermostat was observed in the south east corner room. Mould • Moisture-impacted wood window frames and drywall walls were observed walls in various locations throughout the Garage, mainly in the south east corner. Silica • Silica is presumed to be present in vinyl floor tiles, concrete and cement of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Green Point Bear Cache and Firewood Shed	Lead • Yellow colored paint on the bollards in front of the firewood shed is lead-containing. • Lead is expected to be present in older electrical wiring materials and sheathing. Silica • Silica is presumed to be present in the concrete foundation of the subject buildings.
Green Point Theater	Asbestos • Drywall joint compound on walls throughout the projection room and west storage room is asbestos-containing. Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The majority of the approximately 20 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 20 fluorescent light fixtures. Silica • Silica is presumed to be present in ceiling tiles and concrete foundation of the subject building.
Green Point Washroom 1 and 4	Asbestos • White window pane caulking on windows throughout washroom 1 is asbestos-containing. Lead • Yellow colored paint on the interior walls of the mechanical room in washroom 1 is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The two fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in two fluorescent light fixtures. Silica • Silica is presumed to be present in concrete foundation of the subject buildings.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Green Point Entrance Kiosk	Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The one fluorescent light fixture was observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in one fluorescent light fixture. Silica • Silica is presumed to be present in concrete foundation of the subject building.
Hamilton House (and Sheds)	Lead • Cream colored paint on the exterior window and door frames is lead-containing. • Pink colored paint on the exterior window frames on the sheds is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. Silica • Silica is presumed to be present in concrete foundation of the subject buildings.
Maintenance Building	Asbestos • Black window pane caulking on newer windows throughout is asbestos-containing. • Grey window pane caulking on older windows throughout is asbestos-containing. Lead • Red colored paint on the interior floor in the northwest corner room is lead-containing. • Green/blue colored paint on the interior wood slat walls in the northeast room is lead-containing. • Grey colored paint on the interior washroom floors is lead-containing. • Brown colored paint on interior hallway floors is lead-containing. • Brown colored paint with green underneath on the exterior window frames is lead-containing. • White colored paint on the exterior siding under the newer is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The majority of the approximately 40 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 40 fluorescent light fixtures. Silica • Silica is presumed to be present in concrete foundation of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Maintenance Building Sheds	Asbestos • Siding on the Cream Transite Shed is asbestos-containing. • Interior siding and door on the Wood Transite Shed is asbestos-containing. • Black textured flooring on the exterior steps of the Recycling Shed is asbestos-containing. Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The one fluorescent light fixture within the Recycling Shed was observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in one fluorescent light fixture. Silica • Silica is presumed to be present in concrete foundations of the subject buildings and cement panels.
Nettle Patrol Cabin	Lead • Olive colored paint on the interior walls on the mud room is lead-containing. • Brown colored paint on the exterior tin roof is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. Silica • Silica is presumed to be present in vinyl floor tiles of the cabin.
Pachena Info Center	Asbestos • Grey window pane caulking (painted green) on exterior windows is asbestos-containing. • Cream window pane caulking on the exterior windows is asbestos-containing. • White window sealant on the interior window in the east corner is asbestos-containing. Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The three fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in three fluorescent light fixtures. Silica • Silica is presumed to be present in vinyl floor tiles and concrete foundation of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Port Renfrew Info Center	Lead • Red colored paint on the exterior walls is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The five fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in five fluorescent light fixtures. Mould/ Microbial Contamination • It should be noted that rodent droppings were observed in various locations throughout the subject building. Silica • Silica is presumed to be present in vinyl floor tiles and concrete foundation of the subject building.
Port Renfrew Warden Station	Asbestos • Tan sheet flooring under SF-03 in bathroom second floor is asbestos-containing. • Pink floor tile under SF-05 in bathroom on first floor is asbestos-containing. • Drywall joint compound throughout the interior drywall walls is asbestos-containing. • White ducting tape (Tectum) on round furnace vents throughout. Lead • Yellow colored paint on the interior walls on the second floor is lead-containing. • White colored paint on the exterior pillars and trim is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The six fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in six fluorescent light fixtures. Mould • Moisture-impacted drywall and applied ceiling texture coat was observed on the ceiling of the second floor in bedroom 3. Silica • Silica is presumed to be present in vinyl floor tiles, ceiling tiles and concrete of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Interpretive Workshop	Asbestos • Black window pane caulking on windows is asbestos-containing. Lead • Lead is expected to be present in solder used on copper domestic pipes, caulking on bell fittings for cast iron drainage pipes and in electrical equipment (i.e., batteries for emergency lighting/signage). PCBs • The majority of the 22 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 22 fluorescent light fixtures. Mould • Moisture-impacted ceiling tile was observed in the bathroom. Silica • Silica is presumed to be present in ceiling tiles and concrete of the subject building.
Resource Conservation Building	Asbestos • White pipe fitting sealant on gas lines in the furnace rooms and presumed to present on the gas lines in the crawlspace is asbestos-containing. Lead • Brown paint on gutters and downspouts is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes, caulking on bell fittings for cast iron drainage pipes and in electrical equipment (i.e., batteries for emergency lighting/signage). PCBs • The majority of the approximate 40 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 40 fluorescent light fixtures. Mould • Moisture-impacted ceiling tiles were observed in various locations throughout. Silica • Silica is presumed to be present in ceiling tiles and concrete foundation of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Kwisitis Visitor Center	Asbestos • 30 cm x 30 cm (12 in. x 12 in.) tan floor tile with brown smears in the following locations: – Main floor: storage rooms, staff room, janitor and storage, east stairwell, kitchen pantry and bathroom. – Second floor: projector room, north storage closet, north exit stairwell and east stairwell. – Basement in all rooms (except Garage room) is asbestos-containing. • Black penetration putty in basement electrical room is asbestos-containing. • Black piping putty on elbow on exterior north side piping is asbestos-containing. • White cement panel in basement electrical room is asbestos-containing. • Black window pane caulking on windows is asbestos-containing. • Grey exterior door caulking on east exterior door by loading zone is asbestos-containing. Lead • White paint on interior basement walls is lead-containing. • Brown paint on exterior north vent is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes, caulking on bell fittings for cast iron drainage pipes and in electrical equipment (i.e., batteries for emergency lighting/signage). PCBs • The majority of the approximate 42 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 42 fluorescent light fixtures. • In addition one suspected mercury-containing thermostat was observed in the Kwisitis Visitor Center, as indicated on the attached floor plan drawing. Silica • Silica is presumed to be present in ceramic tiles and concrete of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Pacific Rim Visitor Center	Asbestos • Window pane caulking on windows throughout is asbestos-containing. • Drywall joint compound throughout is asbestos-containing. Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • The majority of the approximate seven fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in seven fluorescent light fixtures. Mould • Moisture-impacted ceiling tile was observed in the kitchen and library. Silica • Silica is presumed to be present in ceiling tiles and concrete of the subject building.
Wickaninnish Beach Washroom	Lead • Light blue paint on interior doors is lead-containing. • Green paint on interior trim is lead-containing. • Yellow paint on interior door (men's) is lead containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • Six fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in six fluorescent light fixtures. Silica • Silica is presumed to be present in concrete foundation of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Pacific Rim Visitors Center Washroom	Asbestos • Drywall joint compound throughout is asbestos-containing. Lead • Grey paint on exterior beams and trusses is lead-containing. • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • Six fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in six fluorescent light fixtures. Silica • Silica is presumed to be present in ceramic tiles and concrete foundation of the subject building.
Long Beach North Washroom	Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • Eight fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in eight fluorescent light fixtures. Silica • Silica is presumed to be present in concrete of the subject building.
Long Beach South Washroom	Asbestos • Vermiculite, a potential ACM, may be present in masonry block walls as loose-fill insulation. Masonry block walls cavities were assessed at openings on the tops of walls, and were observed to be filled with concrete. Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • Eight fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in eight fluorescent light fixtures. Silica • Silica is presumed to be present in concrete of the subject building.

Summary of Identified Hazardous Building Materials	
Building Name	**Identified Hazardous Building Materials**
Incinerator Beach Washroom	Asbestos • Vermiculite, a potential ACM, may be present in masonry block walls as loose-fill insulation. Masonry block walls cavities were assessed at openings on the tops of walls, and were observed to be filled with concrete. Lead • Lead is expected to be present in solder used on copper domestic pipes and caulking on bell fittings for cast iron drainage pipes. PCBs • Four fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Mercury • Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in four fluorescent light fixtures. Silica • Silica is presumed to be present in concrete of the subject building.

Building-by-building summaries of the identified hazardous building materials are provided in Appendix B through Appendix BB. General findings and recommendations pertaining to hazardous building materials within the subject buildings are provided in Section 4 and Section 5 of this report.

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) to conduct hazardous building materials assessments within the buildings associated with the following National Park sites in British Columbia:

- Fort Langley National Historic Site in Langley, BC (24 buildings)
- Gulf of Georgia Cannery in Richmond, BC (5 buildings)
- Fort Rodd Hill National Historic Site in Victoria, BC (31 buildings)
- Gulf Islands National Park on Vancouver, Saturna, Prevost, Pender, Russell, Mayne and Tumbo Island, BC (45 buildings)
- Pacific Rim National Park in and between Tofino, Ucluelet and Port Renfrew, BC (39 buildings)

The general locations of the National Park sites are indicated on Drawing A1 in Appendix A.

This report presents the findings of assessment activities within 39 buildings (subject buildings) throughout the Pacific Rim National Park in and between Tofino, Ucluelet and Port Renfrew, BC. An overall plan of the Pacific Rim National Park which shows the locations of the buildings assessed is presented in the drawings in Appendix A. In addition, a list of the buildings included in this assessment is also provided in Appendix A.

The purpose of the assessment was to check for potential hazardous building materials that may require special attention in accordance with the requirements of the Canada Labour Code, Part II (Canada Labour Code), the current version of British Columbia's Occupational Health and Safety Regulation (BC Reg. 296/97), as well as the Parks Canada Asbestos Management Guide (January 2014) and the Parks Canada Asbestos Management Standard (January 2014).

The hazardous building materials considered included asbestos-containing materials (ACMs), lead-containing materials including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould or moisture affected building materials, and silica.

The site work was conducted by Keith Irwin and Kim Wiese of Stantec on from June 22 through 25, 2015.

1.1 UNDERSTANDING OF THE PROJECT

Stantec understands that the subject buildings were constructed during time periods when hazardous building materials were commonly used in construction, and that information pertaining to the identity, location and approximate extent of hazardous building materials (if any) within the subject buildings is either not on-file or outdated. As such, and in accordance with the Parks Canada Asbestos Management Guide (January 2014), the Parks Canada Asbestos Management Directive (January 2014), the Canada Labour Code and BC Reg. 296/97

pertaining to identifying hazards associated with hazardous building materials in the workplace, PWGSC commissioned this assessment on behalf of Parks Canada.

2.0 SCOPE AND METHODOLOGY

Keith Irwin and Kim Wiese of Stantec conducted visual assessments within the subject buildings from June 22 through 25, 2015. Site work was conducted in general compliance with the requirements of the Canada Labour Code, BC Reg. 296/97 and Stantec's Safe Work Practices (SWPs).

Mechanical systems, structures and finishes of the subject buildings were visually examined to determine the suspected presence of ACMs, lead including LCPs, PCBs, mercury, ODSs, mould, and silica. Where building materials were suspected but not confirmed to contain asbestos or lead (in paint) samples were collected for analysis to confirm or deny the presence of these hazardous materials. Based on analytical results, visually similar materials were referenced to specific analyzed samples to reduce the number of samples collected.

Additional background information and the methodology used for the determination of presence or absence of each specific hazardous material considered in this assessment are outlined in the following sections.

2.1 ASBESTOS

The common use of friable (materials which, when dry, can be easily crumbled or powdered by hand pressure) ACMs in construction generally ceased voluntarily in the mid-1970s but was only banned through legislation by the late 1980s. Friable asbestos was used in many building products, primarily high temperature insulations, spray-applied structural fireproofing, and a material known as vermiculite that was commonly used as block wall insulation and may be contaminated with asbestos fibres. Asbestos was also used in many non-friable manufactured products such as floor tiles, ceiling tiles, Transite cement products, and various other construction materials. Some cement products currently used in the construction of buildings may still contain asbestos.

The presence of asbestos in federal workplaces, and pertaining to federally regulated workers is governed by the Canada Labour Code. The presence of asbestos in the workplace in British Columbia pertaining to provincially regulated workers is governed by BC Reg. 296/97. As both federally regulated workers and provincially regulated workers (e.g., contractors) are expected to carry out work activities within the subject buildings, and as the provincial regulations are generally more prescriptive pertaining to asbestos (and generally include the requirements noted in the Canada Labour Code), this assessment was conducted to meet the requirements of BC Reg. 296/97.

According to the current version of BC Reg. 296/97, ACM means any material containing at least 0.5% asbestos, or vermiculite insulation with any asbestos.

Based on these criteria, a visual assessment of accessible areas was undertaken in order to check for the presence of materials suspected of containing asbestos. Locations to collect discrete bulk asbestos samples of suspect building materials were identified. Samples of representative materials were then collected at these locations.

Multiple samples were collected from each "homogenous application" of observed suspected ACMs (materials suspected to contain asbestos that are uniform in material type, colour, texture application and estimated installation date) and submitted to EMSL Canada Inc. (EMSL) in Mississauga, Ontario for analysis of asbestos content using polarized light microscopy (PLM) with dispersion staining, in accordance with the United States Environmental Protection Agency (EPA) 600/R-93/116 method.

The number of samples to be collected for each homogenous application of a suspected ACM was based on accepted occupational hygiene standards and protocols, along with the assessor's experience and understanding of the consistency of that building material's application.

EMSL's analytical laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

2.1.1 Sample Results Interpretation

When asbestos is detected in concentrations greater than 0.5% in one of the samples within a set that was collected to represent a "homogenous application" of a particular material (or detected in any concentration, in a set of samples collected for applications of vermiculite), the entire sample set and the entire application of that material was then considered to be an ACM.

In addition to the above, a "positive stop" option was used during the laboratory analysis of the building material samples submitted for asbestos analysis. The "positive stop" option is utilized by the laboratory when asbestos is detected at a concentration of greater than one percent in one of the samples within a set that was collected to represent a "homogenous application" of that material. At this point, further analysis of subsequent samples within the set is deemed to be unnecessary (as the entire set will be considered an ACM, per above), and the remainder of the samples within the set are not analyzed.

2.1.2 Potential Asbestos-Containing Vermiculite Insulation

As part of the assessment, Stantec assessed the subject buildings for areas where vermiculite insulation, a potential ACM, would likely be present. This included making note of and assessing attic spaces, floor cavities and masonry or brick walls, which are typical areas where vermiculite is found. Regarding this portion of the assessment, the following should be noted:

- Where masonry or brick walls were observed, destructive assessment (drilling) was not conducted to assess the cavity for the presence of vermiculite.
- Where non-vermiculite attic insulation (e.g., fiberglass) was observed, inspection for the presence of vermiculite under the other insulation was conducted only at the attic access point (not throughout the attic).

2.1.3 Asbestos Sampling Quality Assurance/Quality Control

Sampling activities pertaining to asbestos were conducted in accordance with Stantec's SWPs, which take into account current provincial regulations pertaining to such work (i.e., sampling procedures, required number of samples, and laboratory analytical procedures).

Representative bulk samples were collected of accessible suspect ACMs in sufficient quantities for laboratory analyses. Suspect ACM samples were sealed in polyethylene zip-lock bags labeled with the sample number, suspect material description, and sample location. As part of sampling procedures, sampling tools were cleaned between sample collection events to avoid the potential for cross-contamination of samples.

Sample bags were compiled in order and placed into a single container accompanied with a Chain of Custody form outlining the project information, date, building location, number of samples, and sample description. Samples were submitted to the analytical laboratory in a sealed container via courier.

2.2 LEAD

Lead may be used in its pure metallic form or combined chemically with other elements to form lead compounds. Metallic lead is used to make products such as electric storage batteries, ammunition, lead solder, radiation shields, pipes, and sheaths for electric cables. Metallic lead is sometimes combined with other metals such as copper, tin, and antimony as lead alloys for use in the manufacture of a variety of metal products. Lead is commonly found in buildings in the solder used on copper domestic pipes, in the caulking on bell fittings of cast iron drainage pipes and in electrical equipment.

The presence of lead-containing materials (other than paint) was assessed through visual means.

With respect to paint, the lead content of interior paint was limited to 0.5% by weight (equivalent to 5,000 mg/kg or ppm) in 1976 under the Federal *Hazardous Products Act,* which governs the import, export and distribution of hazardous products in Canada. In 2005, the *Hazardous Products Act* had reduced the criteria for surface coatings (including paint) to 600 mg/kg (600 ppm) to define them as "lead-containing". This criterion has since (2010) been reduced to 90 ppm.

However, with respect to potential lead exposures associated with disturbance to surfaces coated with lead-containing products, WorkSafeBC has compiled a manual titled *Lead-Containing Paint and Coatings: Preventing Exposure in the Construction Industry*, (Lead Guideline) which defines a "lead-containing surface coating material" and indicates that "...the improper removal of lead paint containing 600 mg/kg lead results in airborne lead concentrations that exceed half of the exposure limit". As such, Stantec will reference this value (600 ppm) in defining paints as "lead-containing".

Based on this criterion, samples of suspected LCPs were collected from major paint applications, and were collected to substrate, where possible, in sufficient quantity to conduct analyses for total lead content. Samples collected were placed into separate, sealed, and labeled polyethylene bags, and submitted to EMSL for analyses of total lead content using Flame Atomic Absorption Spectrometry AAS (SW 846 3050B*/7000B).

EMSL's analytical laboratory is also accredited by the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Approval Program.

2.3 POLYCHLORINATED BIPHENYLS

PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. In fluorescent fixtures, PCBs were usually found within the small capacitors inside the ballast that controls the lamp. The Federal Chlorobiphenyls Regulation, SOR/91-152, prohibited the use of PCBs in electrical equipment manufactured after July 1, 1980.

The presence of PCB-containing equipment was assessed through visual means. With respect to fluorescent lamp ballasts, due to the risk of electrical shock associated with dismantling operating fixtures, fluorescent lamp ballasts were not removed to view identification numbers/information.

The total number of fluorescent lamp fixtures that may have ballasts that contain PCBs was approximated for each building assessed.

Suspected PCB-containing electrical equipment can be visually inspected and compared to the Environment Canada reference guide entitled *Identification of Lamp Ballasts Containing PCBs, Report EPS 2/CC/2*, dated August 1991 (PCB Guide).

2.4 MERCURY

Mercury is commonly found in buildings as mercury vapour lighting, thermostats/thermometers with mercury-containing glass ampoules, electrical switches and can also be found in minor amounts in fluorescent lamp tubes and vapour bulbs and may be present in stable forms in adhesives. Exposure to mercury in federal workplaces is governed by the Canada Labour Code, while provincially it is governed by BC Reg. 296/97.

The presence of mercury and mercury-containing equipment was assessed through visual means.

2.5 MOULD

Moist building materials may provide suitable conditions for mould growth, and the removal of building materials impacted by mould growth may require workers with specific training and experience using work procedures that have been developed to protect workers and work areas from exposure to elevated concentrations of airborne mould.

The presence of suspect visible mould was assessed through visual means and sampling. Material observed with dark-colored staining and/or a textured and discolored appearance is described as "suspect mould". Mould identified visually is defined as "suspect mould" unless it is confirmed as mould by laboratory analysis.

2.5.1 Mould Reference Guidelines

With respect to mould and/or moisture, the visual assessment procedures utilized during this project were based on the recommendations provided in the documents listed below:

- Standard Construction Document CCA 82 *Mould Guidelines for the Canadian Construction Industry*, Canadian Construction Association, 2004 (referred to as CCA 82)
- *Guidelines on Assessment and Remediation of Fungi in Indoor Environment*, New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology, April 2000 (referred to as the NYC Guidelines)
- *Fungal Contamination in Public Buildings: Heath Effects and Investigation Methods*, Federal-Provincial Committee on Environmental and Occupational Health, 2004 (referred to as the Health Canada Guide)
- *Indoor Air Quality in Office Buildings: A Technical Guide*, report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health, 1995 (referred to as the IAQ Guide)
- *Bioaerosols: Assessment and Control*, American Conference of Governmental Industrial Hygienists (ACGIH), 1999 (referred to as the ACGIH Report)

2.6 OZONE-DEPLETING SUBSTANCES

Chlorofluorocarbons (CFCs) and other ODSs are often found in refrigeration units associated with air-conditioning or other refrigeration equipment. In September 1987, 47 countries agreed to the Montreal Protocol on Substances that Deplete the Ozone Layer. ODSs are regulated in BC by the *British Columbia Waste Management Act*—Ozone Depleting Substances and Other Halocarbons Regulation (BC Reg. 387/99 as amended by BC Reg. 109/2002) and the Federal Halocarbon Regulations, 2003 (FHR 2003).

The presence of ODSs and equipment containing these materials was assessed through visual means.

2.7 SILICA

Silica, also referred to as free crystalline silica, is found in concrete, cement, mortar, ceramic wall and floor tiles, stucco finishes and acoustic ceiling tiles. Prolonged exposure to, and inhalation of free crystalline silica, may result in respiratory disease known as silicosis, which is characterized by progressive fibrosis of the inner lung tissue and marked shortness of breath or impaired lung function.

Exposure to silica dust is governed by BC Reg. 296/97 According to both legislative instruments; the time-weighted average exposure limit for airborne silica dust is 0.025 mg/m^3.

The presence of silica was assessed through visual means.

3.0 ASSESSMENT LIMITATIONS

In preparation of this report, Stantec used professional judgment based on experience. The work was conducted in accordance with generally accepted professional standards. Stantec relied on information gathered during the site investigation and laboratory analytical reports.

This report reflects the observations made within accessed areas of the subject buildings and the results of analyses performed on specific materials sampled during the assessment. Analytical results reflect the sampled materials at the specific sample locations.

Sampling was conducted pertaining to suspected ACMs and suspected LCPs only. The assessment for the presence of other hazardous building materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces only. Concealed spaces were inspected via existing access panels, where present. Interior and exterior finishes, solid ceilings, walls, flooring and structural elements were not removed to access concealed areas.

It should be noted that the following building locations, although included in the proposed scope of work, were not accessed during the project due to security restrictions or the lack of keys required to provide access. As such, limited comments, if any, will be made regarding the presence, extent and/or condition of hazardous building materials in the following areas:

- Hamilton House and adjacent sheds: The inside of the house and sheds was not accessed because the door was looked and staff did not have a key during the assessment.
- Maintenance Building Wooden Shed: A padlock was on the door and available staff did not have a key during the assessment.

In addition to the above, and due to limitations on the agreed to scope of work for this project as well as physical limitations in accessing concealed areas and limitations associated with working in occupied/operational spaces, there are specific limitations to the information that can be provided to each hazardous building material considered in this assessment, as outlined in the following sub-sections.

3.1 ASBESTOS

Suspected ACMs that were not sampled include, but are not limited to, the following (where present, based on building construction or as otherwise noted):

- Roofing materials associated with buildings where the roof could not be accessed safely with the equipment present on-site
- Sub-grade materials
- Interior components of mechanical equipment (e.g., inner linings or gaskets in boilers)
- Interior components of heating, ventilation and air conditioning (HVAC) units
- Heat protection materials inside mechanical installations (e.g., gaskets) and light fixtures (e.g., paper backing in sealed incandescent fixtures)
- Flooring material concealed beneath ceramic tile, brickwork, hardwood flooring, and/or concealed beneath existing sub-floors
- Drywall and/or wall plaster and associated finish materials concealed behind new and/or additional walls or ceilings
- Woven tape inside duct connection joints or inner ducting insulation
- Materials within sealed/hard wall cavities, hard ceiling cavities or crawlspaces without appropriate access points
- Insulation materials inside fire doors
- Insulation materials in attic, ceiling or crawlspace areas beyond reasonable reach from safe access points

If encountered during renovation, demolition or other activities, any suspected ACMs not identified within this report should be presumed to contain asbestos and handled as such until otherwise proven, through analytical testing.

3.2 LEAD

Assessment for the presence of lead or lead-containing materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces of the subject buildings only. The presence of lead or lead-containing materials in inaccessible areas not assessed included, but was not limited to: ceiling spaces, wall cavities, crawlspaces, and buried materials.

With respect to paint, samples of suspected LCPs were collected within the subject buildings only from surfaces of major paint applications where visually different paint colours and/or types were identified. Although the surfaces where samples were collected may be covered with more than one coat of paint, the paint samples are described by the surface (visible) colour only.

Attempts were made to represent all layers of paint in the samples collected. As analytical results are referenced to the surface paint colour only, the lead content of all painted surfaces similar to that represented by the surface paint colour will be presumed to be the same, regardless of differing sub surface paints, if any.

3.3 POLYCHLORINATED BIPHENYLS

Due to height restrictions and the risk of electrical shock in handling operational light fixtures, the ballasts present in the fixtures observed within the subject buildings were not removed for comparison to the PCB Guide. The visible labels of ballasts in several fixtures were inspected for comparison to the PCB Guide.

Conclusions and recommendations regarding the presence of PCBs within the subject buildings are based on Stantec's limited observations in combination with information provided by staff regarding lighting renovations (where requested by Stantec based on observations) and is presented to provide guidance regarding the likelihood that PCB-containing equipment is or is not present within the subject buildings. The exact extent and/or number of fluorescent lamp ballasts containing PCBs, if any, within the subject buildings will not be commented on.

3.4 MERCURY

Visual assessment for the presence of mercury-containing equipment within the subject buildings was conducted in accessible areas only. The presence of mercury or mercury-containing equipment in inaccessible areas includes, but is not limited to: ceiling spaces, wall cavities, and crawlspaces, or as internal parts of HVAC mechanisms.

3.5 MOULD

Visual assessment for the presence of suspected visible mould and/or suitable conditions for mould growth (e.g., moist and/or water-stained building materials) were conducted in accessed portions of the subject buildings only. The assessment was not intrusive in nature and included visual assessment of exposed surfaces and closer inspection of known problem areas.

The conclusions made in this report provide description(s) of the potential source(s) of moisture within the subject buildings that may have led to suitable conditions for mould growth, only in those cases where potential source(s) of moisture were identified. These conclusions will not necessarily identify all sources of moisture leading to suitable conditions for mould growth within the subject buildings or within the impacted area(s).

This assessment does not constitute a building envelope/building systems assessment, which would include an intrusive investigation to assess the internal condition, potential moisture sources, and expected remaining service life of the various components and systems comprising the envelope of a building.

3.6 OZONE DEPLETING SUBSTANCES

Visual assessment for the presence of ODSs within the subject buildings was conducted in accessible areas only. The presence of ODS-containing equipment in inaccessible areas including, but not limited to, ceiling spaces, wall cavities and crawlspaces, was not assessed. In addition, portable equipment that may contain ODSs (refrigerators, drink coolers, etc.) was not considered as part of this assessment.

3.7 SILICA

Visual assessment for the presence of silica-containing materials within the subject building was conducted in accessible areas only. The presence of potential silica-containing materials in inaccessible areas including, but not limited to, ceiling spaces and wall cavities was not assessed.

4.0 FINDINGS

The results of our assessment are provided on a building-by-building basis in Appendices B through BB. Each Appendix contains the following (where applicable):

- Separate sections with written summaries of findings pertaining to each hazardous building material, including the following:
  - Information regarding the building
  - A listing of suspect materials observed
  - Tables that provide summaries of the sample types, locations, and analytical results
  - Interpretations of observations and/or sample analytical results
- Photographs of identified hazardous building materials, where available
- Information pertaining to condition evaluation of identified hazardous building materials
- Recommendations for identified hazardous building materials found to be in "non-compliant" condition (e.g., damaged ACMs, mould-impacted materials, etc.)

- Floor plan drawings for the buildings/structures included, which include locations of the samples collected during this assessment, and locations of identified hazardous building materials (where practical)
- Copies of the analytical certificates for all suspected ACM samples collected
- Copies of the analytical certificates for all suspected LCP samples collected

It should be noted that evaluation of condition of identified ACMs was conducted using terminology and classifications as outlined in the Parks *Canada Asbestos Management Directive* (2012), and considered the friability of the material (terminology relating to how easily fibres can be released), condition (good, fair and poor) and accessibility of the material.

5.0 GENERAL RECOMMENDATIONS

Building-specific recommendations pertaining to the identified hazardous building materials that require action are provided in Appendices B through BB. General recommendations pertaining to management of identified hazardous building materials in good condition are provided below.

5.1 ASBESTOS

For buildings/structures with identified ACMs, Stantec recommends the following with regards to meeting the requirements of the Canada Labour Code), BC Reg. 296/97, the Parks Canada Asbestos Management Guide (January 2014) and the Parks Canada Asbestos Management Standard (January 2014) as they pertain to managing asbestos in the workplace and/or managing asbestos during renovation/demolition projects:

- Asbestos-containing materials that may be impacted during renovations and/or demolition activities should be removed using appropriate procedures and an experienced contractor, prior to the initiation of other renovation and/or demolition activities.
- Prior to renovation and/or demolition activities that would disturb them, undertake testing of presumed ACMs (materials that were previously un-tested, but are presumed to contain asbestos based on application and vintage) that may be impacted to determine their asbestos content. Confirmed asbestos materials should be handled accordingly.
- Identified ACMs in good condition can be managed in place in accordance with the requirements of the Parks Canada Asbestos Management Guide (January 2014) and the Parks Canada Asbestos Management Standard (January 2014).
- Should a material suspected to contain asbestos fibres become uncovered during renovation and/or demolition activities, all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if asbestos fibres are present. Confirmed asbestos materials should be handled in accordance with applicable guidelines and regulations.

- Suspected ACMs deemed visually similar to the ACMs identified in this report (on a building-by-building basis) should be considered asbestos-containing and handled as such, unless proven otherwise, through analytical testing.
- Asbestos-containing cement pipe may be present below ground—caution should be used if excavation is required.
- If masonry block walls are to be impacted by renovation and/or demolition work, and these walls have not been checked for the presence of vermiculite insulation, intrusive assessments for vermiculite should be undertaken prior to renovation/or demolition work. If vermiculite insulation is suspected to be present, this material should be treated as an ACM until testing can show otherwise.
- Ensure asbestos containing waste is handled, stored, and disposed of in accordance with the requirements of the Federal Transportation of Dangerous Goods Regulation and the British Columbia Hazardous Waste Regulation (BC Reg. 63/88).

5.2 LEAD

Lead-containing materials, including paints, can be managed in place, where in good condition.

If LCPs or other lead-containing equipment/materials within the subject buildings are to be disturbed and/or removed, ensure compliance with the following:

- Exposure protection requirements of the BC Reg. 296/97
- Disposal requirements of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88)
- Transportation requirements of the Federal Transportation of Dangerous Goods Regulation

Corrective action or remedial work on paint applications containing any concentration of lead should be undertaken in a manner so as to avoid generating fine particulate matter or dust (i.e., avoid sanding). Airborne lead dust or fumes should not exceed the BC Reg. 296/97 8-hour Occupational Exposure Limit (OEL) of 0.05 milligram per cubic metre (mg/m^3) during the removal of paints and products containing any concentration of lead. The use of personal protective equipment is recommended to reduce the potential for over-exposure to lead dust. This can be achieved by:

- Providing workers with protective clothing and PPE or devices as necessary to protect the worker against the hazards to which the worker may be exposed
- Providing workers with adequate and training in the care and use of clothing, equipment or device before wearing or using it
- Wetting the surface of the materials to prevent dust emissions
- Providing workers with washing facilities with clean water, soap and individual towels to properly wash prior to exiting the work area

To avoid the inhalation of lead, it is essential to have the following control methods in place:

- Engineering controls
- Work practices and hygiene practices
- Respirators and personal protective equipment
- Training

The work tasks required and the ways in which lead-containing materials (including paints) will be impacted will determine the appropriate respirators, measures and procedures that should be followed to protect workers from lead exposure.

5.3 POLYCHLORINATED BIPHENYLS

Fluorescent lamp ballasts that may contain PCBs can be managed in place, where these items are operating and in good condition. No further action is currently required until such time that renovation or demolition activities are to be conducted, or until 2025, when PCB-containing ballasts will require removal and disposal.

When decommissioned, verify the PCB content of fluorescent lamp ballasts as per the Environment Canada publication *Identification of Lamp Ballasts Containing PCBs*, 1991. PCB-containing items identified for removal and disposal should be handled, transported, stored and disposed of in accordance with the following:

- Disposal requirements of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88)
- Transportation requirements of the Federal Transportation of Dangerous Goods Regulation
- Federal PCB Regulations (SOR/2008-273)

Should a material suspected to contain PCBs become uncovered during renovation activities (i.e., dielectric fluids, hydraulic fluids) all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if PCBs are present. Confirmed PCBs should be handled in accordance with Federal Regulation SOR/2008-273 and BC Reg. 63/88.

5.4 MERCURY

Identified mercury-containing items can be managed in place, therefore no further action is recommended at this time. Mercury vapour within light fixtures and liquid mercury in thermostat switches pose no risk to workers or occupants provided the mercury containers remain intact and undisturbed.

Complete removal of mercury-containing equipment is required prior to renovation or demolition activities that may disturb the equipment. When mercury-containing items (e.g., fluorescent light bulbs/tubes, thermostats) are removed, ensure all mercury waste is handled,

stored and disposed of in accordance with the requirements of the disposal requirements of the following:

- Disposal requirements of the British Columbia Hazardous Waste Regulation (BC Reg. 63/88)
- Transportation requirements of the Federal Transportation of Dangerous Goods Regulation

Precautions should be taken if workers may potentially be exposed to mercury or mercury vapours to ensure that workers exposure levels do not exceed the occupational exposure limit of 0.025 mg/m^3 as per the BC Reg. 296/97 This can be achieved by providing respiratory and skin protection applicable to the hazard and task to be completed.

5.5 MOULD

In general, mould-impacted building materials will require action (e.g. abatement/removal or cleaning). Recommendations pertaining to mould are provided in the building-by-building information included in Appendices B through BB.

5.6 OZONE DEPLETING SUBSTANCES

As no suspect ODS-containing materials or equipment were observed within the subject buildings during the assessment, no recommendations have been provided.

5.7 SILICA

When silica-containing materials are to be removed during demolition activities, ensure dust control measures are employed such that airborne silica dust concentrations do not exceed the exposure limit as stipulated by BC Reg. 296/97 (0.025 mg/m^3). This would include, but not be limited to, the following:

- Providing workers with respiratory protection
- Wetting the surface of the materials to prevent dust emissions
- Providing workers with facilities to properly wash prior to exiting the work area

Providing dust control to mitigate the potential for demolition dust to escape from the work area into public and/or adjacent areas

6.0 CLOSURE

This report has been prepared by Stantec Consulting Ltd. for the sole benefit of Public Works and Government Services Canada. Any use that a third party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The conclusions presented represent the best judgment of the assessor based on current environmental, health and safety standards and the site conditions observed on the dates cited within this report. This report is based on, and limited by, circumstances and conditions stated herein, and on information available at the time of preparation of the report. Due to the limited nature of the investigation and the limited data available, Stantec Consulting Ltd. cannot warrant against undiscovered environmental, health and/or safety liabilities. It is possible that additional, concealed hazardous materials may become evident during renovation and/or demolition activities within the subject buildings.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

We trust that the report meets your current requirements. Should you have any questions or concerns regarding the above, please do not hesitate to contact the undersigned.

Respectfully submitted,

STANTEC CONSULTING LTD.

Kim Wiese, Dipl. Tech.
Environmental Technologist

Tiffany Waite, B.Sc.,
Project Manager

Sean Brigden, B.Sc., P.B.Dipl., CRSP
Technical Leader, Indoor Environments

KW/TW/SB/tt

tt \\cd1183-f05\workgroup\1231\active\ie\123220330\task_600_pacific_rim\report\final_report\rpt_pwgsc_pacific_rim_hazmat_20160308_fin.docx

Stantec

APPENDIX A
BUILDING LIST

Pacific Rim National Park Building List

Appendix	Building Name	Year of Construction
B	4-Plex	1966
C	8-Plex	1978
D	Ucluelet Laundry and Storage	1985
E	New Administration and Generator Shed	2012 and 1983
F	West Coast Trail Patrol Cabins (Camper Creek, Tsuquadra, Tsocowis)	Unknown
G	Cheewhat Patrol Cabin	1978
H	Garage at Airport	Unknown
I	Green Point Bear Cache and Firewood Shed	Unknown and 1966
J	Green Point Theater	1977
K	Green Point Washroom 1 and 4	1975 and 1993
L	Green Point Entrance Kiosk	Unknown
M	Hamilton House (and Sheds)	Unknown
N	Maintenance Building	1944
O	Maintenance Building Sheds	Unknown
P	Nettle Patrol Cabin	1975
Q	Pachena Info Center	1977
R	Port Renfrew Info Center	1987
S	Port Renfrew Warden Station	Unknown
T	Interpretive Workshop	1989
U	Resource Conservation Building	Unknown
V	Kwisitis Visitor Center	1965
W	Pacific Rim Visitor Center	Unknown
X	Wickaninnish Beach Washroom	Unknown
Y	Pacific Rim Visitors Center Washroom	Unknown
Z	Long Beach North Washroom	1977
AA	Long Beach South Washroom	1977
BB	Incinerator Beach Washroom	Unknown

Stantec Consulting Ltd. © 2015

LEGEND

- FORT LANGLEY NATIONAL HISTORIC SITE
- GULF OF GEORGIA CANNERY
- FORT RODD HILL NATIONAL HISTORIC SITE
- GULF ISLANDS NATIONAL PARK
- PACIFIC RIM NATIONAL PARK

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE LOCATIONS

SOUTH COAST NATIONAL PARKS OF CANADA

SOUTH COAST OF BRITISH COLUMBIA

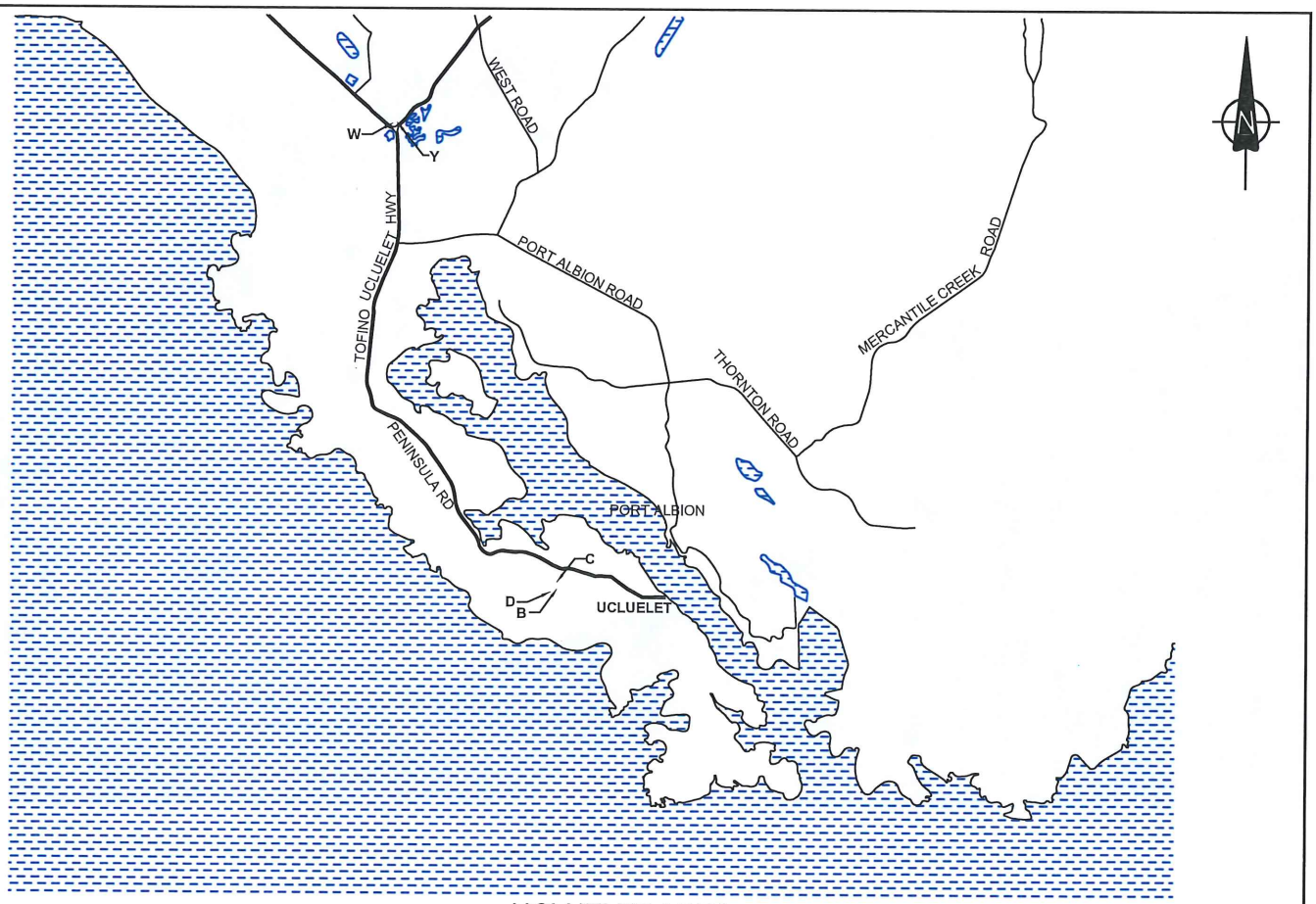
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD SL2015100069 DM/PK
App'd By:	TW

Dwg. No.: A1

Stantec

Stantec Consulting Ltd. © 2015



UCLUELET AREA

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

PACIFIC RIM NATIONAL PARK RESERVE, BC

UCLUELET, BC

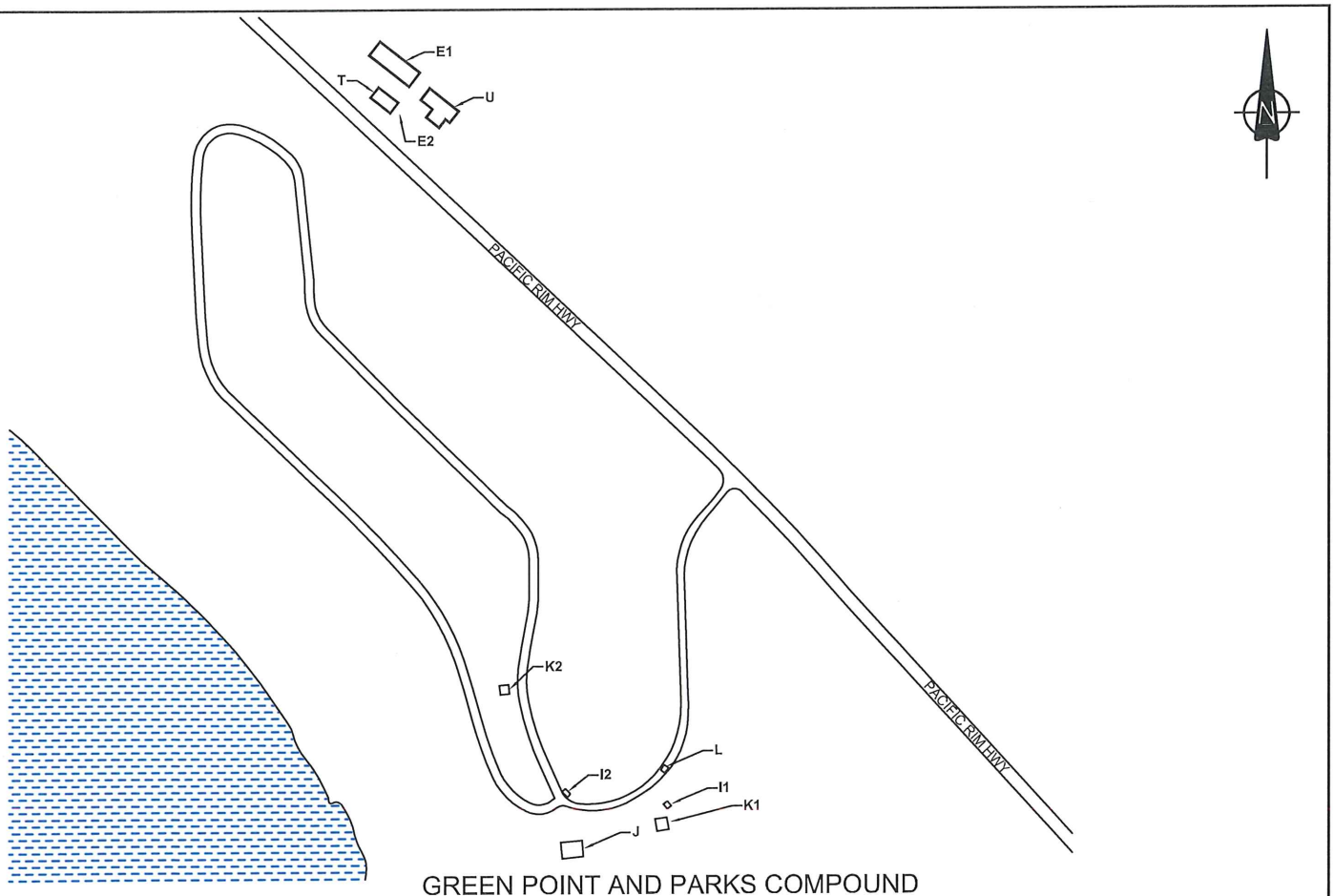
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330.600.100
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD SL2015100070 DM/PK
App'd By:	TW

Dwg. No.: A2

Stantec

Stantec Consulting Ltd. © 2015



GREEN POINT AND PARKS COMPOUND

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

PACIFIC RIM NATIONAL PARK RESERVE, BC

GREEN POINT AND PARKS COMPOUND, BC

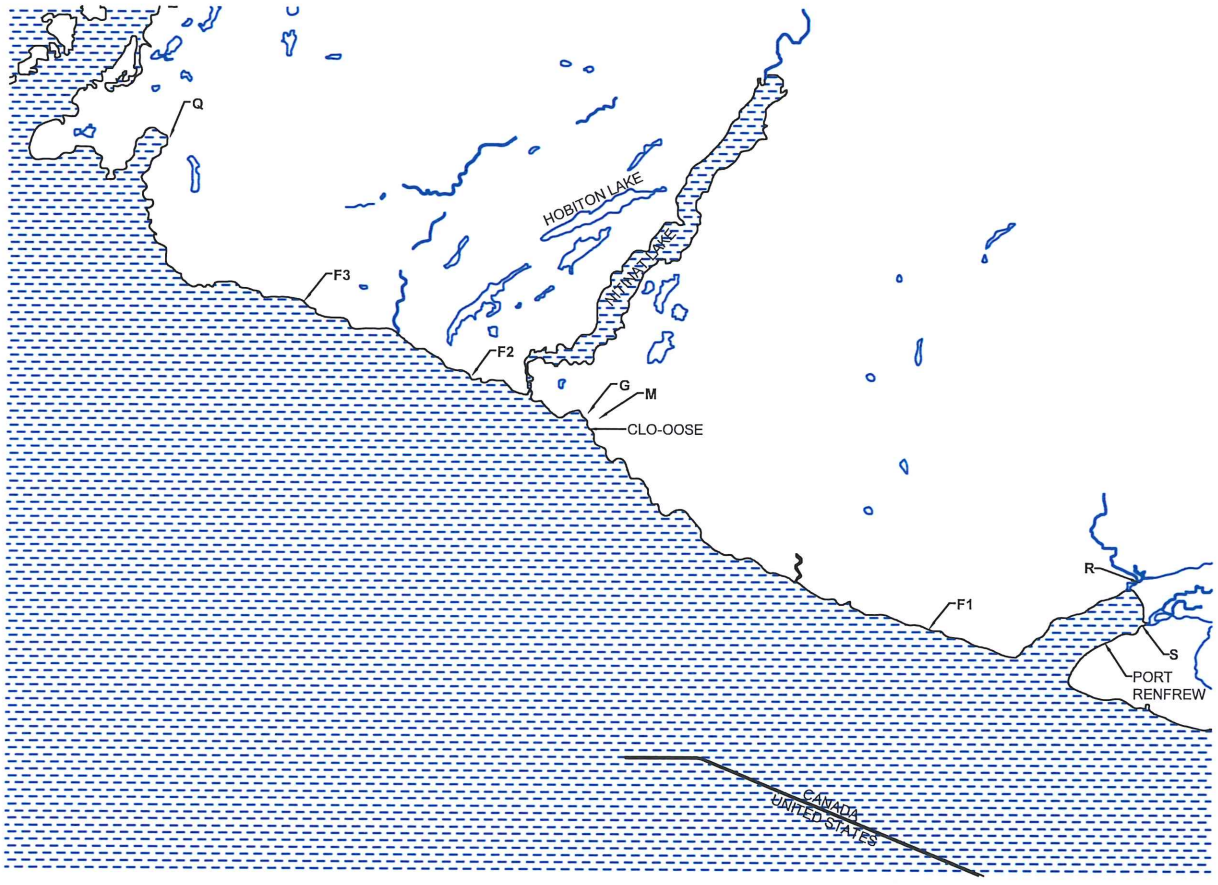
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330.600.100
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD SL2015100071 DM/PK
App'd By:	TW

Dwg. No.: A3

Stantec

Stantec Consulting Ltd. © 2015



WEST COAST TRAIL

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

PACIFIC RIM NATIONAL PARK RESERVE, BC

CLO-OOSE, BC

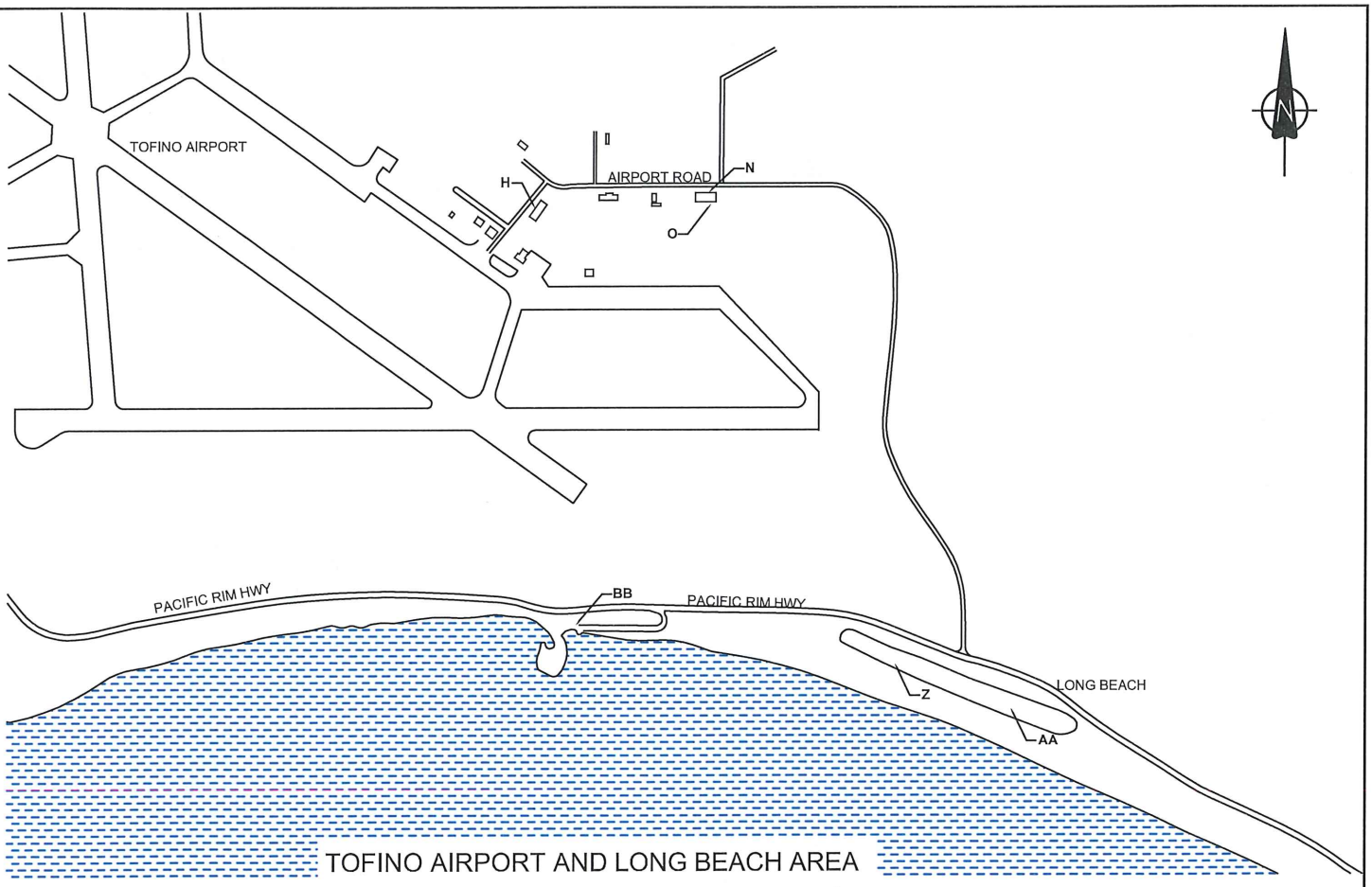
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330.600.100
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD PK SL2015100072
App'd By:	TW

Dwg. No.: A4

Stantec

Stantec Consulting Ltd. © 2015



TOFINO AIRPORT AND LONG BEACH AREA

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

PACIFIC RIM NATIONAL PARK RESERVE, BC

TOFINO AIRPORT, BC

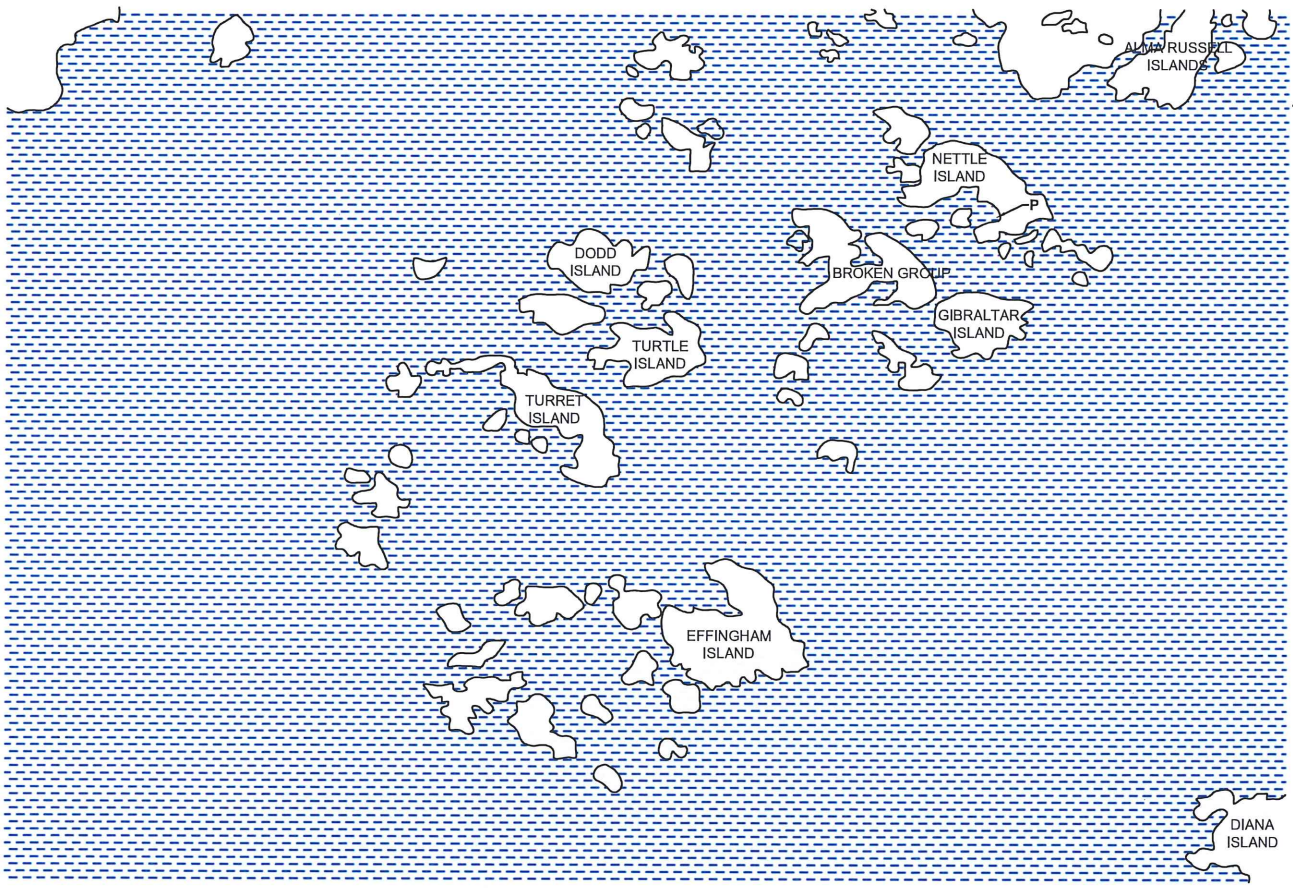
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330.600.100
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD SL2015100073 DM/PK
App'd By:	TW

Dwg. No.: A5

Stantec

Stantec Consulting Ltd. © 2015



BROKEN GROUP ISLANDS

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

PACIFIC RIM NATIONAL PARK RESERVE, BC

BROKEN GROUP ISLANDS, BC

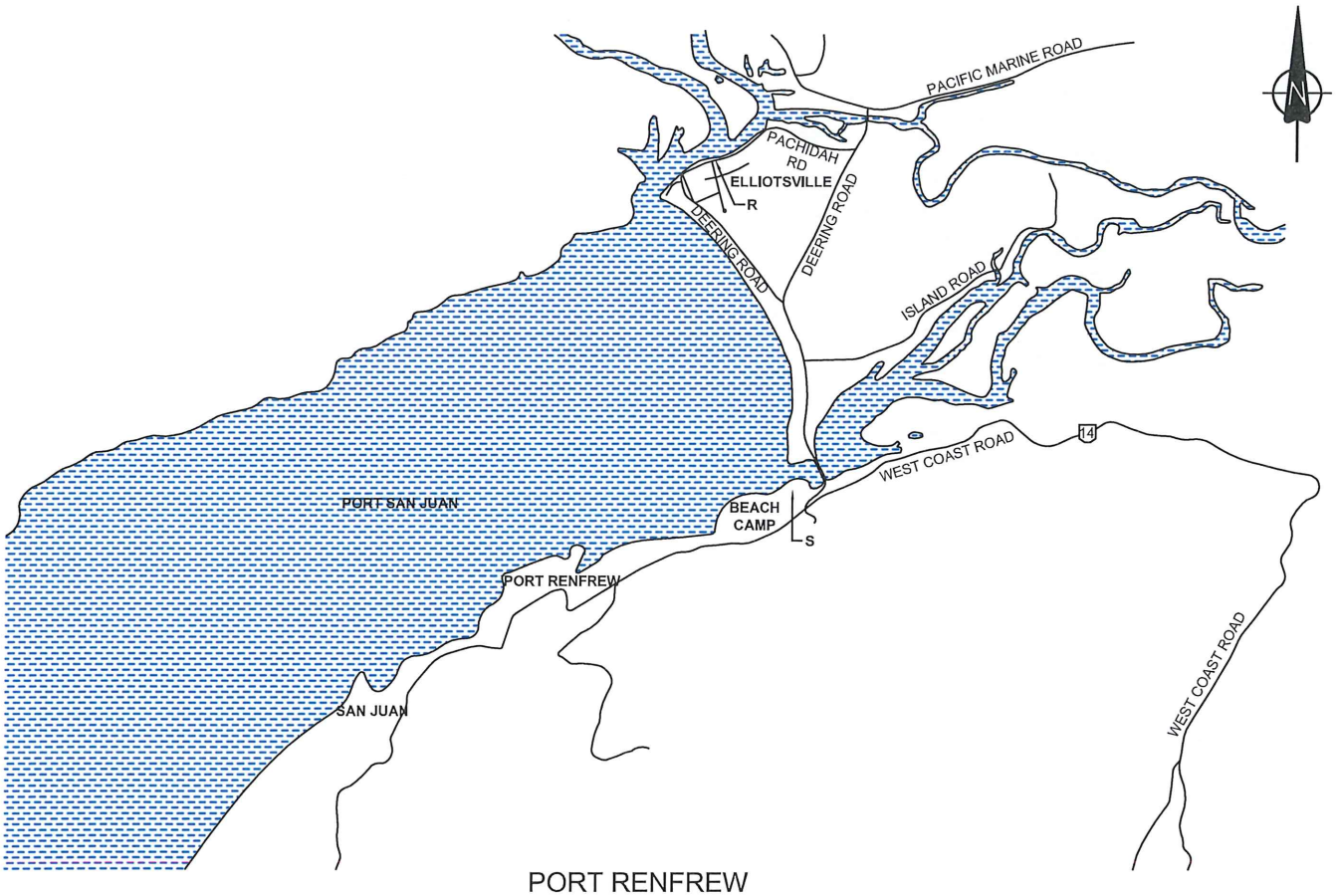
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330.600.100
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD PK SL2015100074
App'd By:	TW

Dwg. No.: A6

Stantec

Stantec Consulting Ltd. © 2015



PORT RENFREW

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

PACIFIC RIM NATIONAL PARK RESERVE, BC

PORT RENFREW, BC

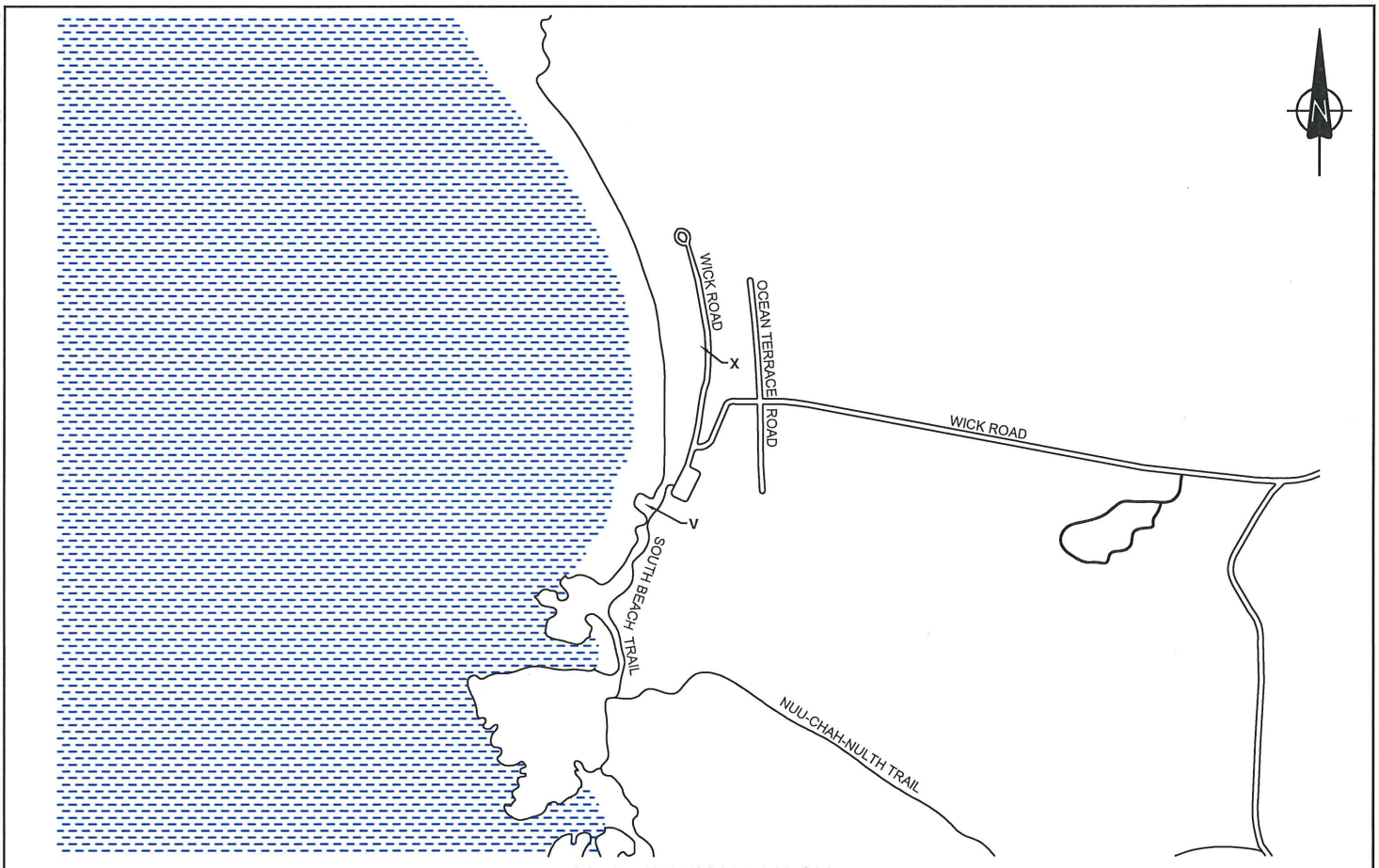
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330.600.100
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD SL2015100075 VM/PK
App'd By:	TW

Dwg. No.: A7

Stantec

Stantec Consulting Ltd. © 2015



NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

SITE PLAN

PACIFIC RIM NATIONAL PARK RESERVE, BC

KWISITIS VISITOR CENTRE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330.600.100
Scale:	N.T.S.
Date:	15/10/06
Dwn. By:	CD PK SL2015100076
App'd By:	TW

Dwg. No.: A8

Stantec

APPENDIX B
FINDINGS AND RECOMMENDATIONS
4-PLEX

B-4.0 FINDINGS—4-PLEX

The 4-Plex was reportedly constructed in 1966 and is a two storey residential structure with four similarly constructed/finished residential units (two up, two down) and a detached parking garage and storage.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

B-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Textured flooring
- Building paper
- Roofing paper
- Roofing shingle
- Window pane caulking
- Drywall joint compound
- Ceiling texture coat
- Assorted vinyl sheet flooring

Fifty-seven samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical result is presented in Table B-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table B-4.1.1 Suspected ACM Sample Collection and Analysis Summary 4-Plex, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
4-Plex—Exterior and Parking Garage			
41-TF-01A	Black textured flooring	Second floor on south side of building steps	None Detected
41-TF-01B	Black textured flooring	Second floor on south side of building steps	None Detected
41-TF-01C	Black textured flooring	Second floor on south side of building steps	None Detected
41-BP-01A	Black building paper	North wall of storage room for Unit 3	None Detected
41-BP-01B	Black building paper	North wall of storage room for Unit 3	None Detected
41-BP-01C	Black building paper	North wall of storage room for Unit 3	None Detected
41-RP-01A	Black roofing paper	East side roof of parking garage and storage	None Detected
41-RP-01B	Black roofing paper	East side roof of parking garage and storage	None Detected
41-RP-01C	Black roofing paper	East side roof of parking garage and storage	None Detected
41-RS-01A	Black roofing shingle	South side of building roof	None Detected
41-RS-01B	Black roofing shingle	South side of building roof	None Detected
41-RS-01C	Black roofing shingle	South side of building roof	None Detected
41-RS-02A	Black roofing shingle	East side roof of parking garage and storage	None Detected
41-RS-02B	Black roofing shingle	East side roof of parking garage and storage	None Detected
41-RS-02C	Black roofing shingle	East side roof of parking garage and storage	None Detected
4-Plex – Unit 1			
41-WPC-01A	**Black window pane caulking**	**East interior bedroom window**	**1.1% Chrysotile**
41-WPC-01B	**Black window pane caulking**	**West interior living room window**	**Stop Positive (Not Analyzed)**
41-WPC-01C	**Black window pane caulking**	**East interior bathroom window**	**Stop Positive (Not Analyzed)**
41-DJC-01A	**Drywall joint compound**	**East bathroom wall by water heater**	**<0.25% Chrysotile**
41-DJC-01B	**Drywall joint compound**	**West bathroom wall by bath tub**	**None Detected**
41-DJC-01C	**Drywall joint compound**	**East bathroom ceiling**	**None Detected**

Table B-4.1.1 Suspected ACM Sample Collection and Analysis Summary 4-Plex, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
41-CTC-01A	Ceiling texture coat	Bedroom ceiling by door	None Detected
41-CTC-01B	Ceiling texture coat	Living room ceiling east side	None Detected
41-CTC-01C	Ceiling texture coat	Living room ceiling south side	1% Chrysotile
41-SF-01	Brown and orange square pattern sheet flooring	Kitchen on south side	0.70% Chrysotile
41-SF-02	Grey square pebble pattern sheet flooring	Under SF-01 in kitchen on south side	9.5% Chrysotile
41-SF-03	Grey square pebble pattern sheet flooring	Bathroom by water heater	7.6% Chrysotile
4-Plex—Unit 2			
42-WPC-01A	Black window pane caulking	East interior bathroom window	0.67% Chrysotile
42-WPC-01B	Black window pane caulking	East interior bedroom window	Stop Positive (Not Analyzed)
42-WPC-01C	Black window pane caulking	West interior living room window	Stop Positive (Not Analyzed)
42-DJC-01A	Drywall joint compound	Bathroom wall by water heater	<0.25% Chrysotile
42-DJC-01B	Drywall joint compound	East side of bathroom on ceiling	None Detected
42-DJC-01C	Drywall joint compound	East kitchen wall	None Detected
42-SF-01	Brown and orange square pattern sheet flooring	Kitchen behind fridge	6.1% Chrysotile
42-SF-02	Grey square pebble pattern sheet flooring	Bathroom by water heater	14.4% Chrysotile
4-Plex—Unit 3			
43-WPC-01A	Black window pane caulking	West interior living room window	1.1% Chrysotile
43-WPC-01B	Black window pane caulking	East interior bathroom window	Stop Positive (Not Analyzed)
43-WPC-01C	Black window pane caulking	North interior bedroom window	Stop Positive (Not Analyzed)
43-DJC-01A	Drywall joint compound	West interior bathroom wall	None Detected
43-DJC-01B	Drywall joint compound	East interior bathroom wall	None Detected
43-DJC-01C	Drywall joint compound	South interior bathroom ceiling	None Detected

Table B-4.1.1 Suspected ACM Sample Collection and Analysis Summary 4-Plex, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
43-CTC-01A	Ceiling texture coat	South interior bedroom ceiling	None Detected
43-CTC-01B	Ceiling texture coat	West interior living room ceiling	None Detected
43-CTC-01C	Ceiling texture coat	North interior living room ceiling	None Detected
43-SF-01	Grey square pebble pattern sheet flooring	Bathroom by water heater	9.0% Chrysotile
43-SF-02	Brown and orange square pattern sheet flooring	Kitchen behind fridge	3.0% Chrysotile
4-Plex—Unit 4			
44-CTC-01A	Ceiling texture coat	South interior bedroom ceiling	None Detected
44-CTC-01B	Ceiling texture coat	West interior living room ceiling	None Detected
44-CTC-01C	Ceiling texture coat	North interior living room ceiling	None Detected
44-WPC-01A	Black window pane caulking	West interior living room window	1.2% Chrysotile
44-WPC-01B	Black window pane caulking	East interior bathroom window	Stop Positive (Not Analyzed)
44-WPC-01C	Black window pane caulking	South interior bedroom window	Stop Positive (Not Analyzed)
44-DJC-01A	Drywall joint compound	South interior bathroom wall	1% Chrysotile
44-DJC-01B	Drywall joint compound	East interior bathroom wall	None Detected
44-DJC-01C	Drywall joint compound	North interior living room wall	None Detected
44-SF-01	Brown and orange square pattern sheet flooring	Kitchen behind fridge	1.3% Chrysotile
44-SF-02	Grey square pebble pattern sheet flooring	Bathroom by water heater	11.6% Chrysotile

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table B-4.1.2, below were identified as ACMs.

Table B-4.1.2 Summary of Identified ACMs 4-Plex, Ucluelet, BC

Identified ACM Description and Condition Information		Photo
Black window pane caulking on windows throughout all units.		
Friability	Non-friable	
Condition	Good	
Content	0.67-1.2% Chrysotile	
Ceiling texture coat throughout all units (concealed behind Styrofoam and ceiling tiles in Units 1 and 2).		
Friability	Friable	
Condition	Good	
Content	1% Chrysotile	

Table B-4.1.2 Summary of Identified ACMs 4-Plex, Ucluelet, BC

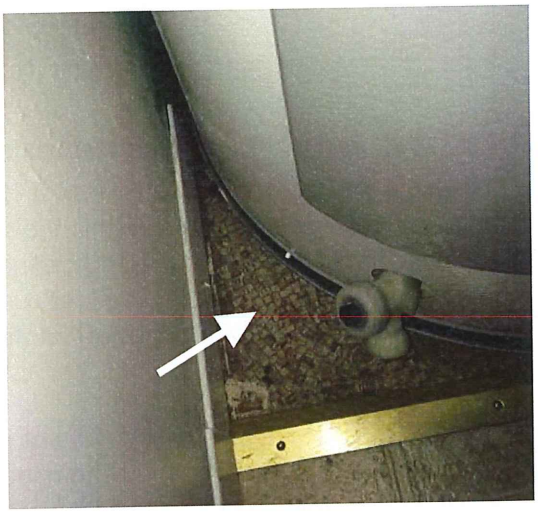
Identified ACM Description and Condition Information		Photo
Brown and orange square pattern sheet flooring in kitchens of all units.		
Friability	Non-friable in situ, friable during removal/disturbance	
Condition	Good	
Content	0.7-6.1% Chrysotile	
Grey square pebble pattern sheet flooring in the Unit 1 kitchen sink, under the brown and orange square pattern sheet flooring of the kitchen and in all units in the bathroom by the water heater.		
Friability	Non-friable in situ, friable during removal/disturbance	
Condition	Good	
Content	7.6-14.4% Chrysotile	

Table B-4.1.2 Summary of Identified ACMs
4-Plex, Ucluelet, BC

Identified ACM Description and Condition Information		Photo
Drywall joint compound on walls throughout all units.		
Friability	Non-friable in situ, potentially friable during removal/disturbance	
Condition	Good	
Content	<0.25-1% Chrysotile	

1.1.1 Wall and Ceiling Finish Materials

Chrysotile asbestos was detected in 3 of 12 samples of drywall joint compound and in 1 of 9 samples of ceiling texture finish within the subject building. These samples were collected from the finishes on various wall and ceiling types (interior partition walls, perimeter walls, ceilings, bulkheads, etc.) within the various units in the subject building, which all appeared to have been finished with consistent materials and at the same time (during original construction).

The extent of asbestos-containing drywall joint compound and/or ceiling texture finish within the subject building is difficult to determine given these inconsistent results, and when considering the following:

- Visual distinction between asbestos-containing wall/ceiling finish materials and non-asbestos-containing forms is not practical, as it is likely that over the years there were several renovations where finish materials may have been layered.
- Finished walls and ceilings are covered with multiple layers of paint, and finishing is conducted to blend different types of wall/ceiling finish materials such that the surfaces are continuous.

- The asbestos content of these materials may be inconsistent, as the application of wall and ceiling finish materials was often conducted by hand-mixing the components.

Based on the above, drywall joint compound and ceiling texture finish throughout the subject building (all units) should be considered asbestos-containing, unless more thorough, area-specific sampling (e.g. pre-renovation or pre-demolition assessment) proves otherwise.

B-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment
- Vent and pipe flashings

With respect to paint, seven paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table B-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table B-4.2.1 Suspected LCP Sample Collection and Analysis Summary 4-Plex, Ucluelet, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
4-Plex—Unit 1				
41-P-01	White	Interior wall on west side of bedroom	<90	No
41-P-02	Blue	Exterior door	<90	No
4-Plex—Unit 3				
43-P-01	Cream	Interior wall in bathroom by water heater	<110	No
4-Plex—Unit 4				
44-P-01	White	Interior east wall in bathroom	<90	No
44-P-02	Red	Interior east wall in kitchen	<250	No
44-P-03	Yellow	Interior west wall in bedroom	<230	No

Table B-4.2.1 Suspected LCP Sample Collection and Analysis Summary 4-Plex, Ucluelet, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
44-P-04	Green	Interior north wall in living room	<510	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

B-4.3 Polychlorinated Biphenyls

Four fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

B-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in four fluorescent light fixtures.

B-4.5 Mould

Mould/moisture damage was observed as summarized in Table B-4.5.1, below.

Table B-4.5.1 Summary of Identified Mould and/or Moisture-Impacted Materials 4-Plex, Ucluelet, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture-impacted plywood was observed on the ceiling of the second floor balcony. The suspected source of moisture is roof leaks and/or lack of insulation creating a cold surface on which water condenses.	

B-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

B-4.1 Silica

Silica is presumed to be present in ceiling tiles and concrete within the subject building.

B-5.0 RECOMMENDATIONS – 4-PLEX

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

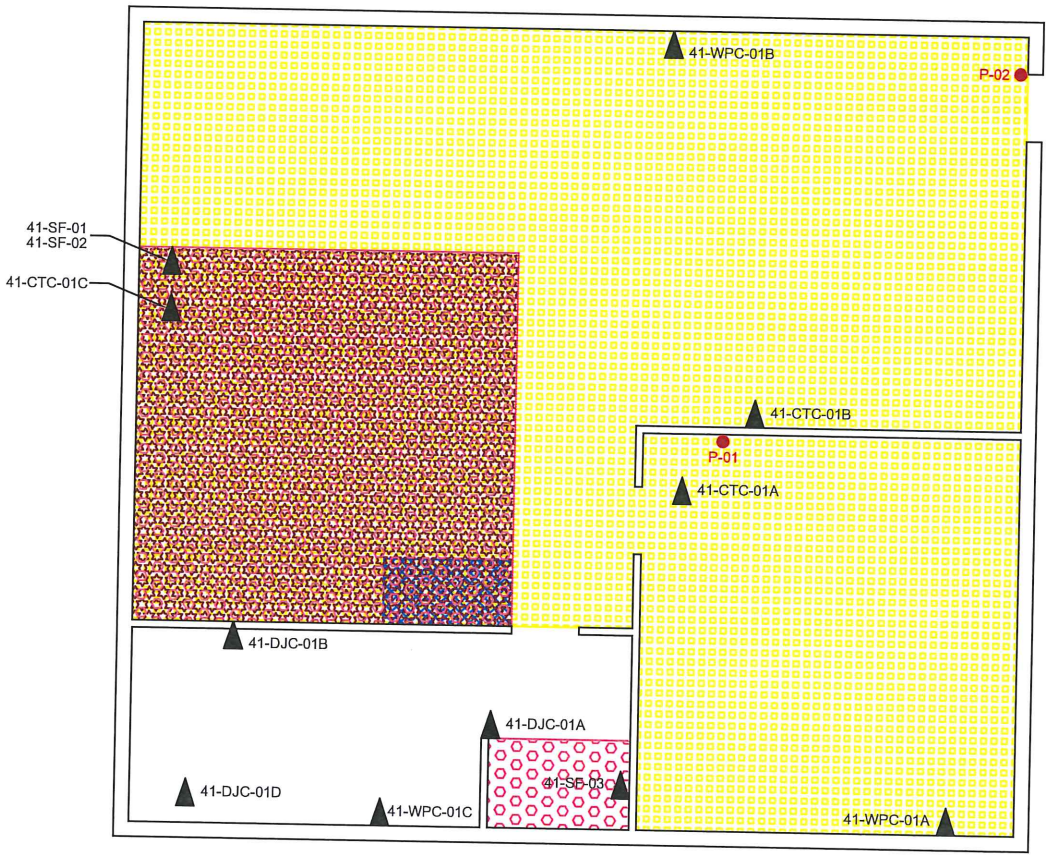
Additional building-specific recommendations to be considered are provided below.

B-5.5 Mould

Stantec recommends the following course of action within the subject building:

- The source of moisture leading to the staining observed on the second floor balcony ceiling should be identified and addressed. Upon completion, the ceiling materials should be cleaned and/or painted, and monitored to verify that the corrections were successful in addressing the moisture issue.

Stantec Consulting Ltd. © 2015



4 - PLEX UNIT #1

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- CONCEALED ASBESTOS-CONTAINING CEILING TEXTURE COAT
- ASBESTOS-CONTAINING VINYL SHEET FLOORING
- CONCEALED ASBESTOS-CONTAINING VINYL SHEET FLOORING
- ASBESTOS-CONTAINING VINYL SHEET FLOORING UNDER SINK

NOTES:
1. **BLACK WINDOW PANE CAULKING ON WINDOWS THROUGHOUT IS ASBESTOS-CONTAINING.**
2. **DRYWALL JOINT COMPOUND THROUGHOUT IS ASBESTOS-CONTAINING.**
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

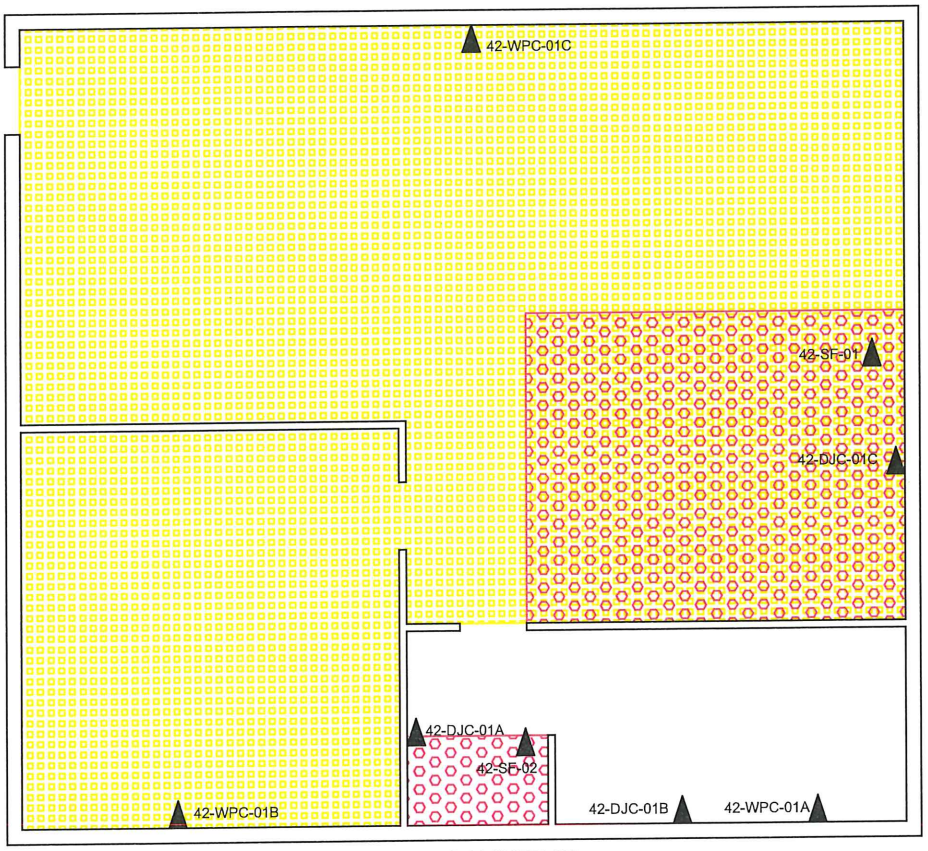
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD PK/DM SL2015100022
App'd By:	TW

Dwg. No.: B1

Stantec

Stantec Consulting Ltd. © 2015



4 - PLEX UNIT #2

LEGEND

- BULK SAMPLE FOR ASBESTOS
- CONCEALED ASBESTOS-CONTAINING CEILING TEXTURE COAT
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

NOTES:
1. BLACK WINDOW PANE CAULKING ON WINDOWS THROUGHOUT IS ASBESTOS-CONTAINING.
2. DRYWALL JOINT COMPOUND THROUGHOUT IS ASBESTOS-CONTAINING.
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

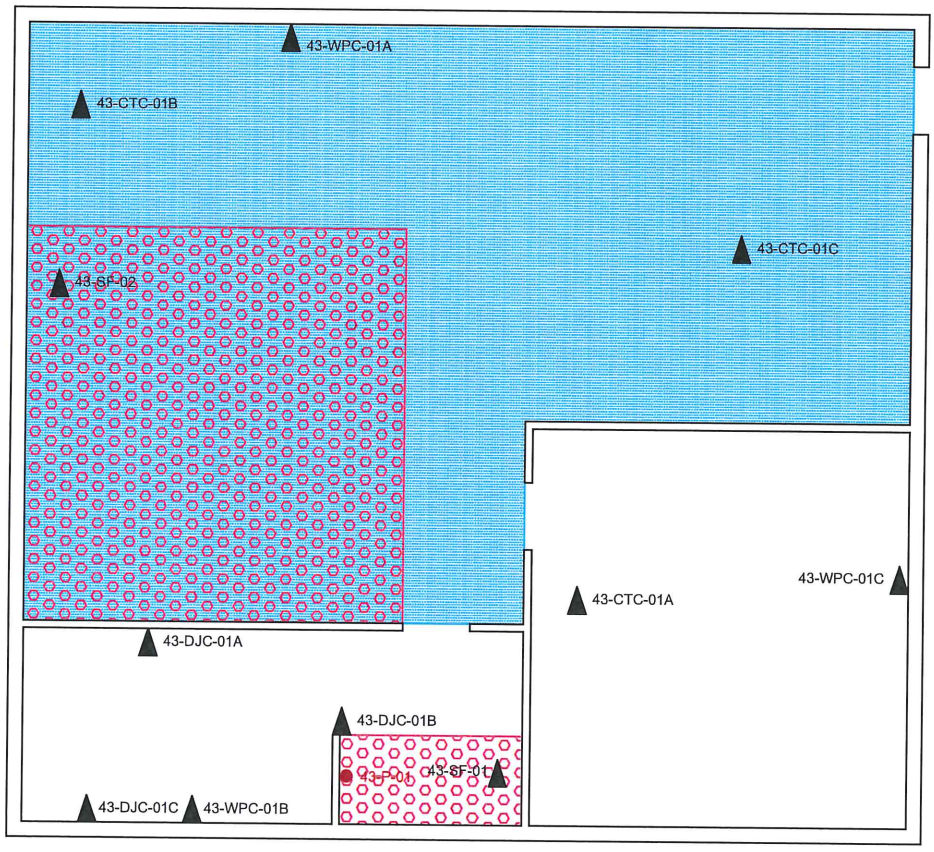
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100023 PK/DM
App'd By:	TW

Dwg. No.: B2

Stantec

Stantec Consulting Ltd. © 2015



4 - PLEX UNIT #3

NOTES:
1. **BLACK WINDOW PANE CAULKING ON WINDOWS THROUGHOUT IS ASBESTOS-CONTAINING.**
2. **DRYWALL JOINT COMPOUND THROUGHOUT IS ASBESTOS-CONTAINING.**
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING CEILING TEXTURE COAT
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

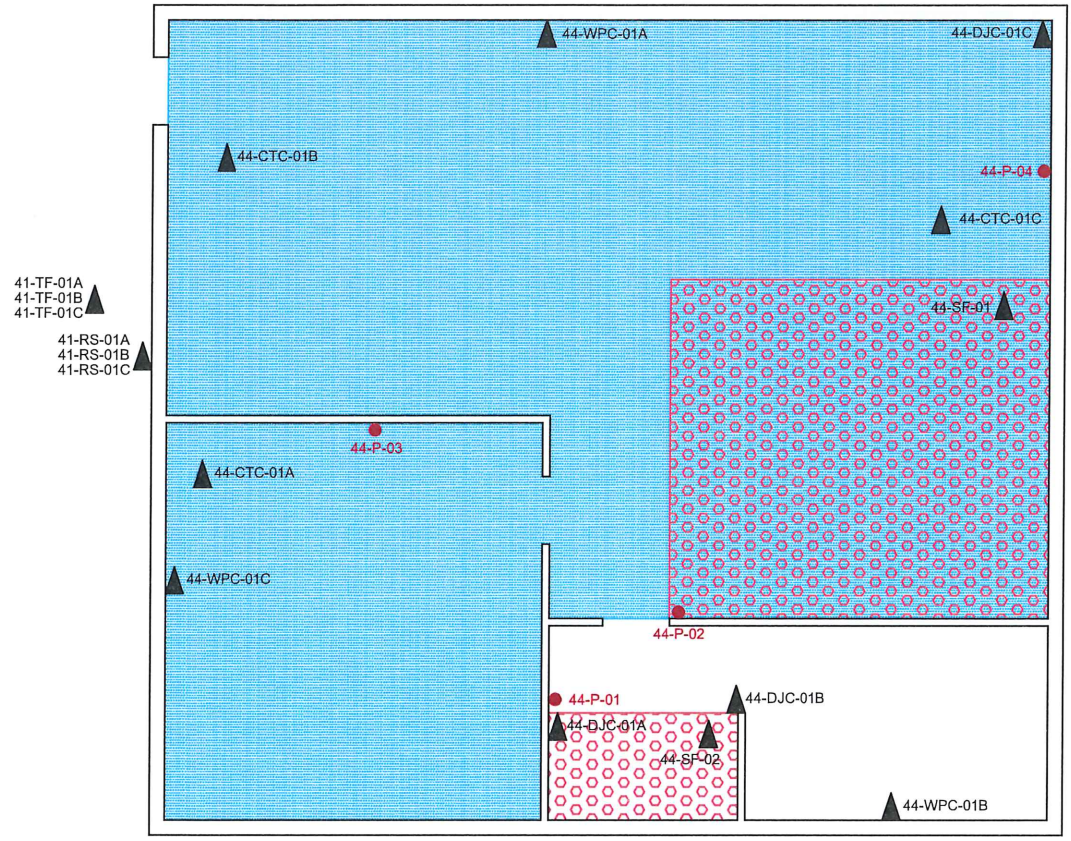
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100024 PK/DM
App'd By:	TW

Dwg. No.: B3

Stantec

Stantec Consulting Ltd. © 2015



4 - PLEX UNIT #4

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING CEILING TEXTURE COAT
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

NOTES: 1. BLACK WINDOW PANE CAULKING ON WINDOWS THROUGHOUT IS ASBESTOS-CONTAINING.
2. DRYWALL JOINT COMPOUND THROUGHOUT IS ASBESTOS-CONTAINING.
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

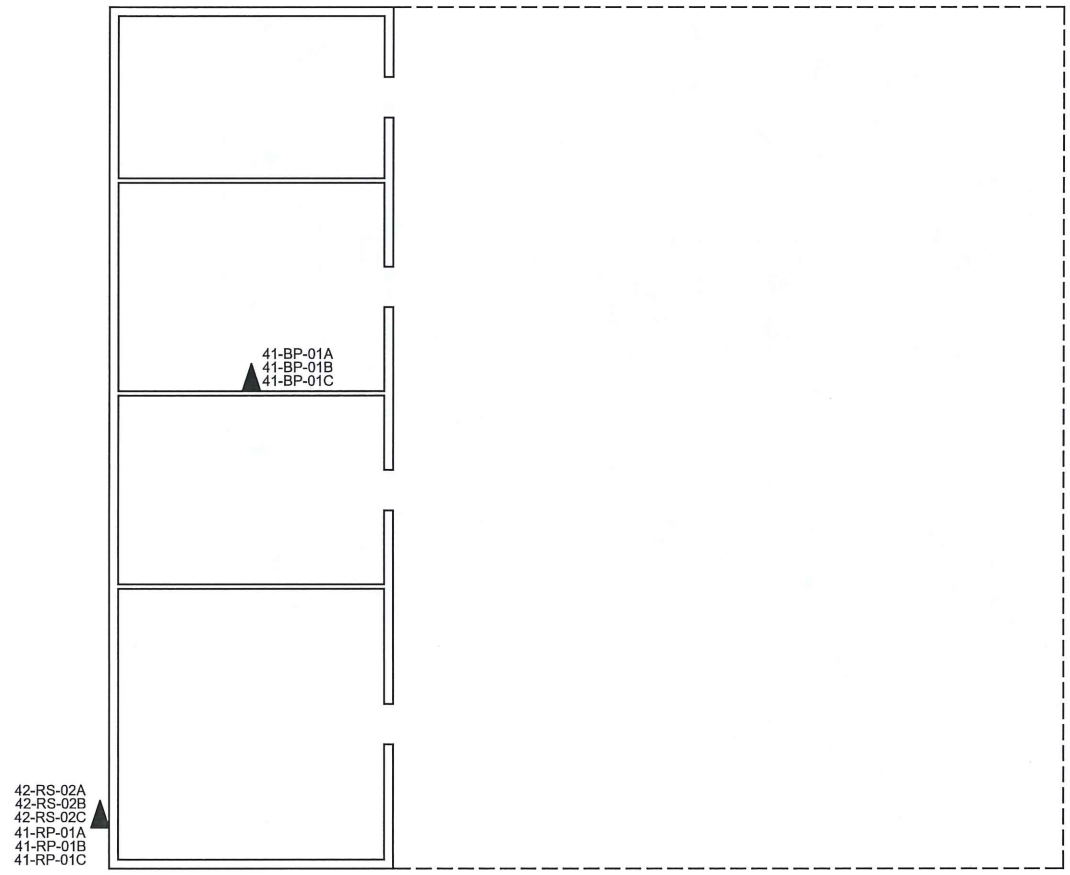
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100025 PK/DM
App'd By:	TW

Dwg. No.: B4

Stantec

Stantec Consulting Ltd. © 2015



4 - PLEX PARKING GARAGE AND STORAGE

LEGEND

▲ BULK SAMPLE FOR ASBESTOS

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100026 PK/DM
App'd By:	TW

Dwg. No.: B5

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 - 4-PLEX

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 41-TF-01A **Lab Sample ID:** 551507086-0001
Sample Description: SECOND FLOOR ON SOUTH SIDE OF BUILDING STEPS/BLACK TEXTURED FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-TF-01B **Lab Sample ID:** 551507086-0002
Sample Description: SECOND FLOOR ON SOUTH SIDE OF BUILDING STEPS/BLACK TEXTURED FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-TF-01C **Lab Sample ID:** 551507086-0003
Sample Description: SECOND FLOOR ON SOUTH SIDE OF BUILDING STEPS/BLACK TEXTURED FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-BP-01A **Lab Sample ID:** 551507086-0004
Sample Description: NORTH WALL OF STORAGE ROOM FOR UNIT 3/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-BP-01B **Lab Sample ID:** 551507086-0005
Sample Description: NORTH WALL OF STORAGE ROOM FOR UNIT 3/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-BP-01C **Lab Sample ID:** 551507086-0006
Sample Description: NORTH WALL OF STORAGE ROOM FOR UNIT 3/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RP-01A **Lab Sample ID:** 551507086-0007
Sample Description: EAST SIDE ROOF OF PARKING GARAGE AND STORAGE/BLACK ROOFING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 41-RP-01B **Lab Sample ID:** 551507086-0008
Sample Description: EAST SIDE ROOF OF PARKING GARAGE AND STORAGE/BLACK ROOFING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RP-01C **Lab Sample ID:** 551507086-0009
Sample Description: EAST SIDE ROOF OF PARKING GARAGE AND STORAGE/BLACK ROOFING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RS-01A **Lab Sample ID:** 551507086-0010
Sample Description: SOUTH SIDE OF BUILDING ROOF/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RS-01B **Lab Sample ID:** 551507086-0011
Sample Description: SOUTH SIDE OF BUILDING ROOF/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RS-01C **Lab Sample ID:** 551507086-0012
Sample Description: SOUTH SIDE OF BUILDING ROOF/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RS-02A **Lab Sample ID:** 551507086-0013
Sample Description: EAST SIDE ROOF OF PARKING GARAGE AND STORAGE/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RS-02B **Lab Sample ID:** 551507086-0014
Sample Description: EAST SIDE ROOF OF PARKING GARAGE AND STORAGE/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 41-RS-02C **Lab Sample ID:** 551507086-0015
Sample Description: EAST SIDE ROOF OF PARKING GARAGE AND STORAGE/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 41-WPC-01A **Lab Sample ID:** 551507086-0016
Sample Description: EAST INTERIOR BEDROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	98.9%	1.1% Chrysotile	

Client Sample ID: 41-WPC-01B **Lab Sample ID:** 551507086-0017
Sample Description: WEST INTERIOR LIVING ROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 41-WPC-01C **Lab Sample ID:** 551507086-0018
Sample Description: EAST INTERIOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 41-DJC-01A **Lab Sample ID:** 551507086-0019
Sample Description: EAST BATHROOM WALL BY WATER HEATER/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	<1% Chrysotile	
400 PLM Pt Ct	7/09/2015	White	0%	100%	<0.25% Chrysotile	

Client Sample ID: 41-DJC-01B **Lab Sample ID:** 551507086-0020
Sample Description: WEST BATHROOM WALL BY BATH TUB/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: 41-DJC-01C **Lab Sample ID:** 551507086-0021
Sample Description: EAST BATHROOM CEILING/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: 41-CTC-01A **Lab Sample ID:** 551507086-0022
Sample Description: BEDROOM CEILING BY DOOR/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Tan	0%	100%	None Detected	

Client Sample ID: 41-CTC-01B **Lab Sample ID:** 551507086-0023
Sample Description: LIVING ROOM CEILING EAST SIDE/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Tan	0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 41-CTC-01C ***Lab Sample ID:*** **551507086-0024**
Sample Description: LIVING ROOM CEILING SOUTH SIDE/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Tan/White	0%	99%	**1% Chrysotile**	

Client Sample ID: 41-SF-01 ***Lab Sample ID:*** **551507086-0025**
Sample Description: KITCHEN ON SOUTH SIDE/BROWN AND ORANGE SQUARE PATTERN SHEET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown	0.0%	99.3%	**0.70% Chrysotile**	

Client Sample ID: 41-SF-02 ***Lab Sample ID:*** **551507086-0026**
Sample Description: UNDER SF-01 IN KITCHEN ON SOUTH SIDE/GREY SQUARE PEBBLE PATTERN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	90.5%	**9.5% Chrysotile**	

Client Sample ID: 41-SF-03 ***Lab Sample ID:*** **551507086-0027**
Sample Description: BATHROOM BY WATER HEATER/GREY SQUARE PEBBLE PATTERN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	92.4%	**7.6% Chrysotile**	

Client Sample ID: 42-WPC-01A ***Lab Sample ID:*** **551507086-0028**
Sample Description: EAST INTERIOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	99.3%	**0.67% Chrysotile**	

Client Sample ID: 42-WPC-01B ***Lab Sample ID:*** **551507086-0029**
Sample Description: EAST INTERIOR BEDROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 42-WPC-01C ***Lab Sample ID:*** **551507086-0030**
Sample Description: WEST INTERIOR LIVING ROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 42-DJC-01A ***Lab Sample ID:*** **551507086-0031**
Sample Description: BATHROOM WALL BY HEATER/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	**<1% Chrysotile**	
400 PLM Pt Ct	7/08/2015	Gray	0%	100%	**<0.25% Chrysotile**	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 42-DJC-01B **Lab Sample ID:** **551507086-0032**
Sample Description: EAST SIDE OF BATHROOM ON CEILING/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: 42-DJC-01C **Lab Sample ID:** **551507086-0033**
Sample Description: EAST KITCHEN WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: 42-SF-01 **Lab Sample ID:** **551507086-0034**
Sample Description: KITCHEN BEHIND FRIDGE/BROWN AND ORANGE SQUARE PATTERN SHEET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	93.9%	**6.1% Chrysotile**	

Client Sample ID: 42-SF-02 **Lab Sample ID:** **551507086-0035**
Sample Description: BATHROOM BY WATER HEATER/GREY SQUARE PEBBLE PATTERN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown	0.0%	85.6%	**14.4% Chrysotile**	

Client Sample ID: 43-WPC-01A **Lab Sample ID:** **551507086-0036**
Sample Description: WEST INTERIOR ROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	98.9%	**1.1% Chrysotile**	

Client Sample ID: 43-WPC-01B **Lab Sample ID:** **551507086-0037**
Sample Description: EAST INTERIOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 43-WPC-01C **Lab Sample ID:** **551507086-0038**
Sample Description: NORTH INTERIOR BEDROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 43-DJC-01A **Lab Sample ID:** **551507086-0039**
Sample Description: WEST INTERIOR BATHROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 43-DJC-01B **Lab Sample ID:** **551507086-0040**

Sample Description: EAST INTERIOR BATHROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: 43-DJC-01C **Lab Sample ID:** **551507086-0041**

Sample Description: SOUTH INTERIOR BATHROOM CEILING/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: 43-CTC-01A **Lab Sample ID:** **551507086-0042**

Sample Description: SOUTH INTERIOR BEDROOM CEILING/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: 43-CTC-01B **Lab Sample ID:** **551507086-0043**

Sample Description: WEST INTERIOR LIVING ROOM CEILING/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	None Detected	

Client Sample ID: 43-CTC-01C **Lab Sample ID:** **551507086-0044**

Sample Description: NORTH INTERIOR LIVING ROOM CEILING/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: 43-SF-01 **Lab Sample ID:** **551507086-0045**

Sample Description: BATHROOM BY WATER HEATER/GREY SQUARE PEBBLE PATTERN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	91.0%	**9.0% Chrysotile**	

Client Sample ID: 43-SF-02 **Lab Sample ID:** **551507086-0046**

Sample Description: KITCHE BEHIND FRIDGE/BROWN AND ORANGE SQUARE PATTERN SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown	0.0%	97.0%	**3.0% Chrysotile**	

Client Sample ID: 44-CTC-01A **Lab Sample ID:** **551507086-0047**

Sample Description: SOUTH INTERIOR BEDROOM CEILING/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 44-CTC-01B — ***Lab Sample ID:*** 551507086-0048
Sample Description: WEST INTERIOR LIVING ROOM CEILING/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	None Detected	

Client Sample ID: 44-CTC-01C — ***Lab Sample ID:*** 551507086-0049
Sample Description: NORTH INTERIOR LIVING ROOM CEILING/CEILING TEXTURE COAT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: 44-WPC-01A — ***Lab Sample ID:*** 551507086-0050
Sample Description: WEST INTERIOR LIVING ROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	98.8%	1.2% Chrysotile	

Client Sample ID: 44-WPC-01B — ***Lab Sample ID:*** 551507086-0051
Sample Description: EAST INTERIOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 44-WPC-01C — ***Lab Sample ID:*** 551507086-0052
Sample Description: SOUTH INTERIOR BEDROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: 44-DJC-01A — ***Lab Sample ID:*** 551507086-0053
Sample Description: SOUTH INTERIOR BATHROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	99%	1% Chrysotile	

Client Sample ID: 44-DJC-01B — ***Lab Sample ID:*** 551507086-0054
Sample Description: EAST INTERIOR BATHROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: 44-DJC-01C — ***Lab Sample ID:*** 551507086-0055
Sample Description: NORTH INTERIOR LIVING ROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507086
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 44-SF-01 ***Lab Sample ID:*** **551507086-0056**

Sample Description: KITCHEN BEHIND FRIDGE/BROWN AND ORANGE SQUARE PATTERN SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown	0.0%	98.7%	**1.3% Chrysotile**	

Client Sample ID: 44-SF-02 ***Lab Sample ID:*** **551507086-0057**

Sample Description: BATHROOM BY WATER HEATER/GREY SQUARE PEBBLE PATTERN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	88.4%	**11.6% Chrysotile**	

Analyst(s):

John Biesiadecki	PLM (13) 400 PLM Pt Ct (1)
Jon Delos Santos	PLM Grav. Reduction (23)
Natalie D'Amico	PLM (8) 400 PLM Pt Ct (1)
Romeo Samson	PLM Grav. Reduction (5)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201520:54:26

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or 551507087
CustomerID: 55JACQ30L
CustomerPO: 123220330
ProjectID:

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - 4 PLEX**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
41-P-01	*551507087-0001*		7/7/2015	<90 ppm
	Site: INTERIOR WALL ON WEST SIDE OF BEDROOM - UNIT 1 Desc: WHITE			
41-P-02	*551507087-0002*		7/7/2015	<90 ppm
	Site: EXTERIOR DOOR - UNIT 1 Desc: BLUE			
43-P-01	*551507087-0003*		7/7/2015	<110 ppm
	Site: INTERIOR WALL IN BATHROOM BY WATER HEATER - UNIT 3 Desc: CREAM			
44-P-01	*551507087-0004*		7/7/2015	<90 ppm
	Site: INTERIOR EAST WALL IN BATHROOM - UNIT 4 Desc: WHITE			
44-P-02	*551507087-0005*		7/7/2015	<250 ppm
	Site: INTERIOR EAST WALL IN KITCHEN - UNIT 4 Desc: RED			
44-P-03	*551507087-0006*		7/7/2015	<230 ppm
	Site: INTERIOR WEST WALL IN BEDROOM - UNIT 4 Desc: YELLOW			
44-P-04	*551507087-0007*		7/7/2015	<510 ppm
	Site: INTERIOR NORTH WALL IN LIVING ROOM - UNIT 4 Desc: GREEN			

Insufficient sample to reach reporting limit for sample #551507087 -0003/ -0005/ -0006/ -0007.

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:18:45

APPENDIX C
FINDINGS AND RECOMMENDATIONS
8-PLEX

C-4.0 FINDINGS—8-PLEX

The 8-Plex was reportedly constructed in 1978 and is four, two storey residential structures with similarly constructed/finished residential units.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

C-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Assorted caulking materials
- Assorted vinyl sheet flooring patterns and types
- Incandescent light heat shields
- Roofing shingles
- Footing Liner
- Footing wrap
- Building paper
- Drywall joint compound

Seventy-eight samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical result is presented in Table C-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table C-4.1.1 Suspected ACM Sample Collection and Analysis Summary 8-Plex, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
8-Plex—Unit 1			
81-WPC-01A	Black window pane caulking	Stairwell landing window	None Detected
81-WPC-01B	Black window pane caulking	Bedroom on second floor	None Detected
81-WPC-01C	Black window pane caulking	Bedroom on second floor	None Detected
81-DC-01A	Grey door caulking	Exterior sliding glass door on deck	None Detected
81-DC-01B	Grey door caulking	Exterior sliding glass door on deck	None Detected
81-DC-01C	Grey door caulking	Exterior sliding glass door on deck	None Detected
81-SF-01	**Tan patterned sheet flooring**	**First floor closet**	**9.4% Chrysotile**
8-Plex—Unit 2			
82-HS-01A	**Incandescent light heat shield**	**Second floor bedroom**	**30% Chrysotile**
82-HS-01B	**Incandescent light heat shield**	**Second floor bedroom**	**Stop Positive (Not Analyzed)**
82-HS-01C	**Incandescent light heat shield**	**Second floor bedroom**	**Stop Positive (Not Analyzed)**
82-DC-01A	Clear door caulking	Exterior sliding glass door on deck	None Detected
82-DC-01B	Clear door caulking	Exterior sliding glass door on deck	None Detected
82-DC-01C	Clear door caulking	Exterior sliding glass door on deck	None Detected
82-WPC-01A	Black window pane caulking	First floor window in living room	None Detected
82-WPC-01B	Black window pane caulking	Second floor bathroom window	None Detected
82-WPC-01C	Black window pane caulking	Second floor bedroom window	None Detected
82-SF-01	**Brown pebble pattern sheet flooring**	**First floor by stairwell**	**6.8% Chrysotile**
82-SF-02	Blue patterned sheet flooring	Second floor in bathroom	None Detected
8-Plex—Unit 3			
83-SF-01	**Tan patterned sheet flooring**	**First floor kitchen**	**17.2% Chrysotile**

Table C-4.1.1 Suspected ACM Sample Collection and Analysis Summary 8-Plex, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
83-WPC-01A	Black window pane caulking	First floor living room	None Detected
83-WPC-01B	Black window pane caulking	Second floor bedroom	None Detected
83-WPC-01C	Black window pane caulking	Second floor bedroom	None Detected
83-DC-01A	Black door caulking	Exterior sliding glass door on deck	None Detected
83-DC-01B	Black door caulking	Exterior sliding glass door on deck	None Detected
83-DC-01C	Black door caulking	Exterior sliding glass door on deck	None Detected
8-Plex—Unit 4			
84-SF-01	**Tan patterned sheet flooring**	**First floor closet**	**10.7% Chrysotile**
84-WPC-01A	Black window pane caulking	Second floor bathroom window	None Detected
84-WPC-01B	Black window pane caulking	Second floor bedroom window	None Detected
84-WPC-01C	Black window pane caulking	Second floor bedroom window	None Detected
84-DC-01A	Black door caulking	Exterior sliding glass door on deck	None Detected
84-DC-01B	Black door caulking	Exterior sliding glass door on deck	None Detected
84-DC-01C	Black door caulking	Exterior sliding glass door on deck	None Detected
8-Plex—Unit 5			
85-SF-01	**Brown patterned sheet flooring**	**Interior first floor at bottom of stairs**	**10.2% Chrysotile**
85-WPC-01A	Black window pane caulking	Interior first floor window at bottom of stairs	None Detected
85-WPC-01B	Black window pane caulking	Interior first floor window in living room	None Detected
85-WPC-01C	Black window pane caulking	Interior second floor window in bathroom	None Detected
85-RS-01A	Black roofing shingle	On exterior truss under unit	None Detected
85-RS-01B	Black roofing shingle	On exterior truss under unit	None Detected
85-RS-01C	Black roofing shingle	On exterior truss under unit	None Detected
85-FL-01A	Black footing liner	On exterior under unit	None Detected

Table C-4.1.1 Suspected ACM Sample Collection and Analysis Summary 8-Plex, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
85-FL-01B	Black footing liner	On exterior under unit	None Detected
85-FL-01C	Black footing liner	On exterior under unit	None Detected
85-FW-01A	Black footing wrap	On exterior under unit	None Detected
85-FW-01B	Black footing wrap	On exterior under unit	None Detected
85-FW-01C	Black footing wrap	On exterior under unit	None Detected
85-DC-01A	Grey door caulking	Exterior sliding glass door on deck	None Detected
85-DC-01B	Grey door caulking	Exterior sliding glass door on deck	None Detected
85-DC-01C	Grey door caulking	Exterior sliding glass door on deck	None Detected
85-BP-01A	Black building paper	Roof at front door	None Detected
85-BP-01B	Black building paper	Roof at front door	None Detected
85-BP-01C	Black building paper	Roof at front door	None Detected
85-RS-01A	Black roofing shingle	Roof at front door	None Detected
85-RS-01B	Black roofing shingle	Roof at front door	None Detected
85-RS-01C	Black roofing shingle	Roof at front door	None Detected
8-Plex—Unit 6			
86-SF-01	**Brown patterned sheet flooring**	**Interior kitchen on first floor**	**19.1% Chrysotile**
86-WPC-01A	Black window pane caulking	Interior window on first floor at bottom of stairs	None Detected
86-WPC-01B	Black window pane caulking	Interior window on first floor in living room	None Detected
86-WPC-01C	Black window pane caulking	Interior window on second floor in bathroom	None Detected
86-DC-01A	Grey door caulking	Exterior sliding glass door on deck	None Detected
86-DC-01B	Grey door caulking	Exterior sliding glass door on deck	None Detected
86-DC-01C	Grey door caulking	Exterior sliding glass door on deck	None Detected
86-DJC-01A	Drywall joint compound	Second floor bedroom wall	None Detected
86-DJC-01B	Drywall joint compound	Second floor bedroom wall	None Detected
86-DJC-01C	Drywall joint compound	Second floor bedroom wall	None Detected
8-Plex—Unit 7			
87-SF-01	**Cream patterned sheet flooring**	**Interior closest on first floor**	**7.0% Chrysotile**
87-DC-01A	Grey door caulking	Exterior sliding glass door on deck	None Detected

Table C-4.1.1 Suspected ACM Sample Collection and Analysis Summary 8-Plex, Ucluelet, BC

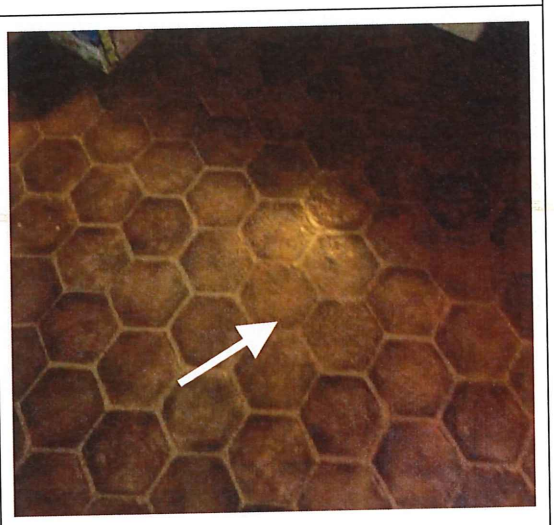
Sample Number	Material Description	Sample Location	Result (%/type asbestos)
87-DC-01B	Grey door caulking	Exterior sliding glass door on deck	None Detected
87-DC-01C	Grey door caulking	Exterior sliding glass door on deck	None Detected
87-WPC-01A	Black window pane caulking	First floor window in living room	None Detected
87-WPC-01B	Black window pane caulking	Second floor bathroom window	None Detected
87-WPC-01C	Black window pane caulking	Second floor bedroom window	None Detected
8-Plex—Unit 8			
88-SF-01	**Brown patterned sheet flooring**	**Interior closet on first floor**	**8.4% Chrysotile**
88-WPC-01A	Black window pane caulking	Interior window on first floor at bottom of stairs	None Detected
88-WPC-01B	Black window pane caulking	Interior bathroom window on second floor	None Detected
88-WPC-01C	Black window pane caulking	Interior hallway window on second floor	None Detected
88-DC-01A	Grey door caulking	Exterior sliding glass door on deck	None Detected
88-DC-01B	Grey door caulking	Exterior sliding glass door on deck	None Detected
88-DC-01C	Grey door caulking	Exterior sliding glass door on deck	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table C-4.1.2, below were identified as ACMs.

Table C-4.1.2 Summary of Identified ACMs 8-Plex, Ucluelet, BC

Identified ACM Description and Condition Information		Photo
Tan/cream hexagon patterned sheet flooring in first floor kitchen and closet and second floor washrooms of units 1, 3, 4 and 7.		
Friability	Non-friable in situ, friable during removal/disturbance	
Condition	Good	
Content	7.0-17.2% Chrysotile	
Heat shields in Unit 2 behind light fixtures on first floor (by stairwell) and second floor (in both bedrooms and hallway).		
Friability	Friable	
Condition	Good	
Content	30% Chrysotile	

Table C-4.1.2 Summary of Identified ACMs
8-Plex, Ucluelet, BC

Identified ACM Description and Condition Information		Photo
Brown pebble pattern sheet flooring in Unit 2 on first floor by stairwell.		No photo available.
Friability	Non-friable in situ, friable during removal/disturbance	
Condition	Good	
Content	6.8% Chrysotile	
Brown hexagon patterned sheet flooring in first floor kitchen and closet and second floor washrooms of Units 5, 6, 8 and in Unit 2 kitchen.		
Friability	Non-friable in situ, friable during removal/disturbance	
Condition	Good	
Content	8.4-19.1% Chrysotile	

C-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment
- Vent and pipe flashings

With respect to paint, 25 paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table C-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table C-4.2.1 Suspected LCP Sample Collection and Analysis Summary 8-Plex, Ucluelet, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
8-Plex Unit 1				
81-P-01	**Brown**	**Interior front door**	**34,000**	**Yes**
81-P-02	Cream	Interior bedroom wall by closet on second floor	<300	No
81-P-03	White	Interior bedroom ceiling on second floor	<120	No
8-Plex Unit 2				
82-P-01	**Yellow**	**Interior door frame on second floor**	**3,000**	**Yes**
82-P-02	**Brown**	**Interior walls in bathroom on second floor**	**610**	**Yes**
8-Plex Unit 3				
83-P-01	**Yellow**	**Interior closet door on first floor**	**3,000**	**Yes**
83-P-02	**Brown**	**Interior bedroom door on first floor**	**3,700**	**Yes**
83-P-03	White	Second floor bedroom ceiling	360	No
83-P-04	Cream	Interior walls on stair landing	<90	No
8-Plex Unit 4				
84-P-01	**Brown**	**Interior front door on first floor**	**26,000**	**Yes**
84-P-02	White	Interior ceiling on living room ceiling area	90	No
84-P-03	Cream	Interior closet wall on first floor	<190	No
8-Plex Unit 5				
85-P-01	Cream	Interior walls on second floor closet	<560	No
85-P-02	Blue	Exterior walls by back deck	<90	No
85-P-03	White	Interior ceiling on second floor bedroom	230	No
85-P-04	**Brown**	**Interior front door on first floor**	**30,000**	**Yes**
8-Plex Unit 6				
86-P-01	Brown	Interior front door on first floor	510	No

Table C-4.2.1 Suspected LCP Sample Collection and Analysis Summary 8-Plex, Ucluelet, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
86-P-02	Cream	Interior walls on second floor bedroom	<170	No
86-P-03	White	Interior ceiling on second floor bedroom	<170	No
8-Plex Unit 7				
87-P-01	**Brown**	**Interior bedroom door on first floor**	**31,000**	**Yes**
87-P-02	Cream	Interior walls on first floor bedroom closet	<160	No
87-P-03	White	Interior ceiling on second floor hallway	<90	No
8-Plex Unit 8				
88-P-01	**Brown**	**Interior front door on first floor**	**12,000**	**Yes**
88-P-02	Cream	Interior closet walls on second floor	<120	No
88-P-03	White	Interior ceiling in bedroom of second floor	380	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table C-4.2.2, below were identified as LCPs.

Table C-4.2.2 Summary of Identified LCPs 8-Plex, Ucluelet, BC

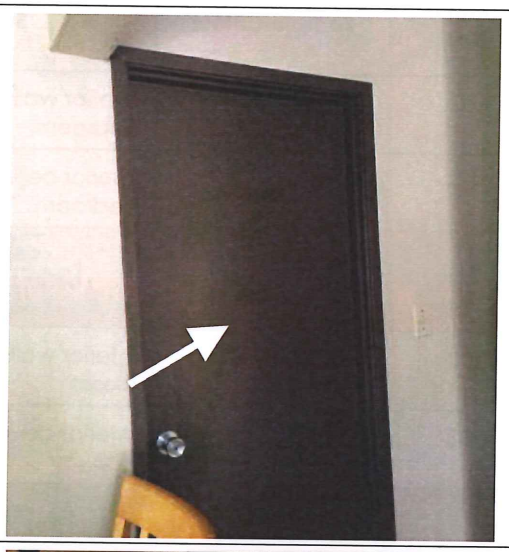
Identified LCP Description	Photo
Brown colored paint on the interior doors of Units 1, 3, 4, 5, 6, 7, and 8. This paint was observed to be in good condition (not bubbling, flaking or peeling).	
Yellow colored paint on the interior doors and frames of Units 2 and 3. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

Table C-4.2.2 Summary of Identified LCPs
8-Plex, Ucluelet, BC

Identified LCP Description	Photo
Brown colored paint on the interior bathroom walls of Unit 2. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

C-4.3 Polychlorinated Biphenyls

No suspected PCB-containing electrical equipment was observed.

C-4.4 Mercury

No suspected mercury-containing equipment was observed.

C-4.5 Mould

No mould or moisture damage was observed during the assessment.

C-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

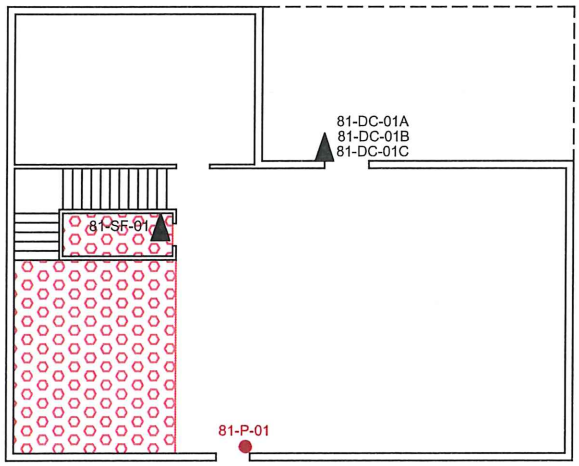
C-4.1 Silica

Silica is presumed to be present in concrete of the subject building.

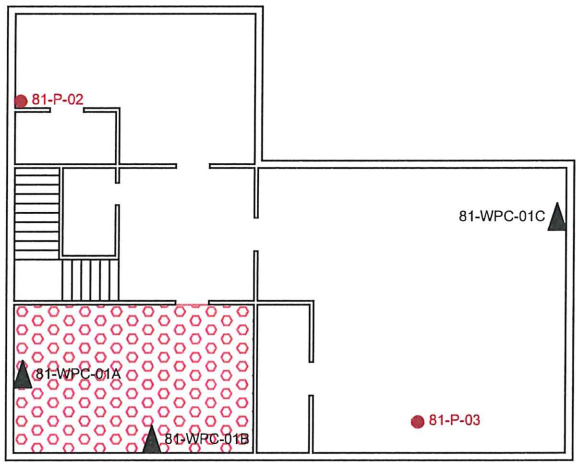
C-5.0 RECOMMENDATIONS—8-PLEX

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

8 - PLEX UNIT #1

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

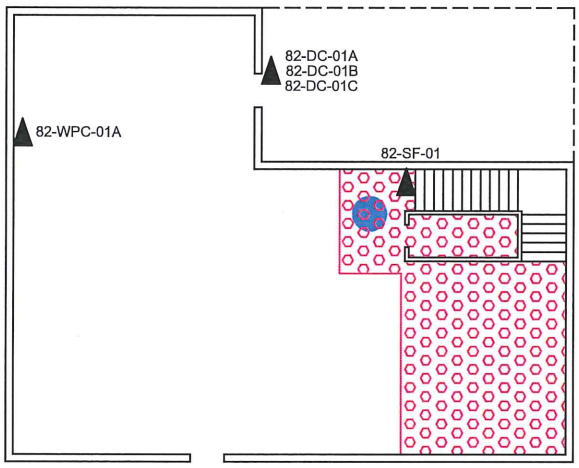
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070129 PK/DM
App'd By:	TW

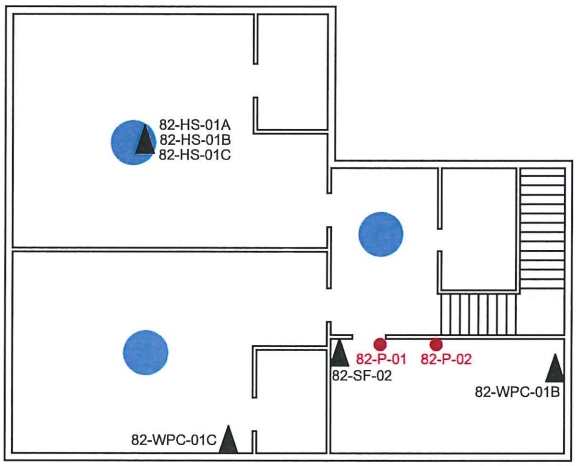
Dwg. No.: C1

Stantec

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING
- ASBESTOS-CONTAINING HEAT SHIELD

8 - PLEX UNIT #2

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

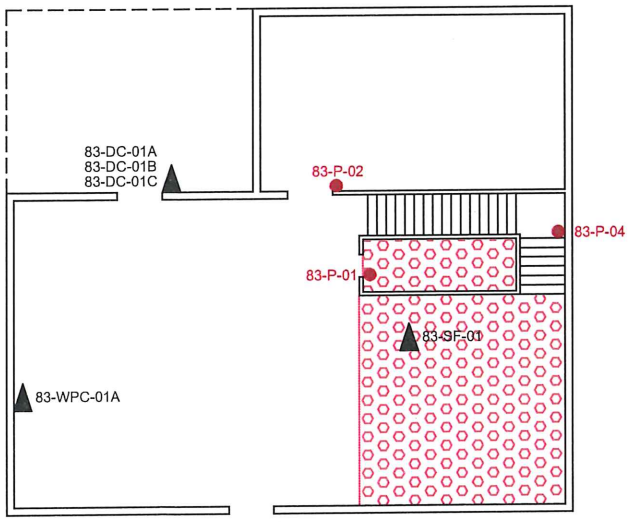
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100027 PK/DM
App'd By:	TW

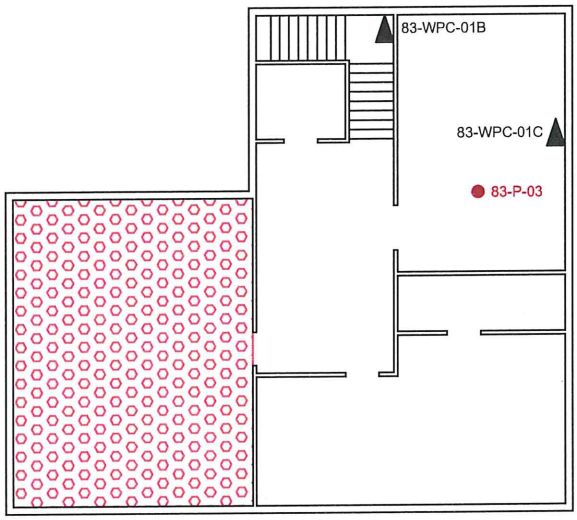
Dwg. No.: C2

Stantec

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

8 - PLEX UNIT #3

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

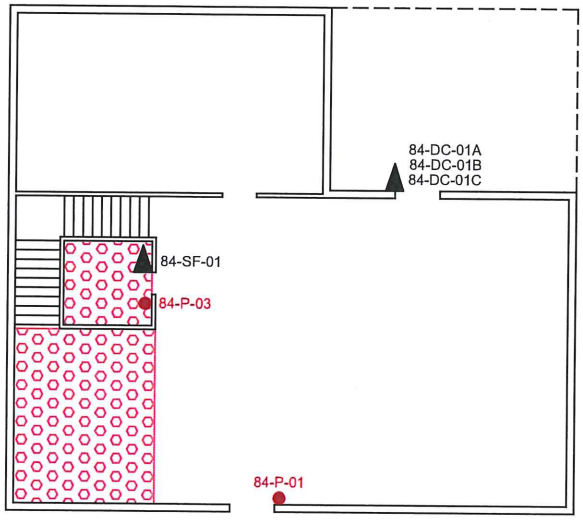
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070131 PK/DM
App'd By:	TW

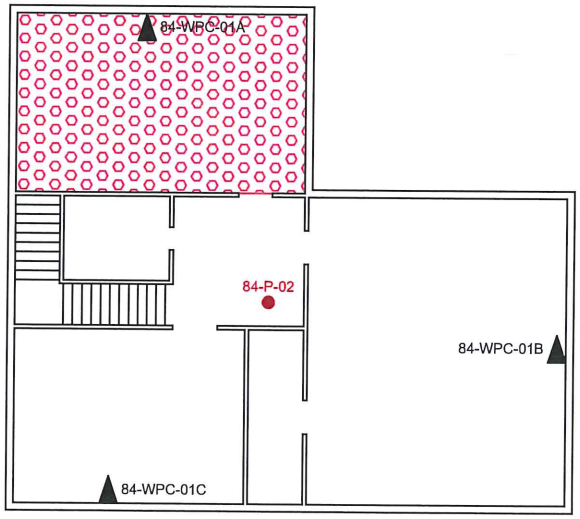
Dwg. No.: C3

Stantec

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

8 - PLEX UNIT #4

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

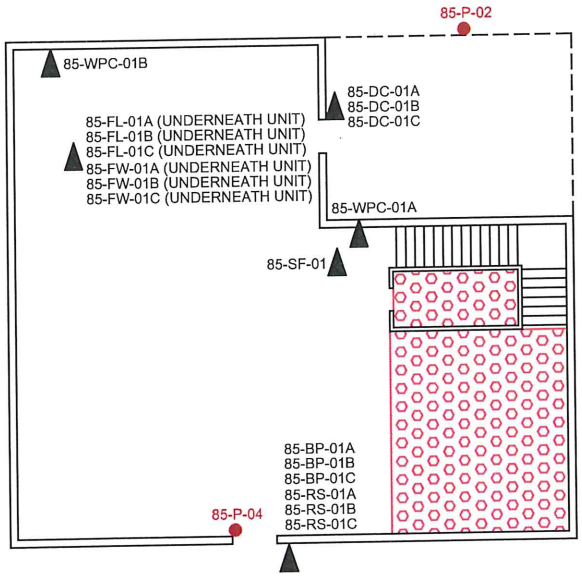
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100028 PK/DM
App'd By:	TW

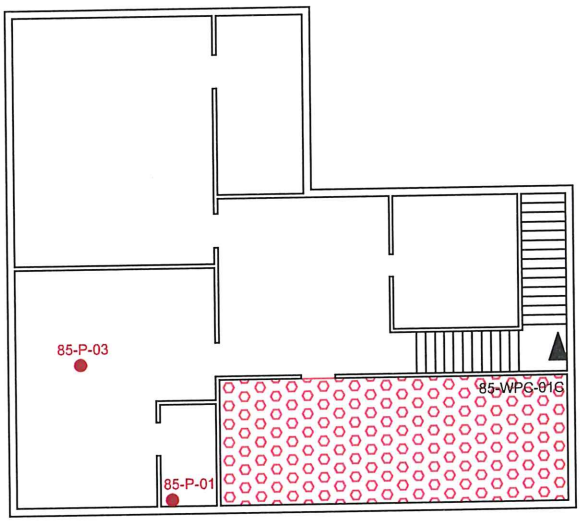
Dwg. No.: C4

Stantec

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

8 - PLEX UNIT #5

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

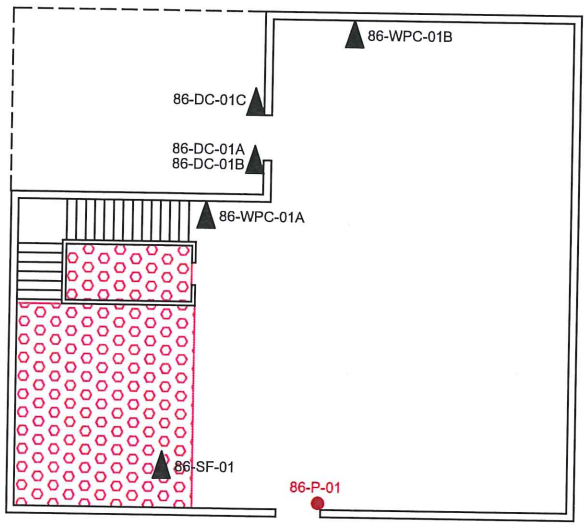
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100029 PK/DM
App'd By:	TW

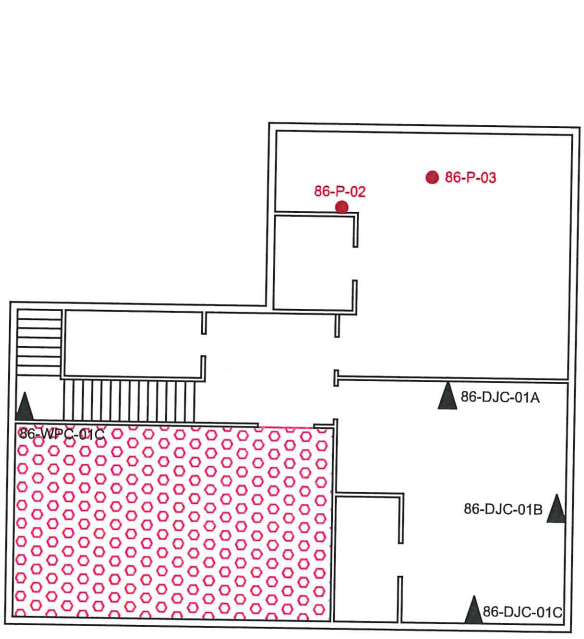
Dwg. No.: C5

Stantec

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

8 - PLEX UNIT #6

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

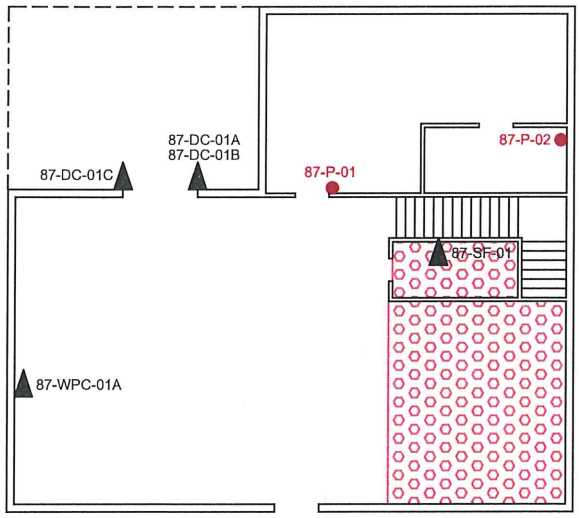
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070133 PK/DM
App'd By:	TW

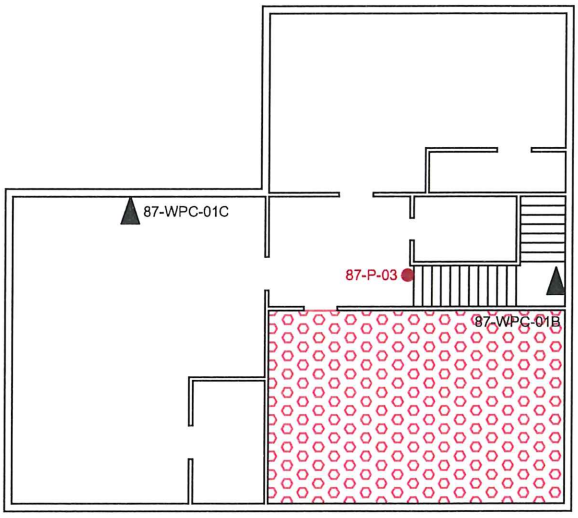
Dwg. No.: C6

Stantec

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

8 - PLEX UNIT #7

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

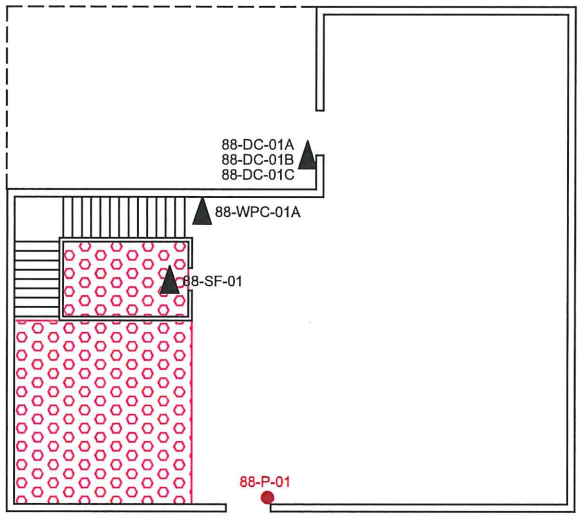
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070152 PK/DM
App'd By:	TW

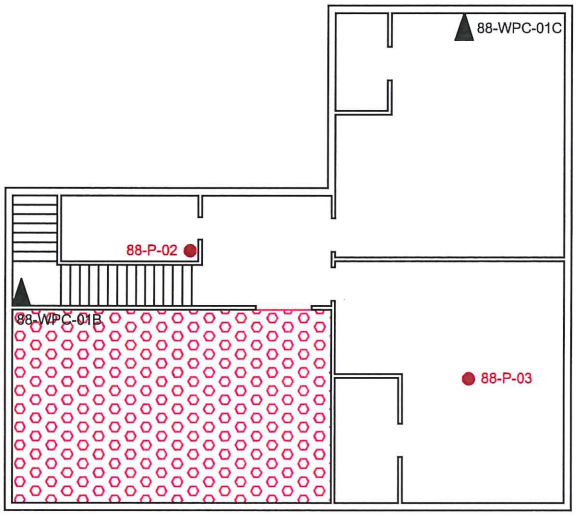
Dwg. No.: C7

Stantec

Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR

8 - PLEX UNIT #8

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING VINYL SHEET FLOORING

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD PK/DM SL2015070134
App'd By:	TW

Dwg. No.: C8

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 - 8 PLEX

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 81-WPC-01A **Lab Sample ID:** 551507085-0001
Sample Description: STAIRWELL LANDING WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 81-WPC-01B **Lab Sample ID:** 551507085-0002
Sample Description: BEDROOM ON SECOND FLOOR/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: 81-WPC-01C **Lab Sample ID:** 551507085-0003
Sample Description: BEDROOM ON SECOND FLOOR/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 81-DC-01A **Lab Sample ID:** 551507085-0004
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 81-DC-01B **Lab Sample ID:** 551507085-0005
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 81-DC-01C **Lab Sample ID:** 551507085-0006
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 81-SF-01 **Lab Sample ID:** 551507085-0007
Sample Description: FIRST FLOOR CLOSET/TAN PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Tan	0.0%	90.6%	**9.4% Chrysotile**	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 82-HS-01A ***Lab Sample ID:*** **551507085-0008**
Sample Description: SECOND FLOOR BEDROOM/HEAT SHIELD

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/07/2015	Gray	0%	70%	**30% Chrysotile**	

Client Sample ID: 82-HS-01B ***Lab Sample ID:*** **551507085-0009**
Sample Description: SECOND FLOOR BEDROOM/HEAT SHIELD

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/07/2015				Stop Positive (Not Analyzed)	

Client Sample ID: 82-HS-01C ***Lab Sample ID:*** **551507085-0010**
Sample Description: SECOND FLOOR BEDROOM/HEAT SHIELD

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/07/2015				Stop Positive (Not Analyzed)	

Client Sample ID: 82-DC-01A ***Lab Sample ID:*** **551507085-0011**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/CLEAR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: 82-DC-01B ***Lab Sample ID:*** **551507085-0012**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/CLEAR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: 82-DC-01C ***Lab Sample ID:*** **551507085-0013**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/CLEAR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: 82-WPC-01A ***Lab Sample ID:*** **551507085-0014**
Sample Description: FIRST FLOOR WINDOW IN LIVING ROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: 82-WPC-01B ***Lab Sample ID:*** **551507085-0015**
Sample Description: SECOND FLOOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 82-WPC-01C **Lab Sample ID:** 551507085-0016
Sample Description: SECOND FLOOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 82-SF-01 **Lab Sample ID:** 551507085-0017
Sample Description: FIRST FLOOR BY STAIRWELL/BROWN PEBBLE PATTERN SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	93.2%	**6.8% Chrysotile**	

Client Sample ID: 82-SF-02 **Lab Sample ID:** 551507085-0018
Sample Description: SECOND FLOOR IN BATHROOM/BLUE PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Green	0.0%	100%	None Detected	

Client Sample ID: 83-SF-01 **Lab Sample ID:** 551507085-0019
Sample Description: FIRST FLOOR KITCHEN/TAN PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Tan	0.0%	82.8%	**17.2% Chrysotile**	

Client Sample ID: 83-WPC-01A **Lab Sample ID:** 551507085-0020
Sample Description: FIRST FLOOR LIVING ROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 83-WPC-01B **Lab Sample ID:** 551507085-0021
Sample Description: SECOND FLOOR BEDROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: 83-WPC-01C **Lab Sample ID:** 551507085-0022
Sample Description: SECOND FLOOR BEDROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 83-DC-01A **Lab Sample ID:** 551507085-0023
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/BLACK DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 83-DC-01B ***Lab Sample ID:*** **551507085-0024**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/BLACK DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 83-DC-01C ***Lab Sample ID:*** **551507085-0025**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/BLACK DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 84-SF-01 ***Lab Sample ID:*** **551507085-0026**
Sample Description: FIRST FLOOR CLOSET/TAN PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Tan	0.0%	89.3%	**10.7% Chrysotile**	

Client Sample ID: 84-WPC-01A ***Lab Sample ID:*** **551507085-0027**
Sample Description: SECOND FLOOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 84-WPC-01B ***Lab Sample ID:*** **551507085-0028**
Sample Description: SECOND FLOOR BEDROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 84-WPC-01C ***Lab Sample ID:*** **551507085-0029**
Sample Description: SECOND FLOOR BEDROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 84-DC-01A ***Lab Sample ID:*** **551507085-0030**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/BLACK DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 84-DC-01B ***Lab Sample ID:*** **551507085-0031**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/BLACK DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 84-DC-01C **Lab Sample ID:** 551507085-0032
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/BLACK DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-SF-01 **Lab Sample ID:** 551507085-0033
Sample Description: INTERIOR FIRST FLOOR AT BOTTOM OF STAIRS/BROWN PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	89.8%	**10.2% Chrysotile**	

Client Sample ID: 85-WPC-01A **Lab Sample ID:** 551507085-0034
Sample Description: INTERIOR FIRST FLOOR WINDOW AT BOTTOM OF STAIRS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-WPC-01B **Lab Sample ID:** 551507085-0035
Sample Description: INTERIOR FIRST FLOOR WINDOW IN LIVING ROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: 85-WPC-01C **Lab Sample ID:** 551507085-0036
Sample Description: INTERIOR SECOND FLOOR WINDOW IN BATHROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-RS-01A **Lab Sample ID:** 551507085-0037
Sample Description: ON EXTERIOR TRUSS UNDER UNIT/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-RS-01B **Lab Sample ID:** 551507085-0038
Sample Description: ON EXTERIOR TRUSS UNDER UNIT/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-RS-01C **Lab Sample ID:** 551507085-0039
Sample Description: ON EXTERIOR TRUSS UNDER UNIT/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 85-FL-01A **Lab Sample ID:** 551507085-0040
Sample Description: ON EXTERIOR UNDER UNIT/BLACK FOOTING LINER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-FL-01B **Lab Sample ID:** 551507085-0041
Sample Description: ON EXTERIOR UNDER UNIT/BLACK FOOTING LINER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-FL-01C **Lab Sample ID:** 551507085-0042
Sample Description: ON EXTERIOR UNDER UNIT/BLACK FOOTING LINER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 85-FW-01A **Lab Sample ID:** 551507085-0043
Sample Description: ON EXTERIOR UNDER UNIT/BLACK FOOTING WRAP

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/07/2015	Brown	80%	20%	None Detected	

Client Sample ID: 85-FW-01B **Lab Sample ID:** 551507085-0044
Sample Description: ON EXTERIOR UNDER UNIT/BLACK FOOTING WRAP

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/07/2015	Gray	80%	20%	None Detected	

Client Sample ID: 85-FW-01C **Lab Sample ID:** 551507085-0045
Sample Description: ON EXTERIOR UNDER UNIT/BLACK FOOTING WRAP

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	80%	20%	None Detected	

Client Sample ID: 85-DC-01A **Lab Sample ID:** 551507085-0046
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 85-DC-01B **Lab Sample ID:** 551507085-0047
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Lab Sample ID: **551507085-0048**

Client Sample ID: 85-DC-01C
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Lab Sample ID: **551507085-0049**

Client Sample ID: 85-BP-01A
Sample Description: ROOF AT FRONT DOOR/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507085-0050**

Client Sample ID: 85-BP-01B
Sample Description: ROOF AT FRONT DOOR/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507085-0051**

Client Sample ID: 85-BP-01C
Sample Description: ROOF AT FRONT DOOR/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507085-0052**

Client Sample ID: 85-RS-02A
Sample Description: ROOF AT FRONT DOOR/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507085-0053**

Client Sample ID: 85-RS-02B
Sample Description: ROOF AT FRONT DOOR/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507085-0054**

Client Sample ID: 85-RS-02C
Sample Description: ROOF AT FRONT DOOR/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507085-0055**

Client Sample ID: 86-SF-01
Sample Description: INTERIOR KITCHEN ON FIRST FLOOR/BROWN PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown	0.0%	80.9%	**19.1% Chrysotile**	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 86-WPC-01A
Lab Sample ID: **551507085-0056**
Sample Description: INTERIOR WINDOW ON FIRST FLOOR AT BOTTOM OF STAIRS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 86-WPC-01B
Lab Sample ID: **551507085-0057**
Sample Description: INTERIOR WINDOW ON FIRST FLOOR IN LIVING ROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 86-WPC-01C
Lab Sample ID: **551507085-0058**
Sample Description: INTERIOR WINDOW ON SECOND FLOOR IN BATHROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 86-DC-01A
Lab Sample ID: **551507085-0059**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 86-DC-01B
Lab Sample ID: **551507085-0060**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 86-DC-01C
Lab Sample ID: **551507085-0061**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 86-DJC-01A
Lab Sample ID: **551507085-0062**
Sample Description: SECOND FLOOR BEDROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/07/2015	White/Yellow	0%	100%	None Detected	

Client Sample ID: 86-DJC-01B
Lab Sample ID: **551507085-0063**
Sample Description: SECOND FLOOR BEDROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/07/2015	White/Yellow	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 86-DJC-01C **Lab Sample ID:** **551507085-0064**
Sample Description: SECOND FLOOR BEDROOM WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White/Yellow	0%	100%	None Detected	

Client Sample ID: 87-SF-01 **Lab Sample ID:** **551507085-0065**
Sample Description: INTERIOR CLOSET ON FIRST FLOOR/CREAM PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Tan	0.0%	93.0%	**7.0% Chrysotile**	

Client Sample ID: 87-DC-01A **Lab Sample ID:** **551507085-0066**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: 87-DC-01B **Lab Sample ID:** **551507085-0067**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: 87-DC-01C **Lab Sample ID:** **551507085-0068**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: 87-WPC-01A **Lab Sample ID:** **551507085-0069**
Sample Description: FIRST FLOOR WINDOW IN LIVING ROOM/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: 87-WPC-01B **Lab Sample ID:** **551507085-0070**
Sample Description: SECOND FLOOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 87-WPC-01C **Lab Sample ID:** **551507085-0071**
Sample Description: SECOND FLOOR BATHROOM WINDOW/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: 88-SF-01 ***Lab Sample ID:*** **551507085-0072**
Sample Description: INTERIOR CLOSET ON FIRST FLOOR/BROWN PATTERNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown	0.0%	91.6%	**8.4% Chrysotile**	

Client Sample ID: 88-WPC-01A ***Lab Sample ID:*** **551507085-0073**
Sample Description: INTERIOR WINDOW ON FIRST FLOOR AT BOTTOM OF STAIRS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 88-WPC-01B ***Lab Sample ID:*** **551507085-0074**
Sample Description: INTERIOR BATHROOM WINDOW ON SECOND FLOOR/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 88-WPC-01C ***Lab Sample ID:*** **551507085-0075**
Sample Description: INTERIOR HALLWAY WINDOW ON SECOND FLOOR/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: 88-DC-01A ***Lab Sample ID:*** **551507085-0076**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 88-DC-01B ***Lab Sample ID:*** **551507085-0077**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: 88-DC-01C ***Lab Sample ID:*** **551507085-0078**
Sample Description: EXTERIOR SLIDING GLASS DOOR ON DECK/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507085
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

Jon Delos Santos	PLM (5) PLM Grav. Reduction (19)
Nicole Dimou	PLM (2)
Romeo Samson	PLM (5) PLM Grav. Reduction (45)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201523:00:24

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507088
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - 8 PLEX**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
81-P-01	*551507088-0001*		7/7/2015	34000 ppm
	Site: INTERIOR FRONT DOOR - UNIT 1 Desc: BROWN			
81-P-02	*551507088-0002*		7/7/2015	<300 ppm
	Site: INTERIOR BEDROOM WALL BY CLOSET ON SECOND FLOOR - Desc: UNIT 1 - CREAM			
81-P-03	*551507088-0003*		7/7/2015	<120 ppm
	Site: INTERIOR BEDROOM CEILING ON SECOND FLOOR - UNIT 1 Desc: WHITE			
82-P-01	*551507088-0004*		7/7/2015	3000 ppm
	Site: INTERIOR DOOR FRAME ON SECOND FLOOR - UNIT 2 Desc: YELLOW			
82-P-02	*551507088-0005*		7/7/2015	610 ppm
	Site: INTERIOR WALLS IN BATHROOM ON SECOND FLOOR - Desc: UNIT 2 - BROWN			
83-P-01	*551507088-0006*		7/7/2015	3000 ppm
	Site: INTERIOR CLOSET DOOR ON FIRST FLOOR - UNIT 3 Desc: YELLOW			
83-P-02	*551507088-0007*		7/7/2015	3700 ppm
	Site: INTERIOR BEDROOM DOOR ON FIRST FLOOR - UNIT 3 Desc: BROWN			
83-P-03	*551507088-0008*		7/7/2015	360 ppm
	Site: SECOND FLOOR BEDROOM CEILING - UNIT 3 Desc: WHITE			
83-P-04	*551507088-0009*		7/7/2015	<90 ppm
	Site: INTERIOR WALLS ON STAIR LANDING - UNIT 3 Desc: CREAM			
84-P-01	*551507088-0010*		7/7/2015	26000 ppm
	Site: INTERIOR FRONT DOOR ON FIRST FLOOR - UNIT 4 Desc: BROWN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/07/2015 16:34:22

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507088
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - 8 PLEX**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	Lab ID	Collected	Analyzed	Lead Concentration
84-P-02	551507088-0011		7/7/2015	90 ppm
	Site: INTERIOR CEILING ON LIVING ROOM CEILING AREA - Desc: UNIT 4 - WHITE			
84-P-03	551507088-0012		7/7/2015	<190 ppm
	Site: INTERIOR CLOSET WALL ON FIRST FLOOR - UNIT 4 Desc: CREAM			
85-P-01	551507088-0013		7/7/2015	<560 ppm
	Site: INTERIOR WALLS ON SECOND FLOOR CLOSET - UNIT 5 Desc: CREAM			
85-P-02	551507088-0014		7/7/2015	<90 ppm
	Site: EXTERIOR WALLS BY BACK DESK - UNIT 5 Desc: BLUE			
85-P-03	551507088-0015		7/7/2015	230 ppm
	Site: INTERIOR CEILING ON SECOND FLOOR BEDROOM - UNIT 5 Desc: WHITE			
85-P-04	551507088-0016		7/7/2015	30000 ppm
	Site: INTERIOR FRONT DOOR ON FIRST FLOOR - UNIT 5 Desc: BROWN			
86-P-01	551507088-0017		7/7/2015	510 ppm
	Site: INTERIOR FRONT DOOR ON FIRST FLOOR - UNIT 6 Desc: BROWN			
86-P-02	551507088-0018		7/7/2015	<170 ppm
	Site: INTERIOR WALLS ON SECOND FLOOR BEDROOM - UNIT 6 Desc: CREAM			
86-P-03	551507088-0019		7/7/2015	<170 ppm
	Site: INTERIOR CEILING ON SECOND FLOOR BEDROOM - UNIT 6 Desc: WHITE			
87-P-01	551507088-0020		7/7/2015	31000 ppm
	Site: INTERIOR BEDROOM DOOR ON FIRST FLOOR - UNIT 7 Desc: BROWN			
87-P-02	551507088-0021		7/7/2015	<160 ppm
	Site: INTERIOR WALLS ON FIRST FLOOR BEDROOM - UNIT 7 Desc: CREAM			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/07/2015 16:34:22

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507088
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - 8 PLEX**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
87-P-03	*551507088-0022*		7/7/2015	<90 ppm
	Site: INTERIOR CEILING ON SECOND FLOOR HALLWAY - UNIT 7 Desc: WHITE			
88-P-01	*551507088-0023*		7/7/2015	12000 ppm
	Site: INTERIOR FRONT DOOR ON FIRST FLOOR - UNIT 8 Desc: BROWN			
88-P-02	*551507088-0024*		7/7/2015	<120 ppm
	Site: INTERIOR CLOSET WALLS ON SECOND FLOOR - UNIT 8 Desc: CREAM			
88-P-03	*551507088-0025*		7/7/2015	380 ppm
	Site: INTERIOR CEILING IN BEDROOM OF SECOND FLOOR Desc: WHITE			

Insufficient sample to reach reporting limit for sample#551507088-0002/-0003/-0012/-0013/-0018/-0019/-0021/-0024.

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/07/2015 16:34:22

APPENDIX D
FINDINGS AND RECOMMENDATIONS
UCUELET LAUNDRY AND STORAGE

D-4.0 FINDINGS—UCLUELET LAUNDRY AND STORAGE

The Ucluelet Laundry and Storage was reportedly constructed in 1985 and is a one storey utility structure comprised mainly drywall and unfinished walls.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

D-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Vinyl sheet flooring
- Drywall joint compound
- Window pane liner
- Building paper

Ten samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table D-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table D-4.1.1 Suspected ACM Sample Collection and Analysis Summary Ucluelet Laundry and Storage, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
UL-SF-01	Brown and tan patterned sheet flooring	South west corner in laundry room	None Detected
UL-DJC-01A	Drywall joint compound	West wall of laundry room	None Detected
UL-DJC-01B	Drywall joint compound	East wall of laundry room	None Detected
UL-DJC-01C	Drywall joint compound	West wall of laundry room	None Detected
UL-WPL-01A	White paper window pane liner	North exterior window	None Detected
UL-WPL-01B	White paper window pane liner	North exterior window	None Detected

Table D-4.1.1 Suspected ACM Sample Collection and Analysis Summary Ucluelet Laundry and Storage, Ucluelet, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
UL-WPL-01C	White paper window pane liner	South exterior window	None Detected
UL-BP-01A	Black building paper	South wall of storage room	None Detected
UL-BP-01B	Black building paper	South wall of storage room	None Detected
UL-BP-01C	Black building paper	South wall of storage room	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

D-4.2 Lead

Lead is expected to be present in the following:

- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, one paint chip sample was obtained from the predominant suspected LCP application within the building. A summary of the sample type, location and analytical result is presented in Table D-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP sample submitted is attached to this Appendix.

Table D-4.2.1 Suspected LCP Sample Collection and Analysis Summary Ucluelet Laundry and Storage, Ucluelet, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
UL-P-01	White	Interior walls on west side of laundry room	<160	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

D-4.3 Polychlorinated Biphenyls

The two fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

D-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in two fluorescent light fixtures.

D-4.5 Mould

No mould or moisture damage was observed during the assessment.

D-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

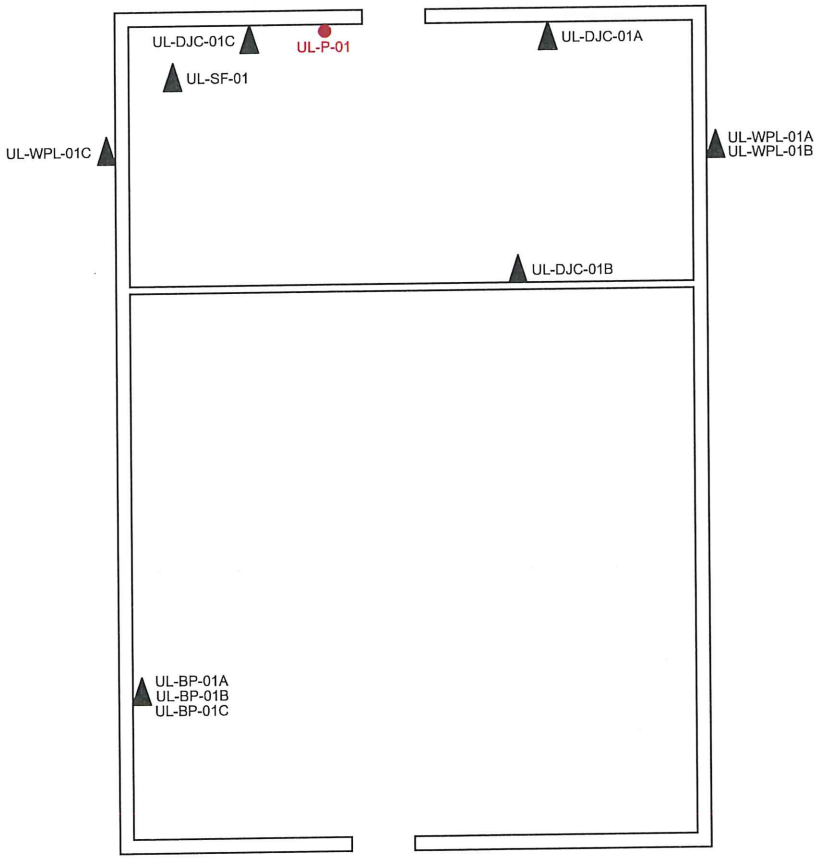
D-4.1 Silica

Silica is presumed to be present in concrete of the subject building.

D-5.0 RECOMMENDATIONS – UCLUELET LAUNDRY AND STORAGE

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



UCLUELET LAUNDRY AND STORAGE

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100030 PK/DM
App'd By:	TW

Dwg. No.: D

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507119
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 - UCLUELET LAUNDRY AND STORAGE

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: UL-SF-01 ***Lab Sample ID:*** **551507119-0001**

Sample Description: BROWN AND TAN PATTERNED SHEET FLOORING/SOUTH WEST CORNER IN LAUNDRY ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown/Yellow	0.0%	100%	None Detected	

Client Sample ID: UL-DJC-01A ***Lab Sample ID:*** **551507119-0002**

Sample Description: DRYWALL JOINT COMPOUND WEST WALL OF LAUNDRY ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: UL-DJC-01B ***Lab Sample ID:*** **551507119-0003**

Sample Description: DRYWALL JOINT COMPOUND EAST WALL OF LAUNDRY ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: UL-DJC-01C ***Lab Sample ID:*** **551507119-0004**

Sample Description: DRYWALL JOINT COMPOUND WEST WALL OF LAUNDRY ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: UL-WPL-01A ***Lab Sample ID:*** **551507119-0005**

Sample Description: WHITE PAPER WINDOW PANE LINER N. EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	90%	10%	None Detected	

Client Sample ID: UL-WPL-01B ***Lab Sample ID:*** **551507119-0006**

Sample Description: WHITE PAPER WINDOW PANE LINER N. EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	85%	15%	None Detected	

Client Sample ID: UL-WPL-01C ***Lab Sample ID:*** **551507119-0007**

Sample Description: WHITE PAPER WINDOW S. EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	80%	20%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507119
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: UL-BP-01A
Lab Sample ID: **551507119-0008**
Sample Description: BLACK BUILDING PAPER S.WALL OF STORAGE ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: UL-BP-01B
Lab Sample ID: **551507119-0009**
Sample Description: BLACK BUILDING PAPER S.WALL OF STORAGE ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: UL-BP-01C
Lab Sample ID: **551507119-0010**
Sample Description: BLACK BUILDING PAPER S.WALL OF STORAGE ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki	PLM (2) PLM Grav. Reduction (3)
Natalie D'Amico	PLM (4) PLM Grav. Reduction (1)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201515:35:52

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or 551507106
CustomerID: 55JACQ30L
CustomerPO: 123220330
ProjectID:

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - UCLUELET LAUNDRY AND STORAGE**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
	551507106-0001		7/6/2015	<160 ppm
	Site: INTERIOR WALLS ON WEST SIDE OF LAUNDRY ROOM - WHITE Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:46:56

APPENDIX E
FINDINGS AND RECOMMENDATIONS NEW ADMINISTRATION AND GENERATOR SHED

E-4.0 FINDINGS—NEW ADMINISTRATION AND GENERATOR SHED

The New Administration building was reportedly constructed in 2012 and is a one storey office structure comprised mainly of drywall walls. The Generator Shed is a one storey steel structure reportedly constructed in 1983.

The results of the assessment for each of the considered hazardous materials within the buildings are provided in the following sub-sections. No suspect ACM or LCP samples were taken from the New Administration building based on its construction date.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

E-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Pipe wrap
- Penetration sealant

Six samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

Based on the construction date of the New Administration Building ACMs are not suspected to be present, as such, no samples were taken.

A summary of the sample types, locations and analytical results is presented in Table E-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table E-4.1.1 Suspected ACM Sample Collection and Analysis Summary New Administration and Generator Shed, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
Generator Shed			
AG-PW-01A	White woven pipe wrap	Interior on piping	None Detected
AG-PW-01B	White woven pipe wrap	Interior on piping	None Detected
AG-PW-01C	White woven pipe wrap	Interior on piping	None Detected
AG-EPS-01A	Clear electrical penetration sealant	North exterior penetration	None Detected

Table E-4.1.1 Suspected ACM Sample Collection and Analysis Summary New Administration and Generator Shed, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
AG-EPS-01B	Clear electrical penetration sealant	North exterior penetration	None Detected
AG-EPS-01C	Clear electrical penetration sealant	North exterior penetration	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

E-4.2 Lead

Lead is expected to be present in the following:

- Solder used in electrical equipment

With respect to paint, two paint chip samples were obtained from the predominant suspected LCP applications within the Generator Shed. Based on the construction date of the New Administration Building LCPs are not suspected to be present, as such, no samples were taken. A summary of the sample types, locations and analytical results is presented in Table E-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table E-4.2.1 Suspected LCP Sample Collection and Analysis Summary New Administration and Generator Shed, Tofino, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
Generator Shed				
AG-P-01	Burgundy	Generator	<90	No
AG-P-02	Green	Exterior door	<150	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

E-4.3 Polychlorinated Biphenyls

Approximately 85 fluorescent light fixtures throughout the New Administration building were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

No suspected PCB-containing electrical equipment was observed in the Generator Shed.

E-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in approximately 85 fluorescent light fixtures throughout the New Administration building.

No suspected mercury-containing equipment was observed in the Generator Shed.

E-4.5 Mould

No mould or moisture damage was observed during the assessment.

E-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

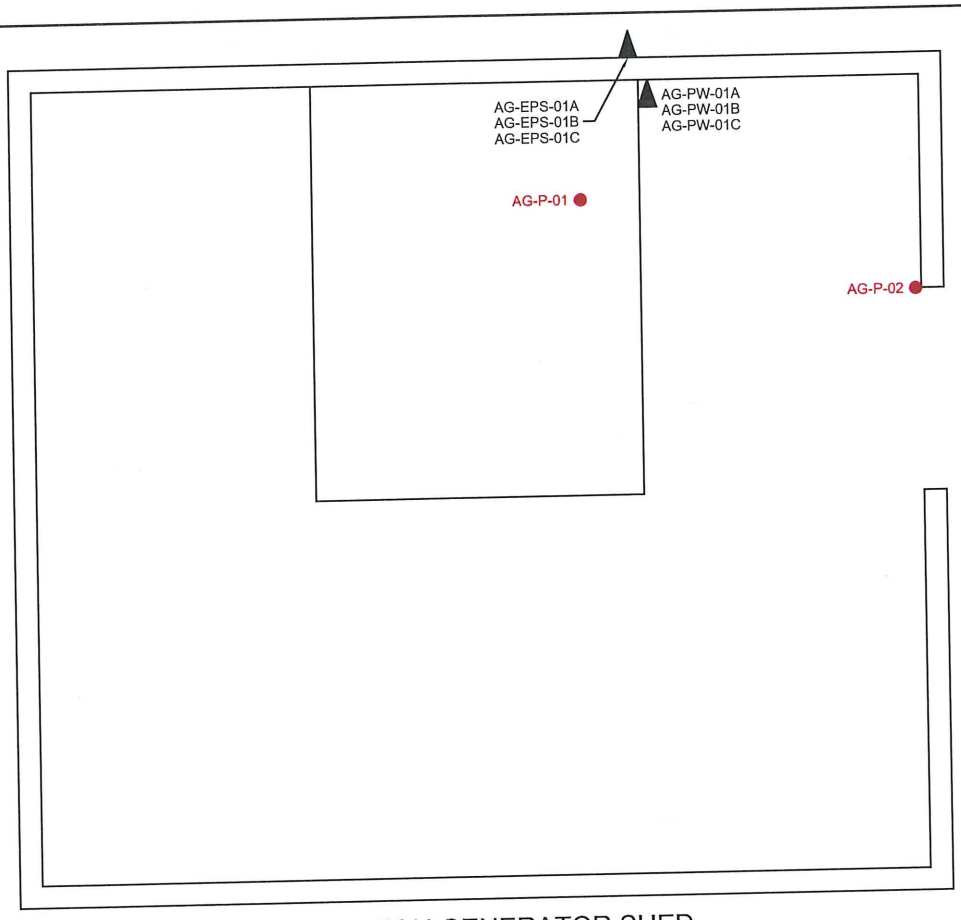
E-4.1 Silica

Silica is presumed to be present in concrete of the subject buildings.

E-5.0 RECOMMENDATIONS—NEW ADMINISTRATION AND GENERATOR SHED

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



ADMINISTRATION GENERATOR SHED

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070135 PK/DM
App'd By:	TW

Dwg. No.: E

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507127
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - ADMINISTRATION GENERATOR SHED

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: AG-PW-01A
Sample Description: WHITE WOVEN PIPE WRAP - NTERIOR ON PIPING
Lab Sample ID: **551507127-0001**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	95%	5%	None Detected	

Client Sample ID: AG-PW-01B
Sample Description: WHITE WOVEN PIPE WRAP - NTERIOR ON PIPING
Lab Sample ID: **551507127-0002**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	95%	5%	None Detected	

Client Sample ID: AG-PW-01C
Sample Description: WHITE WOVEN PIPE WRAP - NTERIOR ON PIPING
Lab Sample ID: **551507127-0003**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	90%	10%	None Detected	

Client Sample ID: AG--EPS-01A
Sample Description: CLEAR ELECTRICAL PENETRATION SEALANT- N. EXTERIOR/PENETRATION
Lab Sample ID: **551507127-0004**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: AG--EPS-01B
Sample Description: CLEAR ELECTRICAL PENETRATION SEALANT- N. EXTERIOR/PENETRATION
Lab Sample ID: **551507127-0005**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: AG--EPS-01C
Sample Description: CLEAR ELECTRICAL PENETRATION SEALANT- N. EXTERIOR/PENETRATION
Lab Sample ID: **551507127-0006**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507127
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

John Biesiadecki	PLM (1) PLM Grav. Reduction (1)
Natalie D'Amico	PLM (2)
Nicole Dimou	PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:01:45

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507105
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - ADMINISTRATION GENERATOR SHED**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
AG-P-01	*551507105-0001*		7/6/2015	<90 ppm
	Site: GENERATOR- BURGUNDY			
AG-P-02	*551507105-0002*		7/6/2015	<150 ppm
	Site: EXTERIOR DOOR - GREEN Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:45:39

APPENDIX F
FINDINGS AND RECOMMENDATIONS WEST COAST TRAIL PATROL CABINS (CAMPER CREEK, TSUQUADRA, TSOCOWIS)

F-4.0 FINDINGS—WEST COAST PATROL CABINS (CAMPER CREEK, TSUQUADRA, TSOCOWIS)

Camper Creek, Tsuquadra and Tscowis Patrol Cabins are estimated to have been constructed in the 1970s and are all one storey residential structures which are similarly constructed.

The results of the assessment for each of the considered hazardous materials within the buildings are provided in the following sub-sections.

Floor plan drawings of each of the buildings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

F-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Building paper
- Roofing felt
- Wood stove fire protector
- Chimney stack insulation
- Assorted caulkings and mastics
- Roofing shingles

Forty-four samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table F-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table F-4.1.1 Suspected ACM Sample Collection and Analysis Summary West Coast Patrol Cabins (Camper Creek, Tsuquadra, Tsocowis), West Coast Trail, BC

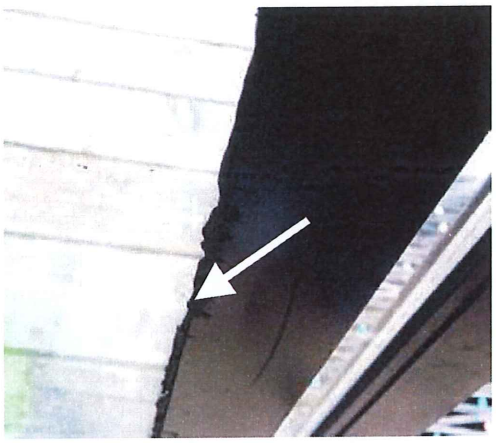
Sample Number	Material Description	Sample Location	Result (%/type asbestos)
Camper Creek Patrol Cabin			
CC-BP-01A	White building paper	North side of building	None Detected
CC-BP-01B	White building paper	North side of building	None Detected
CC-BP-01C	White building paper	North side of building	None Detected
CC-RF-01A	Black roofing felt	South side of mud room on ceiling	None Detected
CC-RF-01B	Black roofing felt	South side of mud room on ceiling	None Detected
CC-RF-01C	Black roofing felt	South side of mud room on ceiling	None Detected
CC-FP-01A	Wood stove fire protector	North side of mud room	None Detected
CC-FP-01B	Wood stove fire protector	North side of mud room	None Detected
CC-FP-01C	Wood stove fire protector	North side of mud room	None Detected
CC-SI-01A	Chimney stack insulation	Fireplace in mud room	None Detected
CC-SI-01B	Chimney stack insulation	Fireplace in mud room	None Detected
CC-SI-01C	Chimney stack insulation	Fireplace in mud room	None Detected
CC-DPC-01A	**Black door pane caulking**	**Sliding glass door to mud room**	**2.0% Chrysotile**
CC-DPC-01B	**Black door pane caulking**	**Sliding glass door to mud room**	**Stop Positive (Not Anlayzed)**
CC-DPC-01C	**Black door pane caulking**	**Sliding glass door to mud room**	**Stop Positive (Not Anlayzed)**
Tsuquadra Patrol Cabin			
TQ-RS-01A	Black roofing shingle	East exterior roof	None Detected
TQ-RS-01B	Black roofing shingle	East exterior roof	None Detected
TQ-RS-01C	Black roofing shingle	East exterior roof	None Detected
TQ-RM-01A	Black roof mastic	East exterior roof on stack	None Detected
TQ-RM-01B	Black roof mastic	East exterior roof on stack	None Detected
TQ-RM-01C	Black roof mastic	East exterior roof on stack	None Detected
TQ-RF-01A	Black roofing felt	Northeast exterior roof	None Detected
TQ-RF-01B	Black roofing felt	Northeast exterior roof	None Detected
TQ-RF-01C	Black roofing felt	Northeast exterior roof	None Detected
TQ-RF-02A	Black roofing felt	South exterior roof	None Detected
TQ-RF-02B	Black roofing felt	South exterior roof	None Detected
TQ-RF-02C	Black roofing felt	South exterior roof	None Detected

Table F-4.1.1 Suspected ACM Sample Collection and Analysis Summary West Coast Patrol Cabins (Camper Creek, Tsuquadra, Tsocowis), West Coast Trail, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
TQ-WM-01A	Cream wall mastic	Interior mud room on north wall	None Detected
TQ-WM-01B	Cream wall mastic	Interior mud room on north wall	None Detected
TQ-WM-01C	Cream wall mastic	Interior mud room on east wall	None Detected
TQ-SI-01A	Grey stack insulation	Interior stack in south room	None Detected
TQ-SI-01B	Grey stack insulation	Interior stack in south room	None Detected
TQ-SI-01C	Grey stack insulation	Interior stack in south room	None Detected
Tsocowis Patrol Cabin			
TC-BP-01A	White building paper	Interior wall on north side	None Detected
TC-BP-01B	White building paper	Interior wall on north side	None Detected
TC-BP-01C	White building paper	Interior wall on north side	None Detected
TC-WPC-01A	Black window pane caulking	Interior west window	None Detected
TC-WPC-01B	Black window pane caulking	Interior west window	None Detected
TC-WPC-01C	Black window pane caulking	Interior west window	None Detected
TC-SC-01A	Cream sink caulking	Sink on south side	None Detected
TC-SC-01B	Cream sink caulking	Sink on south side	None Detected
TC-SC-01C	Cream sink caulking	Sink on south side	None Detected
TC-RF-01A	Black roofing felt	Exterior roof on south side	None Detected
TC-RF-01B	Black roofing felt	Exterior roof on south side	None Detected
TC-RF-01C	Black roofing felt	Exterior roof on south side	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the material presented in Table F-4.1.2, below was identified as an ACM.

Table F-4.1.2 Summary of Identified ACMs West Coast Patrol Cabins (Camper Creek, Tsuquadra, Tsocowis), West Coast Trail, BC

Identified ACM Description and Condition Information		Photo
Black door pane caulking on sliding glass door to mud room at the Camper Creek Cabin		
Friability	Non-friable	
Condition	Good	
Content	2.0% Chrysotile	
Black mastic around stack penetration in roof at the Tsocowis Cabin. As this suspected ACM could not be sampled due to lack of safe roof access it should be presumed to be asbestos-containing (PACM).		
Friability	Non-friable	
Condition	Good	
Content	PACM not sampled	

F-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, nine paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table F-4.2.1, below. A copy of the certificate of

analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table F-4.2.1 Suspected LCP Sample Collection and Analysis Summary West Coast Patrol Cabins (Camper Creek, Tsuquadra, Tsocowis), West Coast Trail, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
Camper Creek Patrol Cabin				
CC-P-01	White	Interior north wall	<130	No
CC-P-02	Blue	Interior floor on north side	<140	No
CC-P-03	Green	Exterior tin roof on north side	90	No
Tsuquadra Patrol Cabin				
TW-P-01	White	Interior south wall	<120	No
TW-P-02	Red	Exterior east wall	<180	No
TW-P-03	Green	Exterior south roof	<440	No
Tsocowis Patrol Cabin				
TC-P-01	Brown	Interior wall in shed on east side	<90	No
TC-P-02	White	Interior wall on north side	<90	No
TC-P-03	Green	Exterior tin roof on northwest side	<620	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

F-4.3 Polychlorinated Biphenyls

No suspected PCB-containing electrical equipment was observed.

F-4.4 Mercury

No suspected mercury-containing equipment was observed.

F-4.5 Mould

Mould/moisture damage was observed as summarized in Table F-4.5.1, below.

Table F-4.5.1 Summary of Identified Mould and/or Moisture-Impacted Materials West Coast Patrol Cabins (Camper Creek, Tsuquadra, Tsocowis), West Coast Trail, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture-impacted plywood was observed on the ceiling of Camper Creek Patrol Cabin. The suspected source of moisture is roof leaks.	

.

F-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

F-4.1 Silica

Silica is presumed to be present in concrete of the subject buildings.

F-5.0 RECOMMENDATIONS—WEST COAST PATROL CABINS (CAMPER CREEK, TSUQUADRA, TSOCOWIS)

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

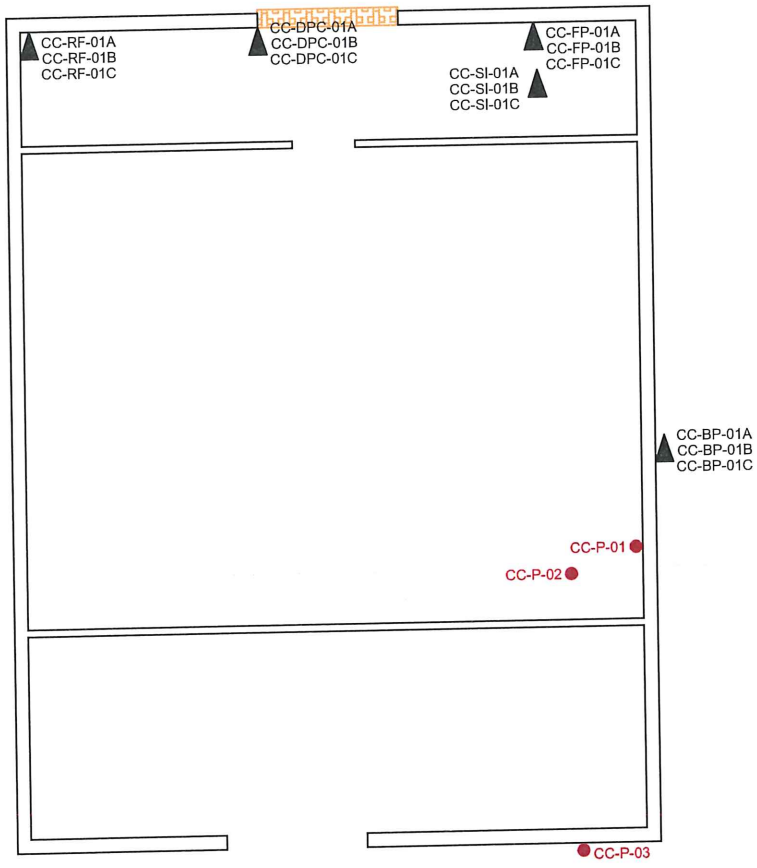
Additional building-specific recommendations to be considered are provided below.

F-5.5 Mould

Stantec recommends the following course of action within the Camper Creek Patrol Cabin:

- Clean staining on plywood with detergent solution. If staining re-appears, the source of moisture should be identified and corrected. This work can be conducted by regular facility maintenance staff, if conducted prior to the onset of mould growth.
- Identified mould should be remediated in accordance with the Mould Guidelines for the Canadian Construction Industry (CAA 2004), by a competent person, who is knowledgeable of potential hazards of mould exposure, following remediation precautions.

Stantec Consulting Ltd. © 2015



CAMPER CREEK PATROL CABIN

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING DOOR PANE CAULKING

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

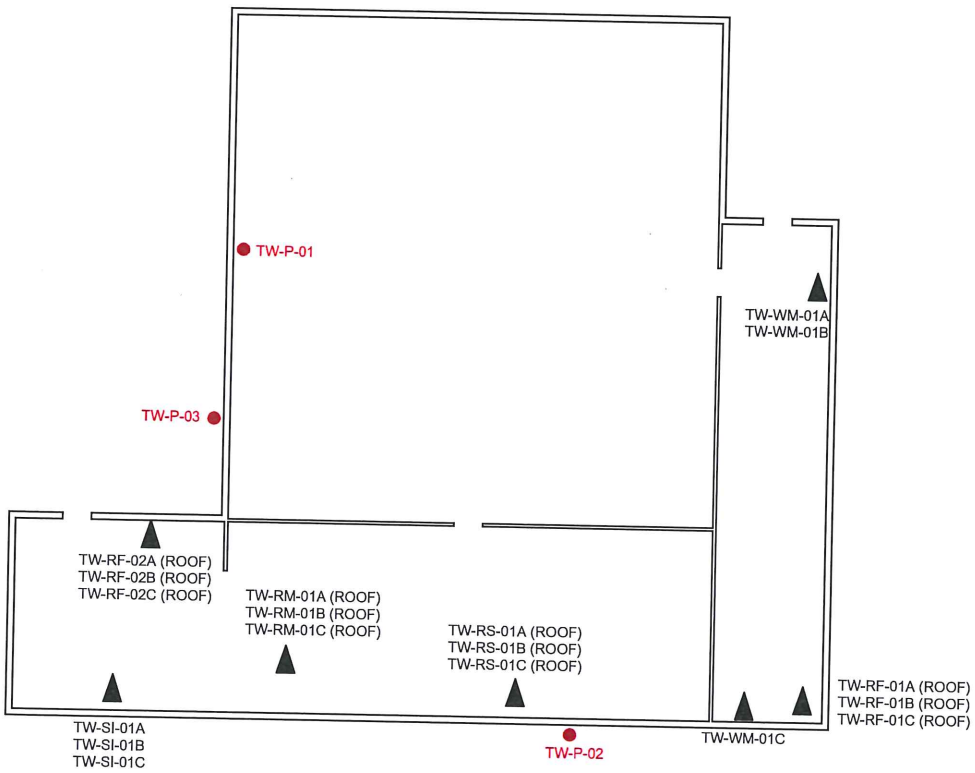
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070149 PK/DM
App'd By:	TW

Dwg. No.: F1

Stantec

Stantec Consulting Ltd. © 2015



TSUQUADRA PATROL CABIN

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

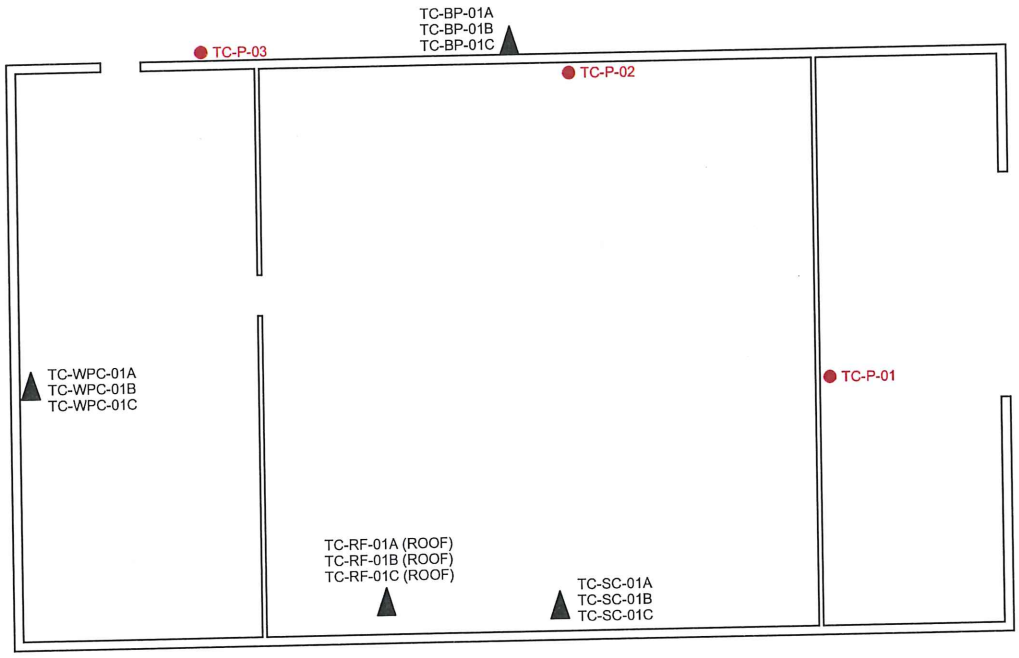
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100031 DM/PK
App'd By:	TW

Dwg. No.: F2

Stantec

Stantec Consulting Ltd. © 2015



TSOCOWIS CREEK PATROL CABIN

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTES: 1. **BLACK MASTIC AROUND STACK PENETRATION IN ROOF IS PRESUMED TO BE ASBESTOS-CONTAINING.**
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100032 DM/PK
App'd By:	TW

Dwg. No.: F3

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507132
Customer ID: 55JACQ30L
Customer PO: CAMPER CREEK
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: CAMPER CREEK PATROL CABIN/123220330

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CC-BP-01A
Sample Description: NORTH SIDE OF BUILDING/WHITE BUILDING PAPER
Lab Sample ID: **551507132-0001**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	90%	10%	None Detected	

Client Sample ID: CC-BP-01B
Sample Description: NORTH SIDE OF BUILDING/WHITE BUILDING PAPER
Lab Sample ID: **551507132-0002**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	90%	10%	None Detected	

Client Sample ID: CC-BP-01C
Sample Description: NORTH SIDE OF BUILDING/WHITE BUILDING PAPER
Lab Sample ID: **551507132-0003**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	90%	10%	None Detected	

Client Sample ID: CC-RF-01A
Sample Description: SOUTH SIDE OF MUD ROOM ON CEILING/BLACK ROOFING FELT
Lab Sample ID: **551507132-0004**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CC-RF-01B
Sample Description: SOUTH SIDE OF MUD ROOM ON CEILING/BLACK ROOFING FELT
Lab Sample ID: **551507132-0005**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CC-RF-01C
Sample Description: SOUTH SIDE OF MUD ROOM ON CEILING/BLACK ROOFING FELT
Lab Sample ID: **551507132-0006**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CC-FP-01A
Sample Description: NORTH SIDE OF MUD ROOM/FIRE PROTECTOR
Lab Sample ID: **551507132-0007**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507132
Customer ID: 55JACQ30L
Customer PO: CAMPER CREEK
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CC-FP-01B — ***Lab Sample ID:*** 551507132-0008
Sample Description: NORTH SIDE OF MUD ROOM/FIRE PROTECTOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	None Detected	

Client Sample ID: CC-FP-01C — ***Lab Sample ID:*** 551507132-0009
Sample Description: NORTH SIDE OF MUD ROOM/FIRE PROTECTOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	None Detected	

Client Sample ID: CC-SI-01A — ***Lab Sample ID:*** 551507132-0010
Sample Description: FIREPLACE IN MUD ROOM/STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Yellow	90%	10%	None Detected	

Client Sample ID: CC-SI-01B — ***Lab Sample ID:*** 551507132-0011
Sample Description: FIREPLACE IN MUD ROOM/STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Yellow	90%	10%	None Detected	

Client Sample ID: CC-SI-01C — ***Lab Sample ID:*** 551507132-0012
Sample Description: FIREPLACE IN MUD ROOM/STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	90%	10%	None Detected	

Client Sample ID: CC-DPC-01A — ***Lab Sample ID:*** 551507132-0013
Sample Description: SLIDING GLASS DOOR TO MUD ROOM/BLACK DOOR PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	98.0%	2.0% Chrysotile	

Client Sample ID: CC-DPC-01B — ***Lab Sample ID:*** 551507132-0014
Sample Description: SLIDING GLASS DOOR TO MUD ROOM/BLACK DOOR PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Client Sample ID: CC-DPC-01C — ***Lab Sample ID:*** 551507132-0015
Sample Description: SLIDING GLASS DOOR TO MUD ROOM/BLACK DOOR PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507132
Customer ID: 55JACQ30L
Customer PO: CAMPER CREEK
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

John Biesiadecki	PLM (3) PLM Grav. Reduction (1)
Natalie D'Amico	PLM (6)
Nicole Dimou	PLM Grav. Reduction (3)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507192
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 - TQ CABIN

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Lab Sample ID: **551507192-0001**

Client Sample ID: TQ-RS-01A
Sample Description: BLACK ROOFING SHINGLE/EAST EXTERIOR ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Various/Black	0.0%	100%	None Detected	

Lab Sample ID: **551507192-0002**

Client Sample ID: TQ-RS-01B
Sample Description: BLACK ROOFING SHINGLE/EAST EXTERIOR ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Various/Black	0.0%	100%	None Detected	

Lab Sample ID: **551507192-0003**

Client Sample ID: TQ-RS-01C
Sample Description: BLACK ROOFING SHINGLE/EAST EXTERIOR ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Various/Black	0.0%	100%	None Detected	

Lab Sample ID: **551507192-0004**

Client Sample ID: TQ-RM-01A
Sample Description: BLACK ROOF MASTIC/EAST EXTERIOR ROOF ON STACK

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507192-0005**

Client Sample ID: TQ-RM-01B
Sample Description: BLACK ROOF MASTIC/EAST EXTERIOR ROOF ON STACK

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507192-0006**

Client Sample ID: TQ-RM-01C
Sample Description: BLACK ROOF MASTIC/EAST EXTERIOR ROOF ON STACK

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Lab Sample ID: **551507192-0007**

Client Sample ID: TQ-RF-01A
Sample Description: BLACK ROOFING FELT/NORTHEAST EXTERIOR ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507192
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: TQ-RF-01B
Sample Description: BLACK ROOFING FELT/NORTHEAST EXTERIOR ROOF
Lab Sample ID: **551507192-0008**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: TQ-RF-01C
Sample Description: BLACK ROOFING FELT/NORTHEAST EXTERIOR ROOF
Lab Sample ID: **551507192-0009**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: TQ-RF-02A
Sample Description: BLACK ROOFING FELT/SOUTH EXTERIOR ROOF
Lab Sample ID: **551507192-0010**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: TQ-RF-02B
Sample Description: BLACK ROOFING FELT/SOUTH EXTERIOR ROOF
Lab Sample ID: **551507192-0011**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: TQ-RF-02C
Sample Description: BLACK ROOFING FELT/SOUTH EXTERIOR ROOF
Lab Sample ID: **551507192-0012**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: TQ-WM-01A
Sample Description: CREAM WALL MASTIC/INTERIOR MUD ROOM ON NORTH WALL
Lab Sample ID: **551507192-0013**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: TQ-WM-01B
Sample Description: CREAM WALL MASTIC/INTERIOR MUD ROOM ON NORTH WALL
Lab Sample ID: **551507192-0014**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: TQ-WM-01C
Sample Description: CREAM WALL MASTIC/INTERIOR MUD ROOM ON EAST WALL
Lab Sample ID: **551507192-0015**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Beige	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507192
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: TQ-SI-01A
Lab Sample ID: **551507192-0016**
Sample Description: GREY STACK INSULATION/INTERIOR STACK IN SOUTH ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	15%	85%	None Detected	

Client Sample ID: TQ-SI-01B
Lab Sample ID: **551507192-0017**
Sample Description: GREY STACK INSULATION/INTERIOR STACK IN SOUTH ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	10%	90%	None Detected	

Client Sample ID: TQ-SI-01C
Lab Sample ID: **551507192-0018**
Sample Description: GREY STACK INSULATION/INTERIOR STACK IN SOUTH ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Gray	15%	85%	None Detected	

Analyst(s):

John Biesiadecki	PLM (2) PLM Grav. Reduction (5)
Natalie D'Amico	PLM (1)
Nicole Dimou	PLM Grav. Reduction (10)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201509:28:04

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507193
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 - TSCOWIS PATROL CABIN

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: TC-BP-01A
Lab Sample ID: 551507193-0001
Sample Description: WHITE BUILDING PAPER/INTERIOR WALL ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	85%	15%	None Detected	

Client Sample ID: TC-BP-01B
Lab Sample ID: 551507193-0002
Sample Description: WHITE BUILDING PAPER/INTERIOR WALL ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	85%	15%	None Detected	

Client Sample ID: TC-BP-01C
Lab Sample ID: 551507193-0003
Sample Description: WHITE BUILDING PAPER/INTERIOR WALL ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	85%	15%	None Detected	

Client Sample ID: TC-WPC-01A
Lab Sample ID: 551507193-0004
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WEST WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: TC-WPC-01B
Lab Sample ID: 551507193-0005
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WEST WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: TC-WPC-01C
Lab Sample ID: 551507193-0006
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WEST WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Black	0%	100%	None Detected	

Client Sample ID: TC-SC-01A
Lab Sample ID: 551507193-0007
Sample Description: CREAM SINK CAULKING/SINK ON SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507193
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: TC-SC-01B ***Lab Sample ID:*** **551507193-0008**
Sample Description: CREAM SINK CAULKING/SINK ON SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	None Detected	

Client Sample ID: TC-SC-01C ***Lab Sample ID:*** **551507193-0009**
Sample Description: CREAM SINK CAULKING/SINK ON SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	None Detected	

Client Sample ID: TC-RF-01A ***Lab Sample ID:*** **551507193-0010**
Sample Description: BLACK ROOFING FELT/EXTERIOR ROOF ON SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: TC-RF-01B ***Lab Sample ID:*** **551507193-0011**
Sample Description: BLACK ROOFING FELT/EXTERIOR ROOF ON SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: TC-RF-01C ***Lab Sample ID:*** **551507193-0012**
Sample Description: BLACK ROOFING FELT/EXTERIOR ROOF ON SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki	PLM (1)
Jon Delos Santos	PLM (2) PLM Grav. Reduction (4)
Romeo Samson	PLM (3) PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0
Initial report from: 07/09/201522:39:53

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507104
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - CAMPER CREEK PATROL CABIN**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
CC-P-01	*551507104-0001*		7/6/2015	<130 ppm
	Site: INTERIOR NORTH WALL - WHITE			
	Insufficient sample to reach reporting limit.			
CC-P-02	*551507104-0002*		7/6/2015	<140 ppm
	Site: INTERIOR FLOOR ON NORTH SIDE - BLUE			
	Insufficient sample to reach reporting limit.			
CC-P-03	*551507104-0003*		7/6/2015	90 ppm
	Site: EXTERIOR TIN ROOF ON NORTH SIDE - GREEN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:43:45

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507113
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - TW CABIN**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
TW-P-01	*551507113-0001*		7/7/2015	<120 ppm
	Site: INTERIOR SOUTH WALL - WHITE			
TW-P-02	*551507113-0002*		7/7/2015	<180 ppm
	Site: EXTERIOR EAST WALL - RED			
TW-P-03	*551507113-0003*		7/7/2015	<440 ppm
	Site: EXTERIOR SOUTH ROOF - GREEN			

Insufficient sample to reach reporting limit for sample #551507113 -0001/ -0002/ -0003.

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/07/2015 15:03:47

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507093
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - TSCOWIS PATROL CABIN**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
TC-P-01	*551507093-0001*		7/7/2015	<90 ppm
	Site: INTERIOR WALL IN SHED ON EAST SIDE Desc: BROWN			
TC-P-02	*551507093-0002*		7/7/2015	<90 ppm
	Site: INTERIOR WALL ON NORTH SIDE Desc: WHITE			
TC-P-03	*551507093-0003*		7/7/2015	<620 ppm
	Site: EXTERIOR TIN ROOF ON NORTHWEST SIDE Desc: GREEN Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:24:09

APPENDIX G
FINDINGS AND RECOMMENDATIONS
CHEEWHAT PATROL CABIN

G-4.0 FINDINGS—CHEEWHAT PATROL CABIN

The Cheewhat Patrol Cabin was reportedly constructed in 1978 and is a two storey residential structure and storage shed along the south wall of the building.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

G-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Fire-stop/wall protector
- Assorted mastics, caulkings and sealants
- Roofing shingles
- Stack insulation
- Roofing felt

Twenty-four samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table G-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table G-4.1.1 Suspected ACM Sample Collection and Analysis Summary Cheewhat Patrol Cabin, West Coast Trail, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
CW-WP-01A	White fibrous fire/wall protector	West wall of kitchen	None Detected
CW-WP-01B	White fibrous fire/wall protector	West wall of kitchen	None Detected
CW-WP-01C	White fibrous fire-stop/wall protector	West wall of kitchen	None Detected
CW-SM-01A	Silver mastic	West wall of kitchen	None Detected
CW-SM-01B	Silver mastic	West wall of kitchen	None Detected

Table G-4.1.1 Suspected ACM Sample Collection and Analysis Summary Cheewhat Patrol Cabin, West Coast Trail, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
CW-SM-01C	Silver mastic	West wall of kitchen	None Detected
CW-RS-01A	Black roofing shingle	Low roof on south side of cabin	None Detected
CW-RS-01B	Black roofing shingle	Low roof on south side of cabin	None Detected
CW-RS-01C	Black roofing shingle	Low roof on south side of cabin	None Detected
CW-WPC-01A	White window pane caulking	North window in kitchen	None Detected
CW-WPC-01B	White window pane caulking	North window in kitchen	None Detected
CW-WPC-01C	White window pane caulking	North window in kitchen	None Detected
CW-SI-01A	Grey stack insulation	Second floor stack by north closet	None Detected
CW-SI-01B	Grey stack insulation	Second floor stack by north closet	None Detected
CW-SI-01C	Grey stack insulation	Second floor stack by north closet	None Detected
CW-PS-01A	White penetration sealant	Exterior penetration on south side	None Detected
CW-PS-01B	White penetration sealant	Exterior penetration on south side	None Detected
CW-PS-01C	White penetration sealant	Exterior penetration on south side	None Detected
CW-PS-02A	Black penetration sealant	Exterior penetration on south side	None Detected
CW-PS-02B	Black penetration sealant	Exterior penetration on south side	None Detected
CW-PS-02C	Black penetration sealant	Exterior penetration on south side	None Detected
CW-RF-01A	Black roofing felt	Low roof on south side of cabin	None Detected
CW-RF-01B	Black roofing felt	Low roof on south side of cabin	None Detected
CW-RF-01C	Black roofing felt	Low roof on south side of cabin	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

G-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, six paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table G-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table G-4.2.1 Suspected LCP Sample Collection and Analysis Summary Cheewhat Patrol Cabin, West Coast Trail, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
CW-P-01	White	Walls in stairwell	<130	No
CW-P-02	Red	Floor in second floor west end	840	Yes
CW-P-03	White	Exterior west window frame	69,000	Yes
CW-P-04	Brown	Exterior west siding	71,000	Yes
CW-P-05	Green	Roof on shed along south wall of building	<900	Potential
CW-P-06	Brown	Interior trim in kitchen	970	Yes

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table G-4.2.2, below were identified as actual or potential LCPs.

Table G-4.2.2 Summary of Identified LCPs Cheewhat Patrol Cabin, West Coast Trail, BC

Identified LCP Description	Photo
Red colored paint on the first floor, second floor and stairs of the cabin. This paint was observed to be in good condition (not bubbling, flaking or peeling).	
White colored paint on the exterior window and door frames. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

Table G-4.2.2 Summary of Identified LCPs Cheewhat Patrol Cabin, West Coast Trail, BC

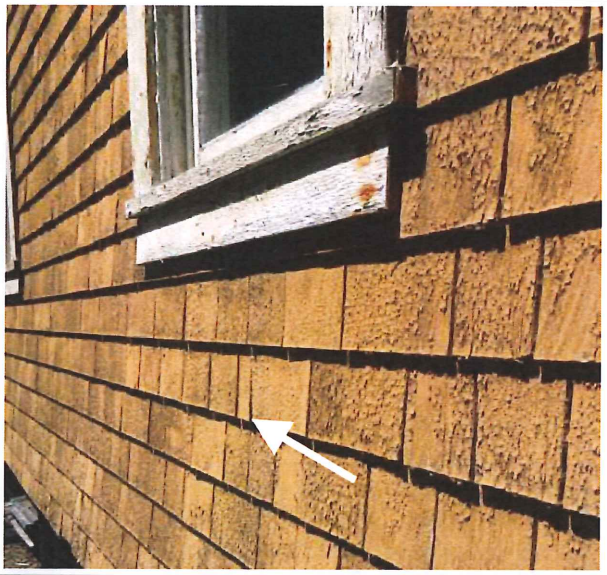
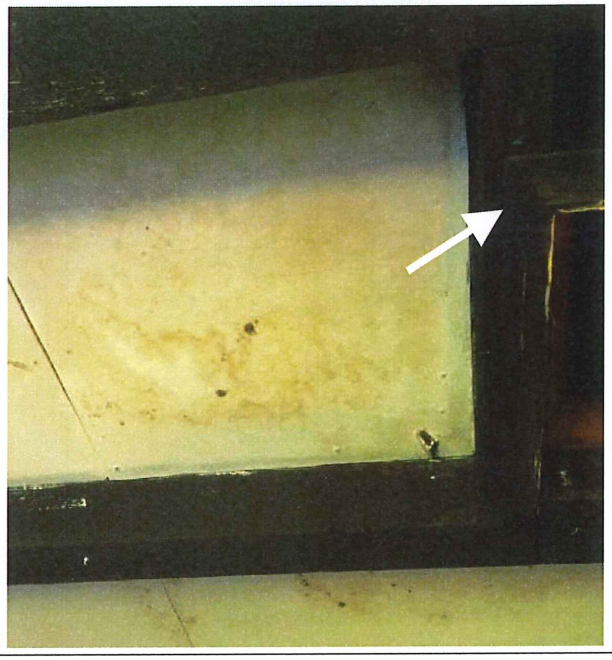
Identified LCP Description	Photo
Brown colored paint on the exterior siding. This paint was observed to be in poor condition (bubbling, flaking or peeling).	
Green colored paint on the exterior roof. This paint is to be considered a potential LCP, as not enough sample could be safely obtained to achieve a low enough detection limit. Additional sampling may prove this paint to be a non-LCP. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

Table G-4.2.2 Summary of Identified LCPs Cheewhat Patrol Cabin, West Coast Trail, BC

Identified LCP Description	Photo
Brown colored paint on the interior trim. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

G-4.3 Polychlorinated Biphenyls

No suspected PCB-containing electrical equipment was observed.

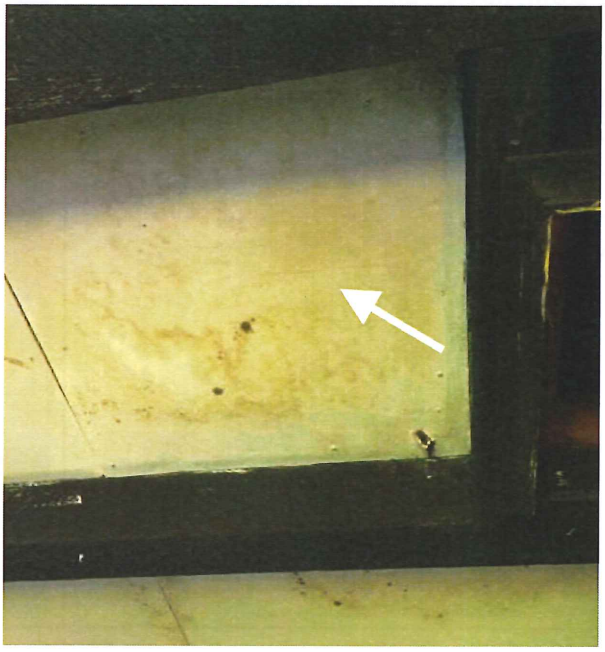
G-4.4 Mercury

No suspected mercury-containing equipment was observed.

G-4.5 Mould

Mould/moisture damage was observed as summarized in Table G-4.5.1, below.

Table G-4.5.1 Summary of Identified Mould and/or Moisture-Impacted Materials Cheewhat Patrol Cabin, West Coast Trail, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture-impacted wood panels were observed on the ceiling of the first floor. The suspected source of moisture is pipe leaks.	

G-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

G-4.1 Silica

Silica is presumed to be present in concrete of the subject building.

G-5.0 RECOMMENDATIONS—CHEEWHAT PATROL CABIN

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Additional building-specific recommendations to be considered are provided below.

G-5.2 Lead

Lead-containing paint observed in poor condition on an exterior vent located on the north side of the building should be cleaned-up and/or addressed to mitigate potential for additional deterioration and dispersal of lead-containing paint chips/dust. Consideration should be given to re-painting surfaces to mitigate the potential for additional deterioration and hazards associated with the lead-containing paint chips/dust that may be created. If re-painting is completed, appropriate precautions to protect workers and work areas from exposure to lead will be required during painting preparation activities.

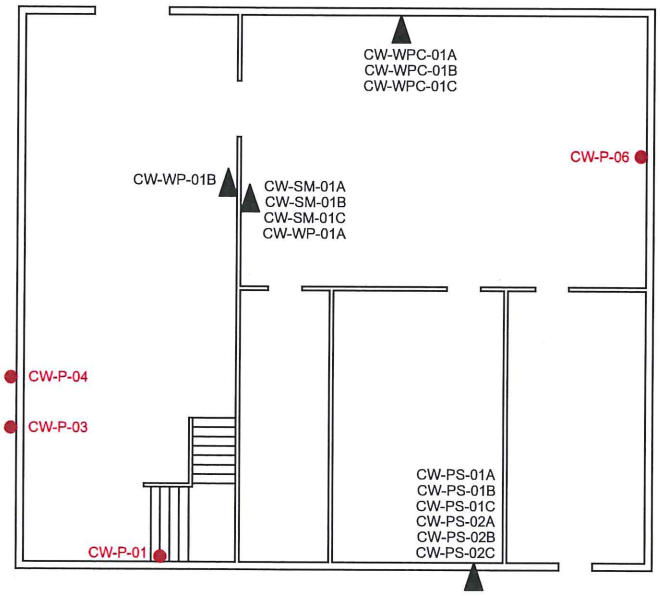
Provisions for worker protection and waste disposal related to the above are included in Section 5.2 of the main body of this report.

G-5.5 Mould

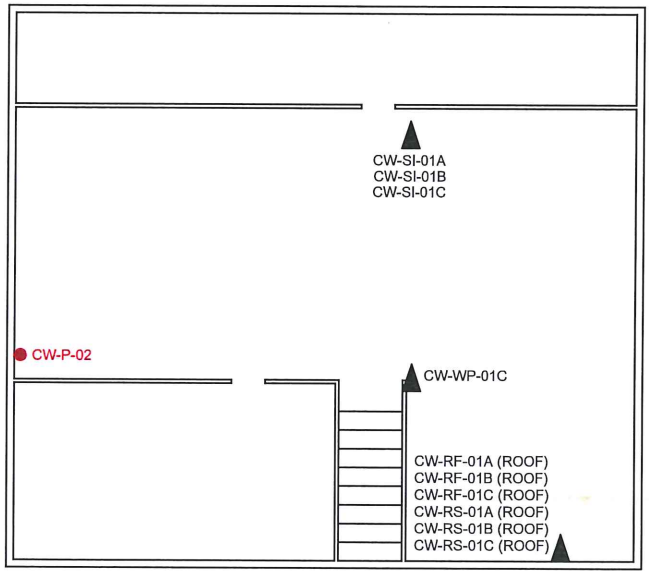
Stantec recommends the following course of action within the subject building:

- Clean staining on wood panel with detergent solution. If staining re-appears, the source of moisture should be identified and corrected. This work can be conducted by regular facility maintenance staff, if conducted prior to the onset of mould growth.

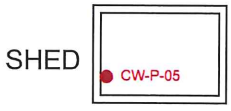
Stantec Consulting Ltd. © 2015



FIRST FLOOR



SECOND FLOOR



CHEEWHAT PATROL CABIN

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070137 PK/DM
App'd By:	TW

Dwg. No.: G

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507140
Customer ID: 55JACQ30L
Customer PO: CHEWHAT
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: CHEWHAT CABIN/123220330

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CW-WP-01A **Lab Sample ID:** 551507140-0001
Sample Description: WEST WALL OF KITCHEN/WHITE FIBROUS WALL PROTECTOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown/Gray	85%	15%	None Detected	

Client Sample ID: CW-WP-01B **Lab Sample ID:** 551507140-0002
Sample Description: WEST WALL OF KITCHEN/WHITE FIBROUS WALL PROTECTOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown/Gray	80%	20%	None Detected	

Client Sample ID: CW-WP-01C **Lab Sample ID:** 551507140-0003
Sample Description: WEST WALL OF KITCHEN/WHITE FIBROUS WALL PROTECTOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	80%	20%	None Detected	

Client Sample ID: CW-SM-01A **Lab Sample ID:** 551507140-0004
Sample Description: WEST WALL OF KITCHEN/SILVER MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Silver	0.0%	100%	None Detected	

Client Sample ID: CW-SM-01B **Lab Sample ID:** 551507140-0005
Sample Description: WEST WALL OF KITCHEN/SILVER MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Silver	0.0%	100%	None Detected	

Client Sample ID: CW-SM-01C **Lab Sample ID:** 551507140-0006
Sample Description: WEST WALL OF KITCHEN/SILVER MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Silver	0.0%	100%	None Detected	

Client Sample ID: CW-RS-01A **Lab Sample ID:** 551507140-0007
Sample Description: LOW ROOF ON SOUTH SIDE OF CABIN/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507140
Customer ID: 55JACQ30L
Customer PO: CHEWHAT
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CW-RS-01B **Lab Sample ID:** 551507140-0008
Sample Description: LOW ROOF ON SOUTH SIDE OF CABIN/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CW-RS-01C **Lab Sample ID:** 551507140-0009
Sample Description: LOW ROOF ON SOUTH SIDE OF CABIN/BLACK ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CW-WPC-01A **Lab Sample ID:** 551507140-0010
Sample Description: NORTH WINDOW IN KITCHEN/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White/Red	0.0%	100%	None Detected	

Client Sample ID: CW-WPC-01B **Lab Sample ID:** 551507140-0011
Sample Description: NORTH WINDOW IN KITCHEN/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White/Red	0.0%	100%	None Detected	

Client Sample ID: CW-WPC-01C **Lab Sample ID:** 551507140-0012
Sample Description: NORTH WINDOW IN KITCHEN/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White/Red	0.0%	100%	None Detected	

Client Sample ID: CW-SI-01A **Lab Sample ID:** 551507140-0013
Sample Description: SECOND FLOOR STACK BY NORTH CLOSET/GREY STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	50%	50%	None Detected	

Client Sample ID: CW-SI-01B **Lab Sample ID:** 551507140-0014
Sample Description: SECOND FLOOR STACK BY NORTH CLOSET/GREY STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	45%	55%	None Detected	

Client Sample ID: CW-SI-01C **Lab Sample ID:** 551507140-0015
Sample Description: SECOND FLOOR STACK BY NORTH CLOSET/GREY STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507140
Customer ID: 55JACQ30L
Customer PO: CHEWHAT
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CW-PS-01A **Lab Sample ID:** 551507140-0016
Sample Description: EXTERIOR PENETRATION ON SOUTH SIDE/WHITE PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: CW-PS-01B **Lab Sample ID:** 551507140-0017
Sample Description: EXTERIOR PENETRATION ON SOUTH SIDE/WHITE PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: CW-PS-01C **Lab Sample ID:** 551507140-0018
Sample Description: EXTERIOR PENETRATION ON SOUTH SIDE/WHITE PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: CW-PS-02A **Lab Sample ID:** 551507140-0019
Sample Description: EXTERIOR PENETRATION ON SOUTH SIDE/BLACK PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CW-PS-02B **Lab Sample ID:** 551507140-0020
Sample Description: EXTERIOR PENETRATION ON SOUTH SIDE/BLACK PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CW-PS-02C **Lab Sample ID:** 551507140-0021
Sample Description: EXTERIOR PENETRATION ON SOUTH SIDE/BLACK PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CW-RF-01A **Lab Sample ID:** 551507140-0022
Sample Description: LOW ROOF ON SOUTH SIDE OF CABIN/BLACK ROOFING FELT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CW-RF-01B **Lab Sample ID:** 551507140-0023
Sample Description: LOW ROOF ON SOUTH SIDE OF CABIN/BLACK ROOFING FELT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507140
Customer ID: 55JACQ30L
Customer PO: CHEWHAT
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CW-RF-01C ***Lab Sample ID:*** **551507140-0024**

Sample Description: LOW ROOF ON SOUTH SIDE OF CABIN/BLACK ROOFING FELT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki	PLM Grav. Reduction (6)
Natalie D'Amico	PLM (4)
Nicole Dimou	PLM (2) PLM Grav. Reduction (12)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201515:13:35

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507103
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - CHEEWHAT CABIN**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
CW-P-01	*551507103-0001*		7/7/2015	<130 ppm
	Site: WALLS IN STAIRWELL Desc: WHITE Insufficient sample to reach reporting limit.			
CW-P-02	*551507103-0002*		7/7/2015	840 ppm
	Site: FLOOR IN FIRST FLOOR BEDROOM Desc: RED			
CW-P-03	*551507103-0003*		7/7/2015	69000 ppm
	Site: EXTERIOR WEST WINDOW FRAME Desc: WHITE			
CW-P-04	*551507103-0004*		7/7/2015	71000 ppm
	Site: EXTERIOR WEST SIDING Desc: BROWN			
CW-P-05	*551507103-0005*		7/7/2015	<900 ppm
	Site: ROOF ON SHED TO SOUTH OF BUILDING Desc: GREEN Insufficient sample to reach reporting limit.			
CW-P-06	*551507103-0006*		7/7/2015	970 ppm
	Site: INTERIOR TRIM IN BUILDING Desc: BROWN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:42:29

APPENDIX H
FINDINGS AND RECOMMENDATIONS
GARAGE AND SHED AT AIRPORT

H-4.0 FINDINGS—GARAGE AND STORAGE SHED AT AIRPORT

The Garage and Storage Shed at the Airports construction dates are unknown. The Garage is a one storey structure with a storage loft comprised mainly of drywall walls and wood finishes, the Shed is a one storey steel structure.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

H-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Cement panel
- Stack insulation
- Assorted vinyl sheet flooring
- Vinyl floor tile
- Assorted caulkings and mastics
- Building paper

Twenty-four samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table H-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table H-4.1.1 Suspected ACM Sample Collection and Analysis Summary Garage at Airport, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
G-CP-01	Cement panel	Interior north side of building by washroom	7% Chrysotile
G-SI-01A	Grey stack insulation	North side of building on floor	None Detected
G-SI-01B	Grey stack insulation	North side of building on floor	None Detected
G-SI-01C	Grey stack insulation	North side of building on floor	None Detected

Table H-4.1.1 Suspected ACM Sample Collection and Analysis Summary Garage at Airport, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
G-SF-01	Square 12"x12" pattern sheet flooring	Bathroom on northeast corner	None Detected
G-SF-02	Square brown and tan pattern	Countertop in bathroom	None Detected
G-FT-01	**Tan floor tile**	**Underneath plywood in southeast corner**	**5.0% Chrysotile**
G-FT-01 Mastic	Mastic on tan floor tile	Underneath plywood in southeast corner	<0.25% Chrysotile
G-WPC-01A	Grey window pane caulking	Exterior window pane on south side	<0.25% Chrysotile
G-WPC-01B	Grey window pane caulking	Exterior window pane on south side	<0.25% Chrysotile
G-WPC-01C	Grey window pane caulking	Exterior window pane on north side	<0.25% Chrysotile
G-BP-01A	Black building paper	Exterior east side of building between garage and small door	None Detected
G-BP-01B	Black building paper	Exterior east side of building between garage and small door	None Detected
G-BP-01C	Black building paper	Exterior east side of building between garage and small door	None Detected
G-DM-01A	**Clear mastic**	**On stored mechanical "stack" on floor in north side of building**	**18.7% Chrysotile**
G-DM-01B	**Clear mastic**	**On stored mechanical "stack" on floor in north side of building**	**Stop Positive (Not Analyzed)**
G-DM-01C	**Clear mastic**	**On stored mechanical "stack" on floor in north side of building**	**Stop Positive (Not Analyzed)**
G-DM-02A	**Black duct mastic**	**On stack on north side of building**	**None Detected**
G-DM-02B	**Black duct mastic**	**On stack on north side of building**	**None Detected**
G-DM-02C	**Black duct mastic**	**On stack on north side of building**	**None Detected**
G-DJC-01A	Drywall joint compound	North wall	None Detected
G-DJC-01B	Drywall joint compound	South wall	None Detected
G-DJC-01C	Drywall joint compound	South wall	None Detected
G-DJC-01D	Drywall joint compound	Post on south side	None Detected
G-DJC-01E	Drywall joint compound	Post on south side	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table H-4.1.2, below were identified as ACMs.

Table H-4.1.2 Summary of Identified ACMs Garage at Airport, Tofino, BC

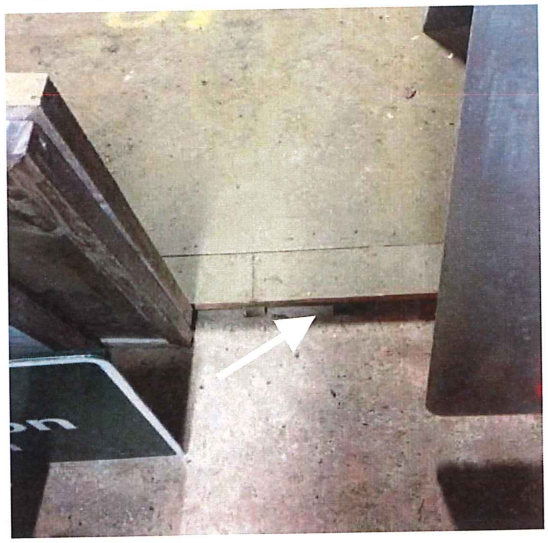
Identified ACM Description and Condition Information		Photo
Cement panel on the interior walls and ceiling in the northeast corner of the Garage building, by the washroom.		
Friability	Non-friable	
Condition	Good	
Content	7% Chrysotile	
Tan floor tile underneath plywood in southeast corner of the Garage building, by the storage room.		
Friability	Non-friable	
Condition	Good	
Content	5.0% Chrysotile	

Table H-4.1.2 Summary of Identified ACMs Garage at Airport, Tofino, BC

Identified ACM Description and Condition Information		Photo
Black and clear mastics on stored mechanical "stacks" and roof vent on the north side of building.		
Friability	Non-friable	
Condition	Good	
Content	18.7% Chrysotile	

H-4.1.1 ACM Mastics

Note that both the clear and black mastics are present on the stored stacks in the north room. It is likely that only the black mastic is asbestos-containing, as the laboratory description (provided by EMSL) indicates "black" for the material type where asbestos was detected, and "clear" for the material type where no asbestos was detected. However, as Stantec provided opposite descriptions with respect to "black" and "clear" types on the sample bags/chain of custody documentation, and given the limited amount of mastic on the stored stack items (and the likelihood that regardless of which specific type is asbestos-containing, that the entire stacks will be disposed of as asbestos-containing), both mastic forms should be considered asbestos-containing unless additional sampling proves otherwise.

H-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment
- Vent and pipe flashings

With respect to paint, nine paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table H-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table H-4.2.1 Suspected LCP Sample Collection and Analysis Summary Garage at Airport, Tofino, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
G-P-01	Beige	Interior walls on south side	2,200	Yes
G-P-02	White	Interior walls in southwest corner of bathroom	<670	Potential
G-P-03	White	Interior walls on south side	2,300	Yes
G-P-04	White	Interior walls in southeast corner storage room	250	No
G-P-05	Green	Exterior door on west side	55,000	Yes

Table H-4.2.1 Suspected LCP Sample Collection and Analysis Summary Garage at Airport, Tofino, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
G-P-06	Green	Exterior window frame on north side	63,000	Yes
G-P-07	Blue	Exterior door on east side	49,000	Yes
G-P-08	White	Exterior siding on south side	60,000	Yes
G-P-09	Cream	Exterior on north side of steel storage shed	<90	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table H-4.2.2, below were identified as actual or potential LCPs.

Table H-4.2.2 Summary of Identified LCPs Garage and Storage Shed at Airport, Tofino, BC

Identified LCP Description	Photo
Beige colored paint on the interior walls of the Garage building. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

Table H-4.2.2 Summary of Identified LCPs Garage and Storage Shed at Airport, Tofino, BC

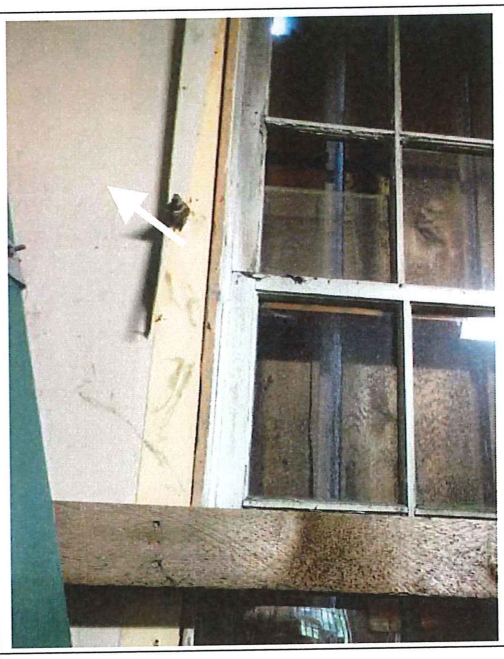
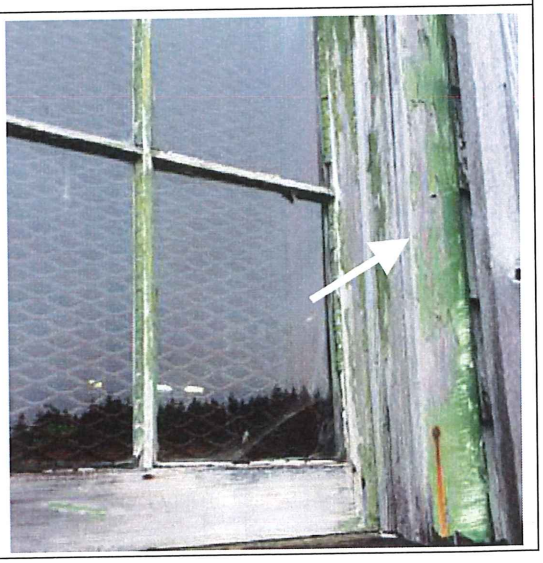
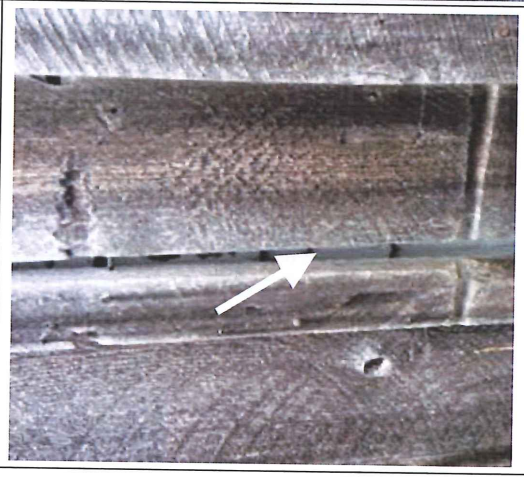
Identified LCP Description	Photo
White colored paint on the interior walls including bathroom of the Garage building. This paint was observed to be in good condition (not bubbling, flaking or peeling).	
Green colored paint on the exterior doors of the Garage building. This paint was observed to be in good condition (not bubbling, flaking or peeling).	No photo available
Green colored paint on the exterior window frames of the Garage building. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

Table H-4.2.2 Summary of Identified LCPs Garage and Storage Shed at Airport, Tofino, BC

Identified LCP Description	Photo
Blue colored paint on the exterior west door of the Garage building. This paint was observed to be in good condition (not bubbling, flaking or peeling).	
White colored paint on the exterior siding under the newer un-painted wood siding of the Garage building. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

H-4.3 Polychlorinated Biphenyls

The majority of the approximately 20 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts.

H-4.4 Mercury

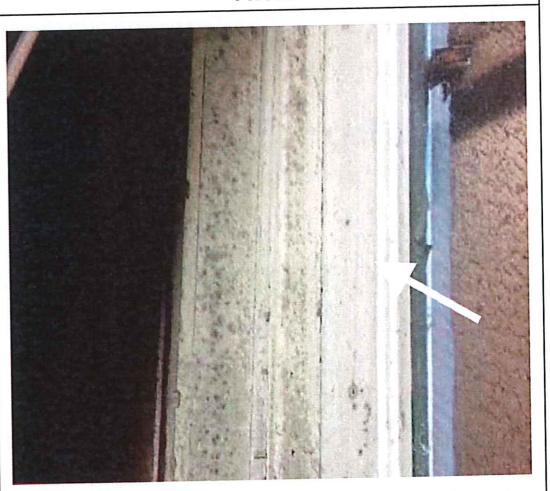
Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 20 fluorescent light fixtures.

In addition one mercury-containing thermostat was observed in the south east corner room, as indicated on the attached floor plan drawings.

H-4.5 Mould

Mould/moisture damage was observed as summarized in Table H-4.5.1, below.

Table H-4.5.1 Summary of Identified Mould and/or Moisture-Impacted Materials Garage and Storage Shed at Airport, Tofino, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture and suspect mould impacted wood window frames and drywall walls were observed in various locations throughout the Garage, mainly in the south east corner. The suspected source of moisture is roof leaks and/or condensation.	

H-4.5.1 Surface Sampling

Table H-4.5.2, below, summarizes the locations and analytical results of the bulk samples collected during this assessment. A copy of the sample analytical report provided by Sporometrics is attached to this appendix.

Table H-4.5.2 Surface Sample Collection and Analysis Summary - Summary of Identified Mould and/or Moisture-Impacted Materials Garage and Storage Shed at Airport, Tofino, BC

Sample No.	Sample Location	Microscopic Observation	Mould Growth Indicated?
G-M-01	Interior south wall of Garage building	N/A	N

H-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

H-4.1 Silica

Silica is presumed to be present in vinyl floor tiles, concrete and cement of the subject building.

H-5.0 RECOMMENDATIONS—GARAGE AND STORAGE SHED AT AIRPORT

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Additional building-specific recommendations to be considered are provided below.

H-5.1 Asbestos

With regards to the identified ACM black and clear mastics, given the efforts required to remove asbestos-containing mastic materials from stored stacks, which would likely be required if the stacks were to be re-used, consideration should be given to disposing of these items (with asbestos-containing mastic) as asbestos waste.

H-5.2 Lead

Lead-containing paint observed in poor condition on the interior walls and exterior siding and window frames should be cleaned-up and/or addressed to mitigate potential for additional deterioration and dispersal of lead-containing paint chips/dust. Consideration should be given to re-painting surfaces to mitigate the potential for additional deterioration

and hazards associated with the lead-containing paint chips/dust that may be created. If re-painting is completed, appropriate precautions to protect workers and work areas from exposure to lead will be required during painting preparation activities.

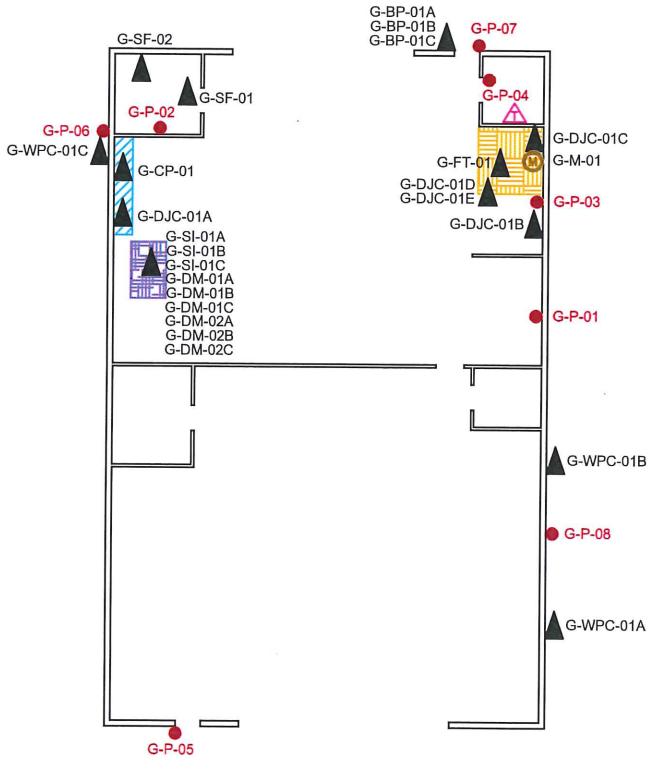
Provisions for worker protection and waste disposal related to the above are included in Section 5.2 of the main body of this report.

H-5.5 Mould

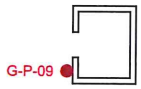
Stantec recommends the following course of action within the subject building:

- Remove and replace moisture-stained wood and drywall with new. If staining re-appears on the new wood, the source of moisture should be identified and corrected. This work can be conducted by regular facility maintenance staff, if conducted prior to the onset of mould growth.

Stantec Consulting Ltd. © 2015



GARAGE AT AIRPORT



STORAGE SHED

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- BULK SAMPLE FOR MOULD
- MERCURY-CONTAINING THERMOSTAT
- ASBESTOS-CONTAINING CEMENT PANEL
- CONCEALED ASBESTOS-CONTAINING FLOOR TILE
- ASBESTOS-CONTAINING STACKS WITH MASTIC

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100033 DM/PK
App'd By:	TW

Dwg. No.: H

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507152
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: GARAGE AT AIRPORT/123220330

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: G-CP-01 ***Lab Sample ID:*** **551507152-0001**
Sample Description: INTERIOR NORTH SIDE OF BLDG BY WASHROOM/CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	93%	7% Chrysotile	

Client Sample ID: G-SI-01A ***Lab Sample ID:*** **551507152-0002**
Sample Description: NORTH SIDE OF BUILDING ON FLOOR/GREY STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	85%	15%	None Detected	

Client Sample ID: G-SI-01B ***Lab Sample ID:*** **551507152-0003**
Sample Description: NORTH SIDE OF BUILDING ON FLOOR/GREY STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	85%	15%	None Detected	

Client Sample ID: G-SI-01C ***Lab Sample ID:*** **551507152-0004**
Sample Description: NORTH SIDE OF BUILDING ON FLOOR/GREY STACK INSULATION

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Gray	90%	10%	None Detected	

Client Sample ID: G-SF-01 ***Lab Sample ID:*** **551507152-0005**
Sample Description: BATHROOM ON NORTHEAST CORNER/SQUARE12" X 12" PATTERN SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: G-SF-02 ***Lab Sample ID:*** **551507152-0006**
Sample Description: COUNTERTOP IN BATHROOM/SQUARE BROWN & TAN PATTERN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: G-FT-01 ***Lab Sample ID:*** **551507152-0007**
Sample Description: UNDERNEATH PLYWOOD IN SOUTHEAST CORNER/TAN FLOOR TILE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown/Green	0.0%	95.0%	5.0% Chrysotile	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507152
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: G-FT-01-Mastic ***Lab Sample ID:*** **551507152-0007A**
Sample Description: UNDERNEATH PLYWOOD IN SOUTHEAST CORNER/TAN FLOOR TILE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	<0.25% Chrysotile	

Client Sample ID: G-WPC-01A ***Lab Sample ID:*** **551507152-0008**
Sample Description: EXTERIOR WINDOW PANE ON SOUTH SIDE/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray/Green	0.0%	100%	<0.25% Chrysotile	

Client Sample ID: G-WPC-01B ***Lab Sample ID:*** **551507152-0009**
Sample Description: EXTERIOR WINDOW PANE ON SOUTH SIDE/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	<0.25% Chrysotile	

Client Sample ID: G-WPC-01C ***Lab Sample ID:*** **551507152-0010**
Sample Description: EXTERIOR WINDOW PANE ON NORTH SIDE/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	<0.25% Chrysotile	

Client Sample ID: G-BP-01A ***Lab Sample ID:*** **551507152-0011**
Sample Description: EXT. EAST SIDE OF BLDG. BETWEEN GARAGE & SM DOOR/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: G-BP-01B ***Lab Sample ID:*** **551507152-0012**
Sample Description: EXT. EAST SIDE OF BLDG. BETWEEN GARAGE & SM DOOR/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: G-BP-01C ***Lab Sample ID:*** **551507152-0013**
Sample Description: EXT. EAST SIDE OF BLDG. BETWEEN GARAGE & SM DOOR/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: G-DM-01A ***Lab Sample ID:*** **551507152-0014**
Sample Description: ON STACK ON NORTH SIDE OF BUILDING/CLEAR DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	81.3%	18.7% Chrysotile	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507152
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: G-DM-01B — ***Lab Sample ID:*** **551507152-0015**
Sample Description: ON STACK ON NORTH SIDE OF BUILDING/CLEAR DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Client Sample ID: G-DM-01C — ***Lab Sample ID:*** **551507152-0016**
Sample Description: ON STACK ON NORTH SIDE OF BUILDING/CLEAR DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Client Sample ID: G-DM-02A — ***Lab Sample ID:*** **551507152-0017**
Sample Description: ON STACK ON NORTH SIDE OF BUILDING/BLACK DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: G-DM-02B — ***Lab Sample ID:*** **551507152-0018**
Sample Description: ON STACK ON NORTH SIDE OF BUILDING/BLACK DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: G-DM-02C — ***Lab Sample ID:*** **551507152-0019**
Sample Description: ON STACK ON NORTH SIDE OF BUILDING/BLACK DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: G-DJC-01A — ***Lab Sample ID:*** **551507152-0020**
Sample Description: NORTH WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: G-DJC-01B — ***Lab Sample ID:*** **551507152-0021**
Sample Description: SOUTH WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray/White	0%	100%	None Detected	

Client Sample ID: G-DJC-01C — ***Lab Sample ID:*** **551507152-0022**
Sample Description: SOUTH WALL/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507152
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: G-DJC-01D
Lab Sample ID: **551507152-0023**
Sample Description: POST ON SOUTH SIDE/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: G-DJC-01E
Lab Sample ID: **551507152-0024**
Sample Description: POST ON SOUTH SIDE/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Analyst(s):

John Biesiadecki	PLM (3) PLM Grav. Reduction (3)
Jon Delos Santos	PLM Grav. Reduction (11)
Romeo Samson	PLM (6)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201511:18:28

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or 551507100
CustomerID: 55JACQ30L
CustomerPO: 123220330
ProjectID:

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - GARAGE IN AIRPORT**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
G-P-01	*551507100-0001*		7/6/2015	2200 ppm
	Site: INTERIOR WALLS ON SOUTH SIDE - BEIGE			
G-P-02	*551507100-0002*		7/6/2015	<670 ppm
	Site: INTERIOR WALLS IN SOUTHWEST CORNER OF BATHROOM Desc: WHITE Insufficient sample to reach reporting limit.			
G-P-03	*551507100-0003*		7/6/2015	2300 ppm
	Site: INTERIOR WALLS ON SOUTH SIDE - WHITE			
G-P-04	*551507100-0004*		7/6/2015	250 ppm
	Site: INTERIOR WALLS IN SOUTHEAST CORNER STORAGE ROOM Desc: WHITE			
G-P-05	*551507100-0005*		7/6/2015	55000 ppm
	Site: EXTERIOR DOOR ON WEST SIDE - GREEN			
G-P-06	*551507100-0006*		7/6/2015	63000 ppm
	Site: EXTERIOR WINDOW FRAME ON NORTH SIDE - GREEN			
G-P-07	*551507100-0007*		7/6/2015	49000 ppm
	Site: EXTERIOR DOOR ON EAST SIDE - BLUE			
G-P-08	*551507100-0008*		7/6/2015	60000 ppm
	Site: EXTERIOR SIDING ON SOUTH SIDE - WHITE			
G-P-09	*551507100-0009*		7/6/2015	<90 ppm
	Site: EXTERIOR ON NORTH SIDE OF STEEL STORAGE SHED Desc: CREAM			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:38:34

Sporometrics Inc.
219 Dufferin Street, Suite 20C, Toronto, ON M6K 1Y9 - t.416-516-1660 - f.416-516-1670 - www.sporometrics.com

RESULTS OF LABORATORY ANALYSES:

JOB NO. 24991.00

To:	Kim Wiese	**Date of report:**	2015/07/09
Company:	Stantec Consulting Ltd. - Burnaby, BC	**Date of sampling:**	2015/06/24
Client Project:	123220330 - 600.100	**Analyst:**	Susan Du
Client Address:	500-4730 Kingsway, Burnaby, BC V5H 0C6	**Date Received:**	2015/07/02

BULK / TAPELIFT / BIOTAPE SAMPLE NO.:	**G-M-01**	-	-	-	-	-
Location:	Interior south wall of garage at airport					
Serial #:	N/A					
Expiry date:	N/A					
FUNGAL IDENTIFICATION:[a] ELEMENTS:	**MICROSCOPIC OBSERVATIONS[b] (RATING[c]):**					
No fungal elements observed	-					
OTHER OBSERVATIONS:						
background rating	3+					
FUNGAL GROWTH INDICATED?[d]:	**N**					

AIHA LAP, LLC LAB NO: 171117

Samples were received in satisfactory condition and tested in accordance with SOP 5.4.1.1.3. These results relate only to the samples tested.

[a] **NOS** = not otherwise specified.

[b] Mounted in lactofuchsin / lactic acid, or other medium as required, with 50-100 fields examined in bright field microscopy at 400x magnification.

[c] **-** = not detected; **tr** = 10^0 - 10^1 elements in total; **1+** = 10^0 - 10^1 elements in each of ~25% fields; **2+** = 10^1 - 10^2 elements in each of ~50% fields; **3+** = 10^2 - 10^3 elements in each of ~75 fields; **4+** => 75% fields obscured.

[d] Possibility of fungal growth *in situ* based on microscopic observations; **Y** = yes; **N** = no; **?** = ambiguous. For explanation please refer to the final page of this report.

END OF REPORT

Examined By

Susan Du, MSc

Analyst

Released By

Pan American Aerobiology Spore Analyst Level 1 Mike Saleh 01080130 Certification Board

Mike Saleh, MHSc

Analyst

PAN AMERICAN AEROBIOLOGY CERTIFICATION BOARD PAACB Certified Analysts on Staff

ilac-MRA

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #171117

Sporometrics Inc.
219 Dufferin Street, Suite 20C, Toronto, ON M6K 1Y9 - t.416-516-1660 - f.416-516-1670 - www.sporometrics.com

RESULTS OF LABORATORY ANALYSES: JOB NO. 24991.00

To:	Kim Wiese	**Date of report:**	2015/07/09
Company:	Stantec Consulting Ltd. - Burnaby, BC	**Date of sampling:**	2015/06/24
Client Project:	123220330 - 600.100	**Analyst:**	Susan Du
Client Address:	500-4730 Kingsway, Burnaby, BC V5H 0C6	**Date Received:**	2015/07/02

Guidance on the interpretation of microscopic findings Samples of bulk materials as well as tape lift samples from potentially contaminated surfaces may be examined microscopically to assess the potential of these materials to be supporting fungal growth and serving as indoor fungal amplification sites. Guidelines on indoor microbial contamination proposed by Health Canada (HC. 1995. Indoor air quality in office buildings: A technical guide. Federal-Provincial Advisory Committee on Environmental and Occupational Health. Ottawa: Environmental Health Directorate 93-EHD-166 rev.) state unambiguously that indoor, active fungal growth sites are unacceptable regardless of the extent to which these amplifiers impact on the indoor airborne spore-load. Fungal spores are commonly borne on air currents and settle on flat surfaces as a matter of course. Thus, the observation of fungal spores alone is insufficient to characterize a specimen as a growth site. This judgment primarily requires the microscopic visualization of fungal filaments ("hyphae", or *en masse*, "mycelia"). Additionally, the identification of different kinds of fungi usually requires the observation of spores (e.g. conidia, ascospores, etc.) along with the organs responsible for their production (e.g. conidiophores, ascomata, etc.). However, the latter rarely persist long after the spores have been produced, making definitive identification difficult or impossible in aged specimens. The rating system used by Sporometrics to score the frequency of structures observed microscopically is based on a 5-point assessment of 50-100 microscopic fields, usually taken at 400 x magnification. This system uses the following rating criteria:

Descriptor	Criteria (based on 50-100 fields)	Interpretation of growth *in situ* according to observations:	
		Spores alone	Spores and spore-bearing structures or mycelia
tr	10^0-10^1 elements in total	growth **not** indicated	growth **not** indicated
1+	10^0-10^1 elements per ~25% fields	unclear	growth indicated
2+	10^1-10^2 elements per ~50% fields	growth indicated	growth indicated
3+	10^2-10^3 elements per ~75% fields	growth indicated	growth indicated
4+	> 75% fields obscured by elements	growth indicated	growth indicated

APPENDIX I
FINDINGS AND RECOMMENDATIONS
GREEN POINT BEAR CACHE AND FIREWOOD SHED

I-4.0 FINDINGS—GREEN POINT BEAR CACHE AND FIREWOOD SHED

The Bear Cache construction date is unknown and is a one storey structure mainly comprised of wood walls. The Firewood Shed reportedly was constructed in 1966 and is a one storey structure of similar finishes.

The results of the assessment for each of the considered hazardous materials within the buildings are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

I-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Window pane caulking
- Building paper

Nine samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table I-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table I-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Bear Cache and Firewood Shed, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
Bear Cache			
BC-WPC-01A	Black window pane caulking	Exterior window on north side	None Detected
BC-WPC-01B	Black window pane caulking	Exterior window on north side	None Detected
BC-WPC-01C	Black window pane caulking	Exterior window on south side	None Detected
BC-BP-01A	Black building paper	Interior wall on north side	None Detected
BC-BP-01B	Black building paper	Interior wall on north side	None Detected
BC-BP-01C	Black building paper	Interior wall on north side	None Detected

Table I-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Bear Cache and Firewood Shed, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
Firewood Shed			
FS-BP-01A	Black building paper	Exterior roof on north side	None Detected
FS-BP-01B	Black building paper	Exterior roof on north side	None Detected
FS-BP-01C	Black building paper	Exterior roof on north side	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

I-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing

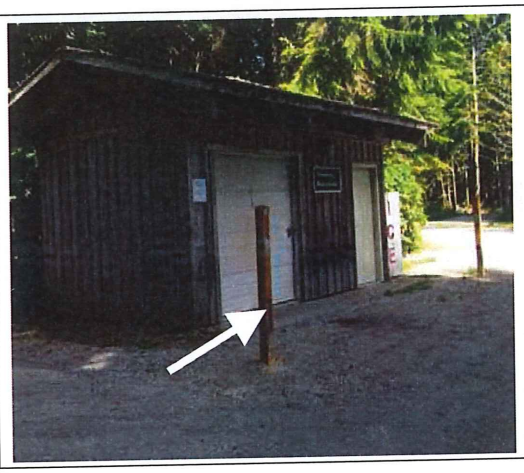
With respect to paint, three paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table I-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table I-4.2.1 Suspected LCP Sample Collection and Analysis Summary Green Point Bear Cache and Firewood Shed, Tofino, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
Bear Cache				
BC-P-01	Blue	Exterior wall on east side	<90	No
Firewood Shed				
FS-P-01	**Yellow**	**Bollard on north side of shed**	**32,000**	**Yes**
FS-P-02	Cream	Exterior paint on light on west side	<120	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the material presented in Table I-4.2.2, below was identified as an LCP.

Table I-4.2.2 Summary of Identified LCPs
Green Point Bear Cache and Firewood Shed, Tofino, BC

Identified LCP Description	Photo
Yellow colored paint on the bollards in front of the firewood shed. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

I-4.3 Polychlorinated Biphenyls

No suspected PCB-containing electrical equipment was observed.

I-4.4 Mercury

No suspected mercury-containing equipment was observed.

I-4.5 Mould

No mould or moisture damage was observed during the assessment.

I-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

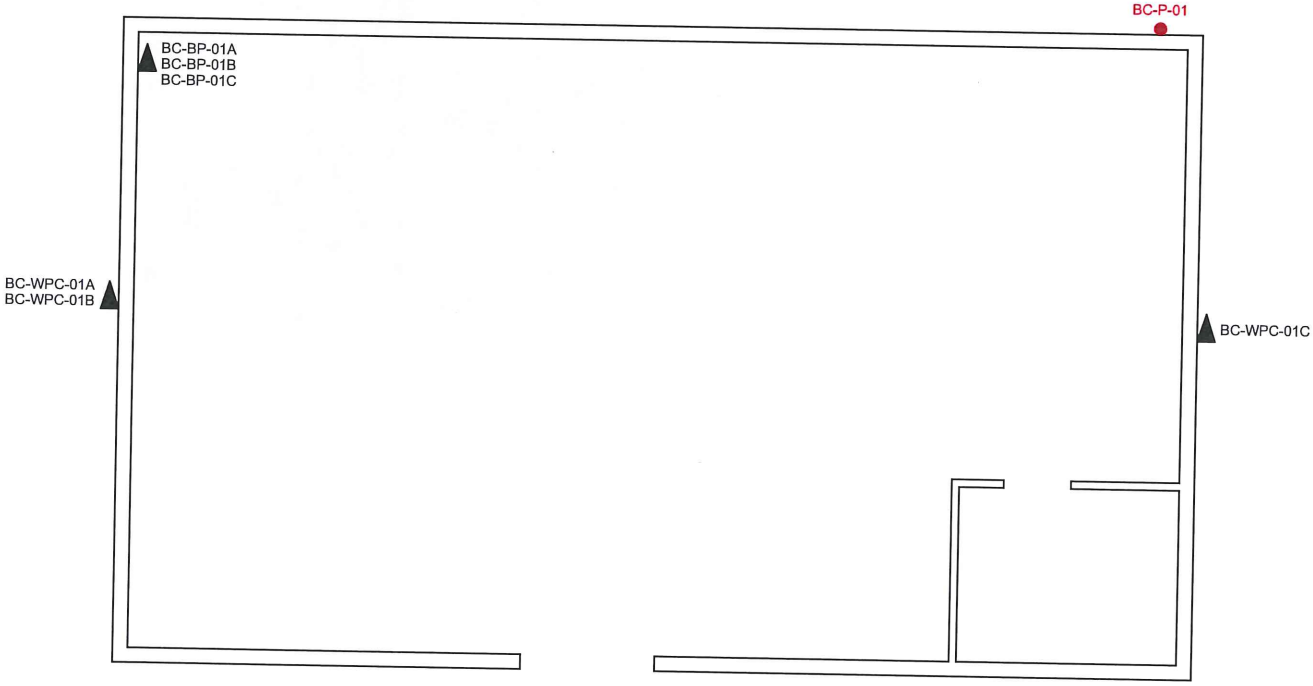
I-4.1 Silica

Silica is presumed to be present in the concrete foundation of the subject buildings.

I-5.0 RECOMMENDATIONS—GREEN POINT BEAR CACHE AND FIREWOOD SHED

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



GREEN POINT BEAR CACHE

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

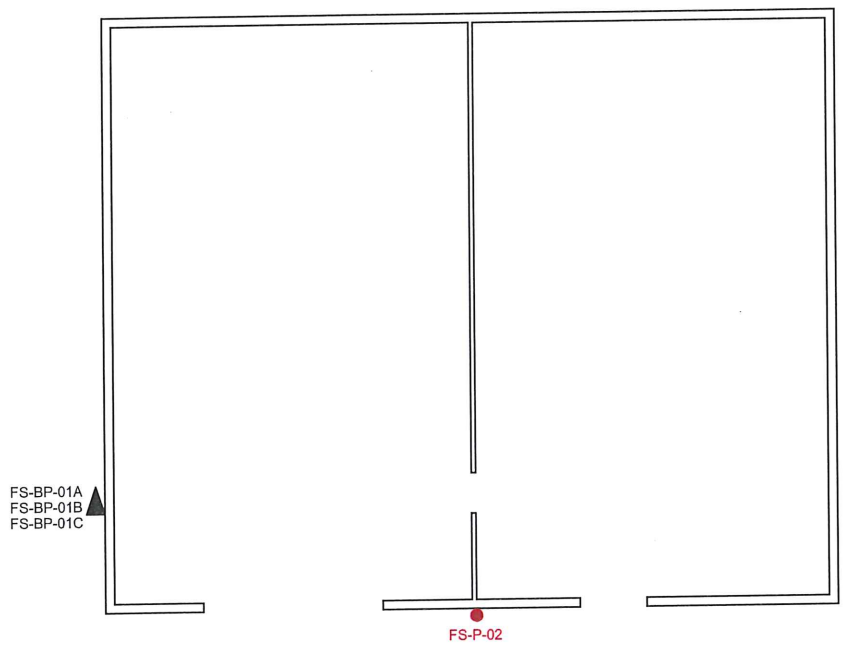
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070150 PK/DM
App'd By:	TW

Dwg. No.: I1

Stantec

Stantec Consulting Ltd. © 2015



GREEN POINT FIREWOOD SHED

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD PK/DM SL2015070136
App'd By:	TW

Dwg. No.: 12

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507129
Customer ID: 55JACQ30L
Customer PO: BEAR CASH
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: BEAR CASH AT GREEN POINT CAMPGROUND/123220330

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: BC-WPC-01A ***Lab Sample ID:*** **551507129-0001**
Sample Description: EXTERIOR WINDOW ON NORTH SIDE/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: BC-WPC-01B ***Lab Sample ID:*** **551507129-0002**
Sample Description: EXTERIOR WINDOW ON NORTH SIDE/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	15%	85%	None Detected	

Client Sample ID: BC-WPC-01C ***Lab Sample ID:*** **551507129-0003**
Sample Description: EXTERIOR WINDOW ON NORTH SIDE/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: BC-BP-01A ***Lab Sample ID:*** **551507129-0004**
Sample Description: INTERIOR WALL ON NORTH SIDE/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: BC-BP-01B ***Lab Sample ID:*** **551507129-0005**
Sample Description: INTERIOR WALL ON NORTH SIDE/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: BC-BP-01C ***Lab Sample ID:*** **551507129-0006**
Sample Description: INTERIOR WALL ON NORTH SIDE/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507129
Customer ID: 55JACQ30L
Customer PO: BEAR CASH
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

Natalie D'Amico	PLM (1)
	PLM Grav. Reduction (3)
Nicole Dimou	PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:21:42

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507131
Customer ID: 55JACQ30L
Customer PO: FIRE WOOD
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: FIRE WOOD SHED AT GREEN POINT CAMPGROUND/123220330

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: FS-BP-01A ***Lab Sample ID:*** **551507131-0001**

Sample Description: EXTERIOR ROOF ON NORTH SIDE/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown/Black	0.0%	100%	None Detected	

Client Sample ID: FS-BP-01B ***Lab Sample ID:*** **551507131-0002**

Sample Description: EXTERIOR ROOF ON NORTH SIDE/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown/Black	0.0%	100%	None Detected	

Client Sample ID: FS-BP-01C ***Lab Sample ID:*** **551507131-0003**

Sample Description: EXTERIOR ROOF ON NORTH SIDE/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown/Black	0.0%	100%	None Detected	

Analyst(s):

Jon Delos Santos PLM Grav. Reduction (1)
Nicole Dimou PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201517:35:06

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507101
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - BEAR CASH AT GREEN POINT CAMPGROUND**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
BC-P-01	*551507101-0001*		7/6/2015	<90 ppm
	Site: EXTERIOR WALL ON EAST SIDE- BLUE			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:40:22

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507102
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - FIREWOOD SHED AT GREEN POINT CAMPGROUND**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
FS-P-01	*551507102-0001*		7/6/2015	32000 ppm
	Site: BOLLARD ON NORTH SIDE OF SHED-YELLOW			
FS-P-02	*551507102-0002*		7/6/2015	<120 ppm
	Site: EXTERIOR PAINT ON LIGHT ON WEST SIDE - CREAM Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:41:18

APPENDIX J
FINDINGS AND RECOMMENDATIONS
GREEN POINT THEATER

J-4.0 FINDINGS—GREEN POINT THEATER

The Green Point Theater was reportedly constructed in 1977 and is a one storey structure comprised mainly of wood and drywall finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

J-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Duct mastic
- Drywall joint compound

Eight samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table J-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table J-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Theater, Pacific Rim National Park, BC

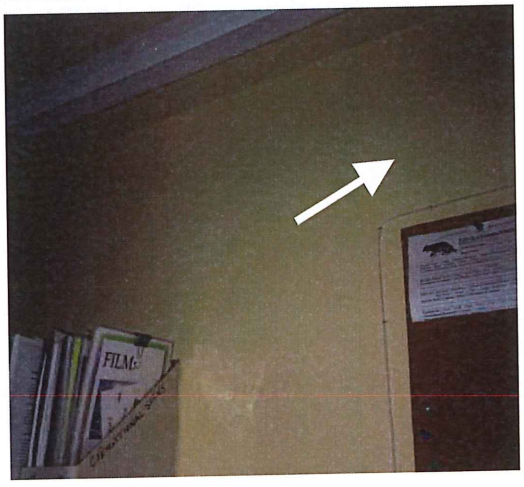
Sample Number	Material Description	Sample Location	Result (%/type asbestos)
GT-DM-01A	Grey duct mastic	Attic ducting on south end	0.32% Chrysotile
GT-DM-01B	Grey duct mastic	Attic ducting on south end	0.36% Chrysotile
GT-DM-01C	Grey duct mastic	Attic ducting on north end	<0.25% Chrysotile
GT-DJC-01A	Drywall joint compound	Interior wall in projection room in north corner	None Detected
GT-DJC-01B	Drywall joint compound	Interior wall in projection room in west corner	2% Chrysotile
GT-DJC-01C	Drywall joint compound	Interior outside of projection room on wall by steps	Stop Positive (Not Analyzed)
GT-DJC-01D	Drywall joint compound	Interior wall in storage room on west side of theater	Stop Positive (Not Analyzed)

Table J-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Theater, Pacific Rim National Park, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
GT-DJC-01E	Drywall joint compound	Interior wall on south side outside of projection room	Stop Positive (Not Analyzed)

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the material presented in Table J-4.1.2, below was identified as an ACM.

Table J-4.1.2 Summary of Identified ACMs Green Point Theater, Pacific Rim National Park, BC

Identified ACM Description and Condition Information		Photo
Drywall joint compound on walls throughout the west storage room as well as in and around the projection room.		
Friability	Non-friable in situ, potentially friable during removal/disturbance	
Condition	Good	
Content	2% Chrysotile	

J4.1.1 Drywall Joint Compound

Chrysotile asbestos was detected in the second of two samples of drywall joint compound analyzed (the remaining three samples submitted were not analyzed, based on "positive stop" methodology). As the asbestos content of this material may be inconsistent (the application of drywall joint compound was often conducted by hand-mixing the components), and as visual distinction between asbestos-containing drywall joint compound and non-asbestos-containing drywall joint compound is not practical (renovations may have resulted in drywall joint compound being layered; finished drywall

walls and ceilings are covered with multiple layers of paint, and finishing is conducted to blend different types of wall materials such that the surface is continuous) the extent of asbestos-containing drywall joint compound is difficult to determine. As such, drywall joint compound in the west storage room as well as in and around the projection room should be considered asbestos-containing.

J4.1.2 Materials with <0.5% Asbestos

It should be noted that although chrysotile asbestos was detected in three of three samples of grey duct mastic analyzed, the concentration detected in each case was less than 0.5%. Given the consistency of the overall application of duct mastic (visual similarity in appearance, use and vintage), the consistency in results and the limited extent of this material, the sampling conducted is considered representative of the entire application. As such, and as <0.5% asbestos was detected in all samples, this non-friable material is not considered an ACM, in the province of BC.

J-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, four paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table J-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table J-4.2.1 Suspected LCP Sample Collection and Analysis Summary Green Point Theater, Pacific Rim National Park, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
GT-P-01	Black	Interior in projection room wall on east side	<90	No
GT-P-02	Cream	Interior in projection room wall on west side	<90	No
GT-P-03	White	Interior on north side wall to projection room	<96	No
GT-P-04	Brown	Exterior trim on north corner	380	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

J-4.3 Polychlorinated Biphenyls

The majority of the approximately 20 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building in concealed or hidden locations, some of which may have PCB-containing ballasts.

J-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 20 fluorescent light fixtures.

J-4.5 Mould

No mould or moisture damage was observed during the assessment.

J-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

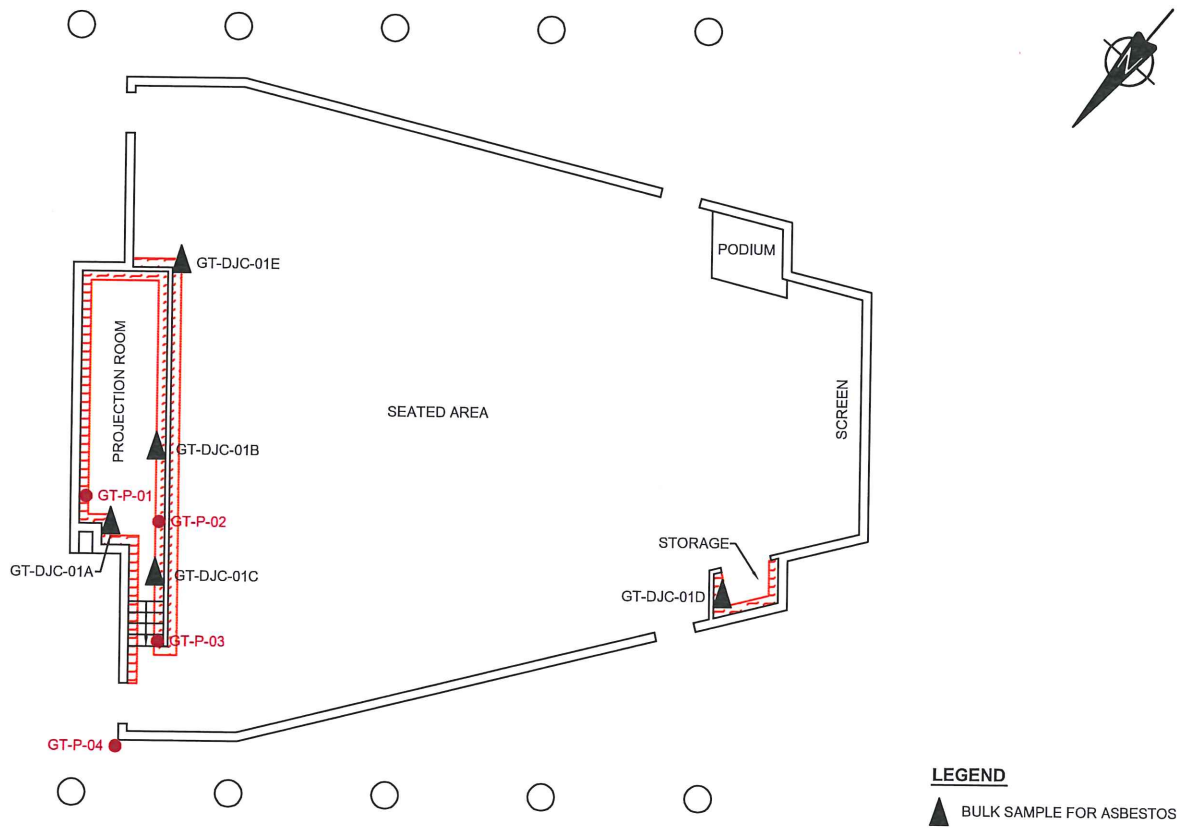
J-4.7 Silica

Silica is presumed to be present in ceiling tiles and concrete foundation of the subject building.

J-5.0 RECOMMENDATIONS—GREEN POINT THEATER

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



GREEN POINT THEATRE
MAIN FLOOR

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING DRYWALL JOINT COMPOUND

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

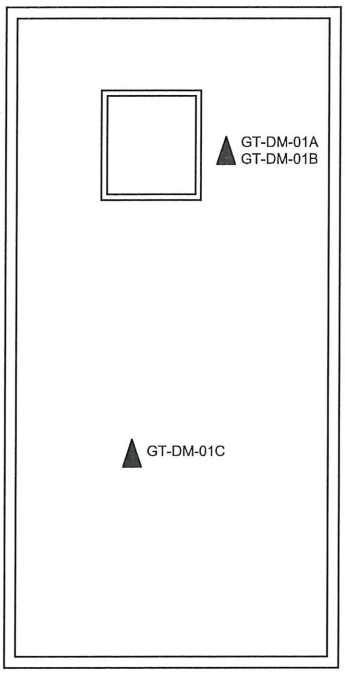
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070138 PK/DM
App'd By:	TW

Dwg. No.: J1

Stantec

Stantec Consulting Ltd. © 2015



GREEN POINT THEATRE
ATTIC SPACE

LEGEND

▲ BULK SAMPLE FOR ASBESTOS

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070147 PK/DM
App'd By:	TW

Dwg. No.: J2

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507146
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: GREEN POINT THEATER/123220330

Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Client Sample ID: GT-DM-01A **Lab Sample ID:** 551507146-0001
Sample Description: ATTIC DUCTING ON SOUTH END/GREY DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	99.7%	**0.32% Chrysotile**	

Client Sample ID: GT-DM-01B **Lab Sample ID:** 551507146-0002
Sample Description: ATTIC DUCTING ON SOUTH END/GREY DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	99.6%	**0.36% Chrysotile**	

Client Sample ID: GT-DM-01C **Lab Sample ID:** 551507146-0003
Sample Description: ATTIC DUCTING ON SOUTH END/GREY DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	**<0.25% Chrysotile**	

Client Sample ID: GT-DJC-01A **Lab Sample ID:** 551507146-0004
Sample Description: INTERIOR WALL IN PROJECTION RM IN NORTH CORNER/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: GT-DJC-01B **Lab Sample ID:** 551507146-0005
Sample Description: INTERIOR WALL IN PROJECTION RM IN WEST CORNER/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	98%	**2% Chrysotile**	

Client Sample ID: GT-DJC-01C **Lab Sample ID:** 551507146-0006
Sample Description: INTERIOR OUTSIDE OF PROJECTION RM ON WALL BY STEPS/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	7/08/2015				Stop Positive (Not Analyzed)	

Client Sample ID: GT-DJC-01D **Lab Sample ID:** 551507146-0007
Sample Description: INTERIOR WALL IN STORAGE RM ON WST SIDE OF THEATER/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	7/08/2015				Stop Positive (Not Analyzed)	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507146
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Client Sample ID: GT-DJC-01E ***Lab Sample ID:*** **551507146-0008**

Sample Description: INTERIOR WALL ON S. SIDE OUTSIDE OF PROJECTION RM/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	7/08/2015				Stop Positive (Not Analyzed)	

Analyst(s):

Natalie D'Amico	PLM (2) PLM Grav. Reduction (1)
Nicole Dimou	PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:06:06

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507099
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - GREEN POINT THEATER**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
GT-P-01	*551507099-0001*		7/7/2015	<90 ppm
	Site: INTERIOR IN PROJECTION ROOM WALL ON EAST SIDE Desc: BLACK			
GT-P-02	*551507099-0002*		7/7/2015	<90 ppm
	Site: INTERIOR IN PROJECTION ROOM WALL ON WEST SIDE Desc: CREAM			
GT-P-03	*551507099-0003*		7/7/2015	<96 ppm
	Site: INTERIOR ON NORTH SIDE WALL TO PROJECTION ROOM Desc: WHITE Insufficient sample to reach reporting limit.			
GT-P-04	*551507099-0004*		7/7/2015	380 ppm
	Site: EXTERIOR TRIM ON NORTH CORNER - BROWN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:37:26

APPENDIX K
FINDINGS AND RECOMMENDATIONS
GREEN POINT WASHROOM 1 AND 4

K-4.0 FINDINGS—GREEN POINT WASHROOMS 1 AND 4

Green Point washroom 1 was reportedly constructed in 1975 and washroom 4 in 1993. Both buildings are one storey structures mainly comprised of masonry block walls and concrete floors.

The results of the assessment for each of the considered hazardous materials within the buildings are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

K-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Window pane caulking
- Electrical putty
- Window frame caulking

Fifteen samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table K-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table K-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Washrooms 1 and 4, Pacific Rim National Park, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
Green Point Washroom 1			
GW1-WPC-01A	White window pane caulking	Exterior window on north side	1.8% Chrysotile
GW1-WPC-01B	White window pane caulking	Exterior window on north side	Stop Positive (Not Analyzed)
GW1-WPC-01C	White window pane caulking	Exterior window on north side	Stop Positive (Not Analyzed)

Table K-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Washrooms 1 and 4, Pacific Rim National Park, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
Green Point Washroom 4			
GW4-EP-01A	Black electrical putty	Exterior penetration on southeast side	None Detected
GW4-EP-01B	Black electrical putty	Exterior penetration on southeast side	None Detected
GW4-EP-01C	Black electrical putty	Exterior penetration on southeast side	None Detected
GW4-EP-02A	Brown electrical putty	Interior penetration in mechanical room at south side	None Detected
GW4-EP-02B	Brown electrical putty	Interior penetration in mechanical room at south side	None Detected
GW4-EP-02C	Brown electrical putty	Interior penetration in mechanical room at south side	None Detected
GW4-WFC-01A	Clear window frame caulking	Exterior southeast side window	None Detected
GW4-WFC-01B	Clear window frame caulking	Exterior southeast side window	None Detected
GW4-WFC-01C	Clear window frame caulking	Exterior southeast side window	None Detected
GW4-WPC-01A	Grey window pane caulking	Exterior northeast side window	None Detected
GW4-WPC-01B	Grey window pane caulking	Exterior northeast side window	None Detected
GW4-WPC-01C	Grey window pane caulking	Exterior northeast side window	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the material presented in Table K-4.1.2, below was identified as an ACM.

Table K-4.1.2 Summary of Identified ACMs
Green Point Washrooms 1, Pacific Rim National Park, BC

Identified ACM Description and Condition Information		Photo
White window pane caulking on windows throughout washroom 1.		
Friability	Non-friable	
Condition	Good	
Content	1.8% Chrysotile	

K-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment

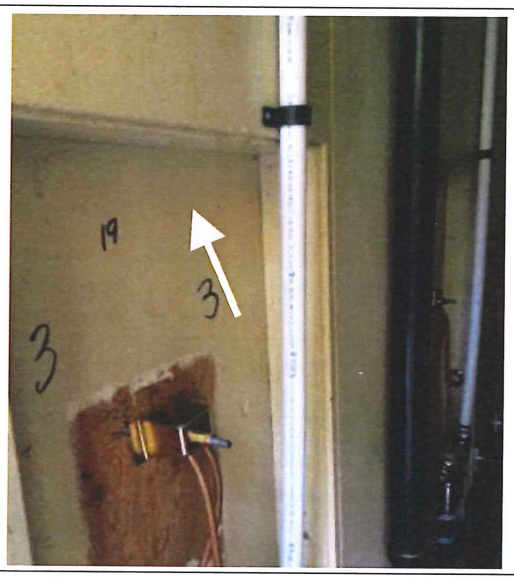
With respect to paint, seven paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table K-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table K-4.2.1 Suspected LCP Sample Collection and Analysis Summary Green Point Washrooms 1 and 4, Pacific Rim National Park, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
Green Point Washroom 1				
GW1-P-01	Blue	Exterior siding on west side	<110	No
GW1-P-02	**Yellow**	**Interior walls in north side of mechanical room**	**3,500**	**Yes**
GW1-P-03	White	Interior walls in south side of wheelchair accessible washroom	<200	No
GW1-P-04	Red	Interior floor in south side of women's washroom on cement	<590	No
GW1-P-05	Yellow	Interior floor in south side of women's washroom on cement	<100	No
Green Point Washroom 4				
GW4-P-01	Blue	Exterior walls on north side	<90	No
GW4-P-02	White	Interior walls in men's washroom at south side	<130	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the material presented in Table K-4.2.2, below was identified as an LCP.

Table K-4.2.2 Summary of Identified LCPs
Green Point Washroom 1, Pacific Rim National Park, BC

Identified LCP Description	Photo
Yellow colored paint on the interior walls of the mechanical room in washroom 1. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

K-4.3 Polychlorinated Biphenyls

The two fluorescent light fixtures within both of the washrooms were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

K-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in two fluorescent light fixtures in both of the washrooms.

K-4.5 Mould

No mould or moisture damage was observed in either of the buildings during the assessment.

K-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed in either of the buildings.

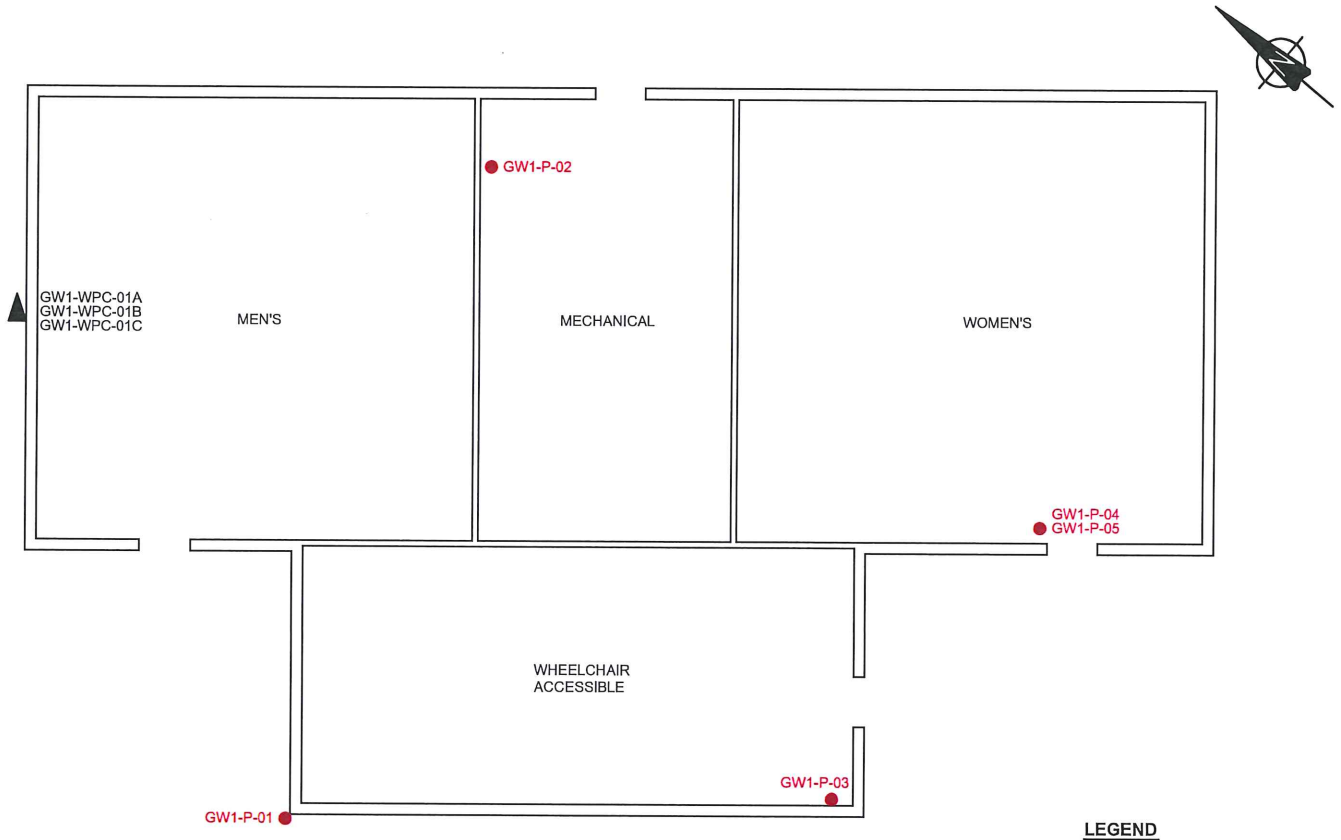
K-4.1 Silica

Silica is presumed to be present in concrete foundation of the subject buildings.

K-5.0 RECOMMENDATIONS—GREEN POINT WASHROOM 1 AND 4

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



GREEN POINT WASHROOM #1

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTES: 1. WHITE WINDOW PANE CAULKING ON WINDOWS IS ASBSESTOS-CONTAINING.
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

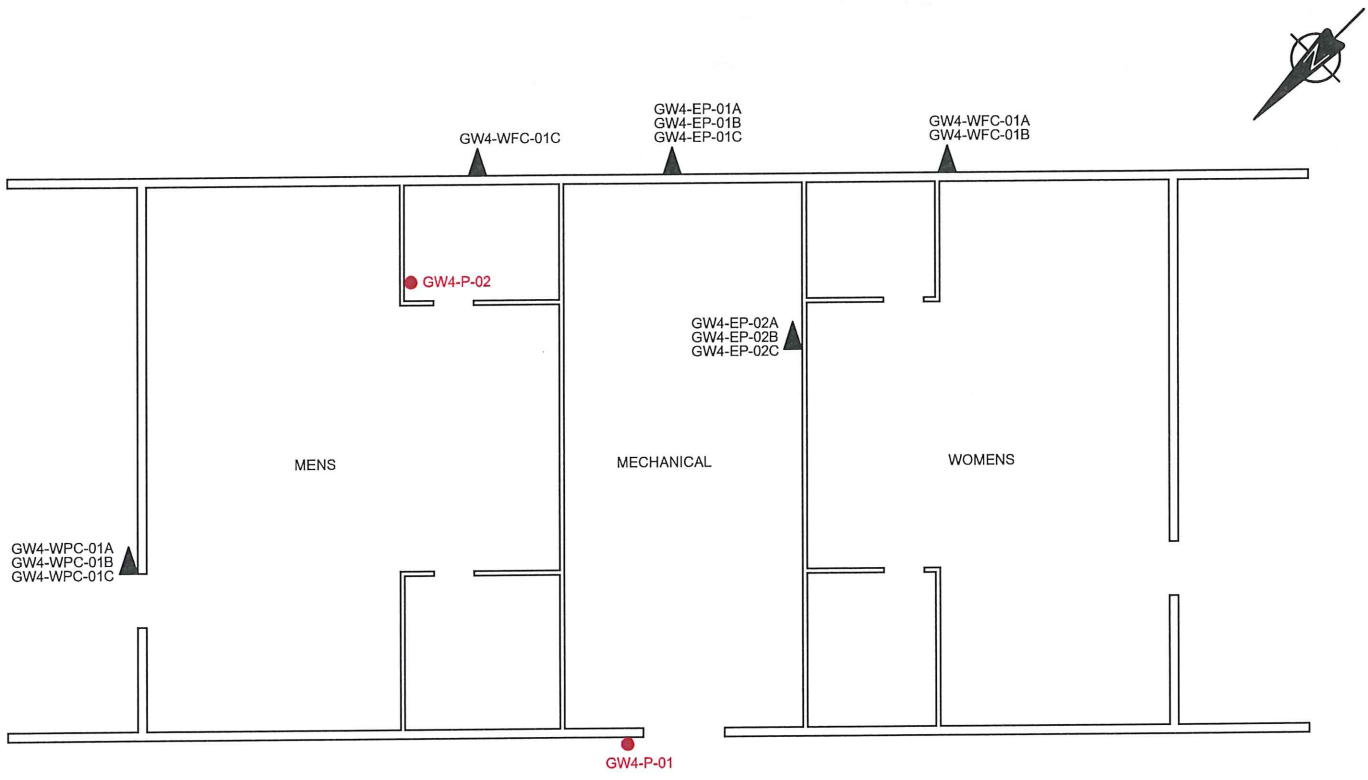
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD PK/DM SL2015070139
App'd By:	TW

Dwg. No.: K1

Stantec

Stantec Consulting Ltd. © 2015



GREEN POINT WASHROOM #4

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/31
Dwn. By:	CD SL2015070225 PK/DM
App'd By:	TW

Dwg. No.: K2

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507149
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: GREEN POINT WASHROOM 1/123220330

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: GW1-WPC-01A ***Lab Sample ID:*** **551507149-0001**

Sample Description: EXTERIOR WINDOW ON NORTH SIDE/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	98.2%	**1.8% Chrysotile**	

Client Sample ID: GW1-WPC-01B ***Lab Sample ID:*** **551507149-0002**

Sample Description: EXTERIOR WINDOW ON NORTH SIDE/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Client Sample ID: GW1-WPC-01C ***Lab Sample ID:*** **551507149-0003**

Sample Description: EXTERIOR WINDOW ON NORTH SIDE/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Analyst(s):

Nicole Dimou PLM Grav. Reduction (1)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201515:47:18

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507130
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - GREEN POINT WASHROOM 4

Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Client Sample ID: GW4-EP-01A
Lab Sample ID: 551507130-0001
Sample Description: BLACK ELECTRICAL PUTTY - EXTERIOR PENETRATION/ON SE SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: GW4-EP-01B
Lab Sample ID: 551507130-0002
Sample Description: BLACK ELECTRICAL PUTTY - EXTERIOR PENETRATION/ON SE SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: GW4-EP-01C
Lab Sample ID: 551507130-0003
Sample Description: BLACK ELECTRICAL PUTTY - EXTERIOR PENETRATION/ON SE SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: GW4-EP-02A
Lab Sample ID: 551507130-0004
Sample Description: BROWN ELECTRICAL PUTTY - INTERIOR PENETRATION IN/MECHANICAL ROOM AT SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: GW4-EP-02B
Lab Sample ID: 551507130-0005
Sample Description: BROWN ELECTRICAL PUTTY - INTERIOR PENETRATION IN/MECHANICAL ROOM AT SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: GW4-EP-02C
Lab Sample ID: 551507130-0006
Sample Description: BROWN ELECTRICAL PUTTY - INTERIOR PENETRATION IN/MECHANICAL ROOM AT SOUTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: GW4-WFC-01A
Lab Sample ID: 551507130-0007
Sample Description: CLEAR WINDOW FRAME CAULKING - EXTERIOR SE SIDE/WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507130
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Client Sample ID: GW4-WFC-01B
Sample Description: CLEAR WINDOW FRAME CAULKING - EXTERIOR SE SIDE/WINDOW
Lab Sample ID: **551507130-0008**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: GW4-WFC-01C
Sample Description: CLEAR WINDOW FRAME CAULKING - EXTERIOR SE SIDE/WINDOW
Lab Sample ID: **551507130-0009**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: GW4-WPC-01A
Sample Description: GREY WINDOW PANE CAULKING - EXTERIOR NE SIDE/WINDOW
Lab Sample ID: **551507130-0010**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: GW4-WPC-01B
Sample Description: GREY WINDOW PANE CAULKING - EXTERIOR NE SIDE/WINDOW
Lab Sample ID: **551507130-0011**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: GW4-WPC-01C
Sample Description: GREY WINDOW PANE CAULKING - EXTERIOR NE SIDE/WINDOW
Lab Sample ID: **551507130-0012**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Analyst(s):

Natalie D'Amico	PLM (1) PLM Grav. Reduction (3)
Nicole Dimou	PLM (2) PLM Grav. Reduction (6)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:03:29

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507098
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - GREEN POINT WASHROOM 1**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
GW1-P-01	*551507098-0001*		7/7/2015	<110 ppm
	Site: EXTERIOR SIDING ON WEST SIDE Desc: BLUE			
GW1-P-02	*551507098-0002*		7/7/2015	3500 ppm
	Site: INTERIOR WALLS IN NORTH SIDE OF MECHANICAL ROOM Desc: YELLOW			
GW1-P-03	*551507098-0003*		7/7/2015	<200 ppm
	Site: INTERIOR WALLS IN SOUTH SIDE OF WHEELCHAIR Desc: ACCESSIBLE WASHROOM - WHITE			
GW1-P-04	*551507098-0004*		7/7/2015	<590 ppm
	Site: INTERIOR FLOOR IN SOUTH SIDE OF WOMEN'S WASHROOM Desc: ON CEMENT - RED			
GW1-P-05	*551507098-0005*		7/7/2015	<100 ppm
	Site: INTERIOR FLOOR IN SOUTH SIDE OF WOMEN'S WASHROOM Desc: ON CEMENT - YELLOW			

Insufficient sample to reach reporting limit for sample #551507098 -0001/ -0003/ -0004/ -0005.

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/07/2015 15:02:00

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or 551507097
CustomerID: 55JACQ30L
CustomerPO: 123220330
ProjectID:

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - GREEN PAINT WASHROOM 4**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
GW4-P-01	*551507097-0001*		7/7/2015	<90 ppm
	Site: EXTERIOR WALLS ON NORTH SIDE - BLUE			
GW4-P-02	*551507097-0002*		7/7/2015	<130 ppm
	Site: INTERIOR WALLS IN MEN'S WASHROOM AT SOUTH SIDE Desc: WHITE Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:32:59

APPENDIX L
FINDINGS AND RECOMMENDATIONS
GREEN POINT ENTRANCE KIOSK

L-4.0 FINDINGS—GREEN POINT ENTRANCE KIOSK

The construction date of Green Point Entrance Kiosk is unknown and is a one storey structure comprised mainly of drywall walls.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

L-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Vinyl sheet flooring
- Electrical putty
- Roofing felt
- Ceiling texture coat
- Drywall joint compound

Thirteen samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table L-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table L-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Entrance Kiosk, Pacific Rim National Park, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
EK-SF-01	Grey and tan pebble pattern sheet flooring	Interior northwest corner in hallway	None Detected
EK-EP-01A	Clear electrical putty	Exterior penetration on north side	None Detected
EK-EP-01B	Clear electrical putty	Exterior penetration on north side	None Detected
EK-EP-01C	Clear electrical putty	Exterior penetration on north side	None Detected
EK-RF-01A	Black roofing felt	Exterior south corner of roof	None Detected
EK-RF-01B	Black roofing felt	Exterior south corner of roof	None Detected
EK-RF-01C	Black roofing felt	Exterior south corner of roof	None Detected

Table L-4.1.1 Suspected ACM Sample Collection and Analysis Summary Green Point Entrance Kiosk, Pacific Rim National Park, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
EK-CTC-01A	Ceiling texture coat	Interior central ceiling in front of storage closet	None Detected
EK-CTC-01B	Ceiling texture coat	Interior hallway outside of washroom	None Detected
EK-CTC-01C	Ceiling texture coat	Interior washroom ceiling	None Detected
EK-DJC-01A	Drywall joint compound	Interior wall outside of storage closet	None Detected
EK-DJC-01B	Drywall joint compound	Interior wall on northeast side	None Detected
EK-DJC-01C	Drywall joint compound	Interior wall on northwest side	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

L-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment
- Vent and pipe flashings

With respect to paint, three paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table L-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table L-4.2.1 Suspected LCP Sample Collection and Analysis Summary Ucluelet Laundry and Storage, Pacific Rim National Park, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
EK-P-01	Yellow	Interior walls in storage closest	<90	No
EK-P-02	Cream	Interior walls outside of storage closet	<90	No

Table L-4.2.1 Suspected LCP Sample Collection and Analysis Summary Ucluelet Laundry and Storage, Pacific Rim National Park, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
EK-P-03	Blue	Exterior walls on northwest corner	<90	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

L-4.3 Polychlorinated Biphenyls

The one fluorescent light fixture present was observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

L-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in one fluorescent light fixture.

L-4.5 Mould

No mould or moisture damage was observed during the assessment.

L-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

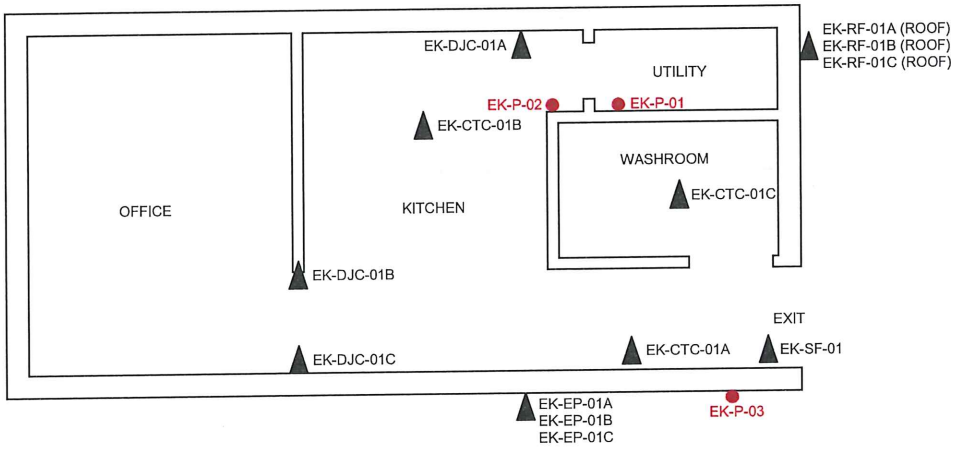
L-4.1 Silica

Silica is presumed to be present in concrete foundation of the subject building.

L-5.0 RECOMMENDATIONS—GREEN POINT ENTRANCE KIOSK

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



GREEN POINT ENTRANCE KIOSK

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100034 DM/PK
App'd By:	TW

Dwg. No.: L

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507145
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - ENTRANCE KIOSK AT GREEN POINT CAMPGROUND

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: EK-SF-01 ***Lab Sample ID:*** **551507145-0001**

Sample Description: GREY AND TAN PEBBLE PATTERN SHEET FLOORING/INTERIOR NW CORNER I HALLWAY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray/Tan	0.0%	100%	None Detected	

Client Sample ID: EK-EP-01A ***Lab Sample ID:*** **551507145-0002**

Sample Description: CLEAR ELECTRICAL PUTTY/EXTERIOR PENETRATION ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: EK-EP-01B ***Lab Sample ID:*** **551507145-0003**

Sample Description: CLEAR ELECTRICAL PUTTY/EXTERIOR PENETRATION ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: EK-EP-01C ***Lab Sample ID:*** **551507145-0004**

Sample Description: CLEAR ELECTRICAL PUTTY/EXTERIOR PENETRATION ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: EK-RF-01A ***Lab Sample ID:*** **551507145-0005**

Sample Description: BLACK ROOFING FELT/EXTERIOR SOUTH CORNER OF ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: EK-RF-01B ***Lab Sample ID:*** **551507145-0006**

Sample Description: BLACK ROOFING FELT/EXTERIOR SOUTH CORNER OF ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: EK-RF-01C ***Lab Sample ID:*** **551507145-0007**

Sample Description: BLACK ROOFING FELT/EXTERIOR SOUTH CORNER OF ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507145
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: EK-CTC-01A
Lab Sample ID: 551507145-0008
Sample Description: CEILING TEXTURE COAT/INTERIOR CENTRAL CEILING IN FRONT OF STORAGE CLOSET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: EK-CTC-01B
Lab Sample ID: 551507145-0009
Sample Description: CEILING TEXTURE COAT/INTERIOR HALLWAY OUTSIDE OF WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: EK-CTC-01C
Lab Sample ID: 551507145-0010
Sample Description: CEILING TEXTURE COAT/INTERIOR WSHROOM CEILING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: EK-DJC-01A
Lab Sample ID: 551507145-0011
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR WALL OUTSIDE OF STORAGE CLOSET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: EK-DJC-01B
Lab Sample ID: 551507145-0012
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR WALL ON NE SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: EK-DJC-01C
Lab Sample ID: 551507145-0013
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR WALL ON NW SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507145
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

John Biesiadecki	PLM Grav. Reduction (2)
Jon Delos Santos	PLM Grav. Reduction (5)
Natalie D'Amico	PLM (4)
Nicole Dimou	PLM (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:34:09

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507096
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - ENTRANCE KIOSK AT GREEN POINT CAMPGROUND**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
EK-P-01	*551507096-0001*		7/7/2015	<90 ppm
	Site: INTERIOR WALLS IN STORAGE CLOSET - YELLOW			
EK-P-02	*551507096-0002*		7/7/2015	<90 ppm
	Site: INTERIOR WALLS OUTSIDE OF STORAGE CLOSET - CREAM			
EK-P-03	*551507096-0003*		7/7/2015	<90 ppm
	Site: EXTERIOR WALLS ON NORTHWEST CORNER - BLUE			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:31:49

APPENDIX M
FINDINGS AND RECOMMENDATIONS
HAMILTON HOUSE (AND SHED)

M-4.0 FINDINGS—HAMILTON HOUSE (AND SHEDS)

The Hamilton House and Sheds construction dates are unknown. The house is a two storey residential structure with wood shingle exterior walls. The sheds are comprised with wood shingle exterior walls and concrete foundations.

The results of the assessment for each of the considered hazardous materials on the exterior, accessible surfaces of the buildings are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

The inside of the house and sheds was not accessed because the door was looked and staff did not have a key during the assessment.

M-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Textured flooring materials
- Assorted caulkings
- Roofing shingles

Eighteen samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table M-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM sample submitted is attached at the end of this Appendix.

Table M-4.1.1 Suspected ACM Sample Collection and Analysis Summary Hamilton House (and Sheds), West Coast Trail, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
HH-TF-01A	Black textured flooring	Exterior steps on west side	None Detected
HH-TF-01B	Black textured flooring	Exterior steps on west side	None Detected
HH-TF-01C	Black textured flooring	Exterior steps on west side	None Detected
HH-WPC-01A	White window pane caulking	Exterior window on east side	None Detected

Table M-4.1.1 Suspected ACM Sample Collection and Analysis Summary Hamilton House (and Sheds), West Coast Trail, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
HH-WPC-01B	White window pane caulking	Exterior window on east side	None Detected
HH-WPC-01C	White window pane caulking	Exterior window on east side	None Detected
HH-WPC-02A	White window pane caulking	Exterior window on shed north of house	None Detected
HH-WPC-02B	White window pane caulking	Exterior window on shed north of house	None Detected
HH-WPC-02C	White window pane caulking	Exterior window on shed north of house	None Detected
HH-WPC-03A	Clear window pane caulking	Exterior window on west side of house	None Detected
HH-WPC-03B	Clear window pane caulking	Exterior window on west side of house	None Detected
HH-WPC-03C	Clear window pane caulking	Exterior window on west side of house	None Detected
HH-RS-01A	Black roofing shingle	East exterior roof	None Detected
HH-RS-01B	Black roofing shingle	East exterior roof	None Detected
HH-RS-01C	Black roofing shingle	East exterior roof	None Detected
HH-CS-01A	White caulking	Exterior penetration	None Detected
HH-CS-01B	White caulking	Exterior penetration	None Detected
HH-CS-01C	White caulking	Exterior penetration	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified associated with the exterior, accessible building materials assessed.

ACMs may be present associated with interior building materials not assessed.

M-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes

- Solder used in electrical equipment
- Vent and pipe flashings

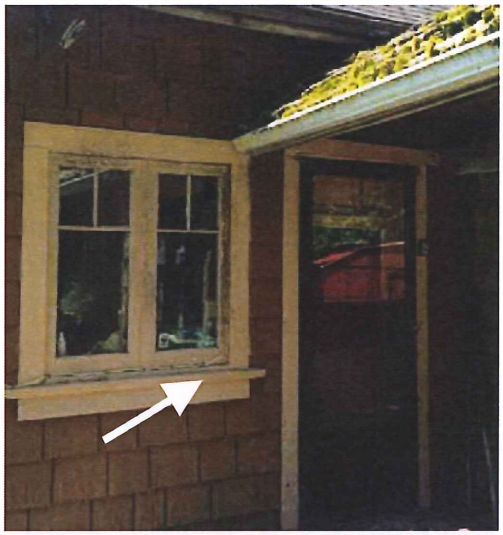
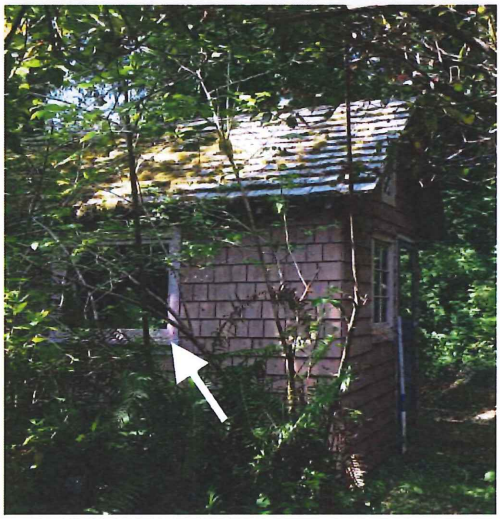
With respect to paint, five paint chip samples were obtained from the predominant suspected LCP applications on the exterior, accessible surfaces of the buildings. A summary of the sample types, locations and analytical results is presented in Table M-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table M-4.2.1 Suspected LCP Sample Collection and Analysis Summary Hamilton House (and Sheds), West Coast Trail, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
HH-P-01	**Cream**	**Exterior window frame on south side**	**3,600**	**Yes**
HH-P-02	Brown	Exterior walls on east side	190	No
HH-P-03	Red	Exterior walls on shed west of house	<90	No
HH-P-04	**Pink**	**Exterior window frame on shed west of house**	**13,000**	**Yes**
HH-P-05	Brown	Exterior walls on shed east of house	120	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table M-4.2.2, below were identified as LCPs associated with the exterior finishes of the buildings.

Table M-4.2.2 Summary of Identified LCPs Hamilton House (and Sheds), West Coast Trail, BC

Identified LCP Description	Photo
Cream colored paint on the exterior window and door frames of the house. This paint was observed to be in poor condition (bubbling, flaking or peeling).	
Pink colored paint on the exterior window frames on the sheds. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

M-4.3 Polychlorinated Biphenyls

No suspected PCB-containing electrical equipment was observed pertaining to exterior, accessed building materials.

M-4.4 Mercury

No suspected mercury-containing equipment was observed pertaining to exterior, accessed building materials.

M-4.5 Mould

No mould or moisture damage was observed during the assessment pertaining to exterior, accessed building materials.

M-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed pertaining to exterior, accessed building materials.

M-4.1 Silica

Silica is presumed to be present in concrete foundation of the subject buildings.

M-5.0 RECOMMENDATIONS—HAMILTON HOUSE (AND SHEDS)

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

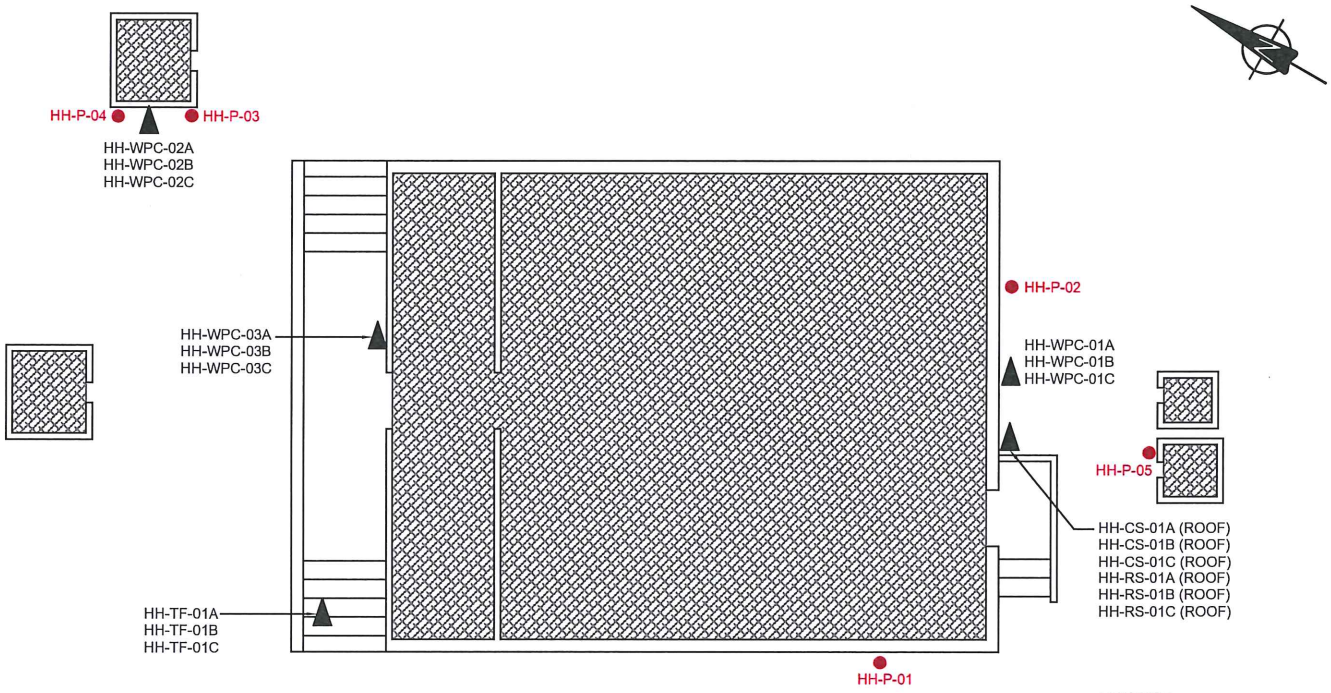
Additional building-specific recommendations to be considered are provided below.

M-5.2 Lead

Lead-containing paint observed in poor condition on the exterior window and door frames should be cleaned-up and/or addressed to mitigate potential for additional deterioration and dispersal of lead-containing paint chips/dust. Consideration should be given to re-painting surfaces to mitigate the potential for additional deterioration and hazards associated with the lead-containing paint chips/dust that may be created. If re-painting is completed, appropriate precautions to protect workers and work areas from exposure to lead will be required during painting preparation activities.

Provisions for worker protection and waste disposal related to the above are included in Section 5.2 of the main body of this report.

Stantec Consulting Ltd. © 2015



HAMILTON HOUSE

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070145 VM/DM
App'd By:	TW

Dwg. No.: M

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507147
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - HAMILTON HOUSE

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: HH-TF-01A ***Lab Sample ID:*** **551507147-0001**
Sample Description: BLACK TEXTURED FLOORING/EXTERIOR STEPS ON WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: HH-TF-01B ***Lab Sample ID:*** **551507147-0002**
Sample Description: BLACK TEXTURED FLOORING/EXTERIOR STEPS ON WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: HH-TF-01C ***Lab Sample ID:*** **551507147-0003**
Sample Description: BLACK TEXTURED FLOORING/EXTERIOR STEPS ON WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-01A ***Lab Sample ID:*** **551507147-0004**
Sample Description: WHITE WINDOW PANE CAULKING/EXTERIOR WINDOW ON EAST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White/Various	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-01B ***Lab Sample ID:*** **551507147-0005**
Sample Description: WHITE WINDOW PANE CAULKING/EXTERIOR WINDOW ON EAST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White/Various	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-01C ***Lab Sample ID:*** **551507147-0006**
Sample Description: WHITE WINDOW PANE CAULKING/EXTERIOR WINDOW ON EAST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White/Various	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-02A ***Lab Sample ID:*** **551507147-0007**
Sample Description: WHITE WINDOW PANE CAULKING/EXTERIOR WINDOW ON SHED NORTH OF HOUSE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507147
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: HH-WPC-02B **Lab Sample ID:** 551507147-0008
Sample Description: WHITE WINDOW PANE CAULKING/EXTERIOR WINDOW ON SHED NORTH OF HOUSE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-02C **Lab Sample ID:** 551507147-0009
Sample Description: WHITE WINDOW PANE CAULKING/EXTERIOR WINDOW ON SHED NORTH OF HOUSE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-03A **Lab Sample ID:** 551507147-0010
Sample Description: CLEAR WINDOW PANE CAULKING/EXTERIOR WINDOW ON WEST SIDE OF HOUSE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-03B **Lab Sample ID:** 551507147-0011
Sample Description: CLEAR WINDOW PANE CAULKING/EXTERIOR WINDOW ON WEST SIDE OF HOUSE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: HH-WPC-03C **Lab Sample ID:** 551507147-0012
Sample Description: CLEAR WINDOW PANE CAULKING/EXTERIOR WINDOW ON WEST SIDE OF HOUSE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: HH-RS-01A **Lab Sample ID:** 551507147-0013
Sample Description: BLACK ROOFING SHINGLE/EAST ESTERIOR ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	1.7%	98.3%	None Detected	

Client Sample ID: HH-RS-01B **Lab Sample ID:** 551507147-0014
Sample Description: BLACK ROOFING SHINGLE/EAST ESTERIOR ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	2.2%	97.8%	None Detected	

Client Sample ID: HH-RS-01C **Lab Sample ID:** 551507147-0015
Sample Description: BLACK ROOFING SHINGLE/EAST ESTERIOR ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507147
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: HH-CS-01A
Sample Description: WHITE CAULKING/EXTERIOR PENETRATION
Lab Sample ID: **551507147-0016**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: HH-CS-01B
Sample Description: WHITE CAULKING/EXTERIOR PENETRATION
Lab Sample ID: **551507147-0017**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: HH-CS-01C
Sample Description: WHITE CAULKING/EXTERIOR PENETRATION
Lab Sample ID: **551507147-0018**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Analyst(s):

Jon Delos Santos PLM Grav. Reduction (6)
Natalie D'Amico PLM Grav. Reduction (12)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0
Initial report from: 07/08/201517:10:30

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507095
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - HAMILTON HOUSE**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
HH-P-01	*551507095-0001*		7/7/2015	3600 ppm
	Site: EXTERIOR WINDOW FRAME ON SOUTH SIDE - CREAM			
HH-P-02	*551507095-0002*		7/7/2015	190 ppm
	Site: EXTERIOR WALLS ON EAST SIDE - BROWN			
HH-P-03	*551507095-0003*		7/7/2015	<90 ppm
	Site: EXTERIOR WALLS ON SHED WEST OF HOUSE - RED			
HH-P-04	*551507095-0004*		7/7/2015	13000 ppm
	Site: EXTERIOR WINDOW FRAME ON SHED WEST OF HOUSE - PINK			
HH-P-05	*551507095-0005*		7/7/2015	120 ppm
	Site: EXTERIOR WALLS ON SHED EAST OF HOUSE - BROWN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:30:22

APPENDIX N
FINDINGS AND RECOMMENDATIONS
MAINTENANCE BUILDING

N-4.0 FINDINGS—MAINTENANCE BUILDING

The Maintenance Building was reportedly constructed in 1944 and is a one storey structure with a storage loft and is comprised mainly of wood and drywall finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

N-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Assorted mastics, caulkings and putties
- Building paper
- Drywall joint compound

Twenty-three samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table N-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table N-4.1.1 Suspected ACM Sample Collection and Analysis Summary Maintenance Building, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
MB-DM-01A	Burgundy duct mastic	Central duct vents for sawdust	None Detected
MB-DM-01B	Burgundy duct mastic	Central duct vents for sawdust	None Detected
MB-DM-01C	Burgundy duct mastic	Central duct vents for sawdust	None Detected
MB-BP-01A	Black building paper	Exterior north wall under siding	None Detected
MB-BP-01B	Black building paper	Exterior north wall under siding	None Detected
MB-BP-01C	Black building paper	Exterior north wall under siding	None Detected
MB-DC-01A	Clear door caulking	South exterior main door entrance	None Detected
MB-DC-01B	Clear door caulking	South exterior main door entrance	None Detected
MB-DC-01C	Clear door caulking	South exterior main door entrance	None Detected

Table N-4.1.1 Suspected ACM Sample Collection and Analysis Summary Maintenance Building, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
MB-WPC-01A	Black window pane caulking	Interior window on northwest room on window	6.1% Chrysotile
MB-WPC-01B	Black window pane caulking	Interior window on northwest office on window	Stop Positive (Not Analyzed)
MB-WPC-01C	Black window pane caulking	Interior window on northwest office on window	Stop Positive (Not Analyzed)
MB-WPC-02A	Grey window pane caulking	Exterior window on west side	0.71% Chrysotile
MB-WPC-02B	Grey window pane caulking	Exterior window on north side	Stop Positive (Not Analyzed)
MB-WPC-02C	Grey window pane caulking	Exterior window on north side	Stop Positive (Not Analyzed)
MB-EP-01A	Grey electrical putty	Exterior penetration on north side	None Detected
MB-EP-01B	Grey electrical putty	Exterior penetration on north side	None Detected
MB-EP-01C	Grey electrical putty	Exterior penetration on north side	None Detected
MB-DJC-01A	Drywall joint compound	Interior wall in northwest office	None Detected
MB-DJC-01B	Drywall joint compound	Interior wall in men's washroom	None Detected
MB-DJC-01C	Drywall joint compound	Interior wall in women's washroom	None Detected
MB-DJC-01D	Drywall joint compound	Interior wall in east room by stairwell to loft	None Detected
MB-DJC-01E	Drywall joint compound	Interior east wall in kitchen	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table N-4.1.2, below were identified as ACMs.

Table N-4.1.2 Summary of Identified ACMs Maintenance Building, Tofino, BC

Identified ACM Description and Condition Information		Photo
Black window pane caulking on newer windows throughout.		
Friability	Non-friable	
Condition	Good	
Content	6.1% Chrysotile	
Grey window pane caulking on older windows throughout.		
Friability	Non-friable	
Condition	Poor	
Content	0.71% Chrysotile	

N-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment
- Vent and pipe flashings

With respect to paint, eight paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table N-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table N-4.2.1 Suspected LCP Sample Collection and Analysis Summary Maintenance Building, Tofino, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
MB-P-01	Red	Floor in northwest corner room	2,100	Yes
MB-P-02	Green/blue	Wood slat walls in northeast room	1,500	Yes
MB-P-03	Grey	Floor in men's bathroom	2,000	Yes
MB-P-04	Brown	Floor in hallway at east end	1,800	Yes
MB-P-05	Yellow	North walls in kitchen	<100	No
MB-P-06	Yellow	Floor in northeast corner room	110	No
MB-P-07	Brown with green underneath	Exterior window frame on north side	51,000	Yes
MB-P-08	White	Old exterior siding underneath newer siding on north side	66,000	Yes

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table N-4.2.2, below were identified as LCPs.

Table N-4.2.2 Summary of Identified LCPs Maintenance Building, Tofino, BC

Identified LCP Description	Photo
Red colored paint on the interior floor in the northwest corner room. This paint was observed to be in good condition (not bubbling, flaking or peeling).	No photo available
Green/blue colored paint on the interior wood slat walls in the northeast room. This paint was observed to be in good condition (not bubbling, flaking or peeling).	
Grey colored paint on the interior washroom floors. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

Table N-4.2.2 Summary of Identified LCPs Maintenance Building, Tofino, BC

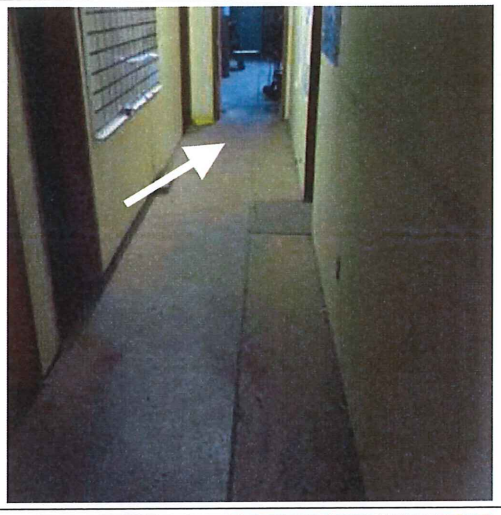
Identified LCP Description	Photo
Brown colored paint on interior hallway floors. This paint was observed to be in good condition (not bubbling, flaking or peeling).	
Brown colored paint with green underneath on the exterior window frames. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

Table N-4.2.2 Summary of Identified LCPs
Maintenance Building, Tofino, BC

Identified LCP Description	Photo
White colored paint on the exterior siding under the newer siding. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

N-4.3 Polychlorinated Biphenyls

The majority of the approximately 40 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts.

N-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 40 fluorescent light fixtures.

N-4.5 Mould

No mould or moisture damage was observed during the assessment.

N-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

N-4.1 Silica

Silica is presumed to be present in concrete foundation of the subject building.

N-5.0 RECOMMENDATIONS—MAINTENANCE BUILDING

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Additional building-specific recommendations to be considered are provided below.

N-5.1 Asbestos

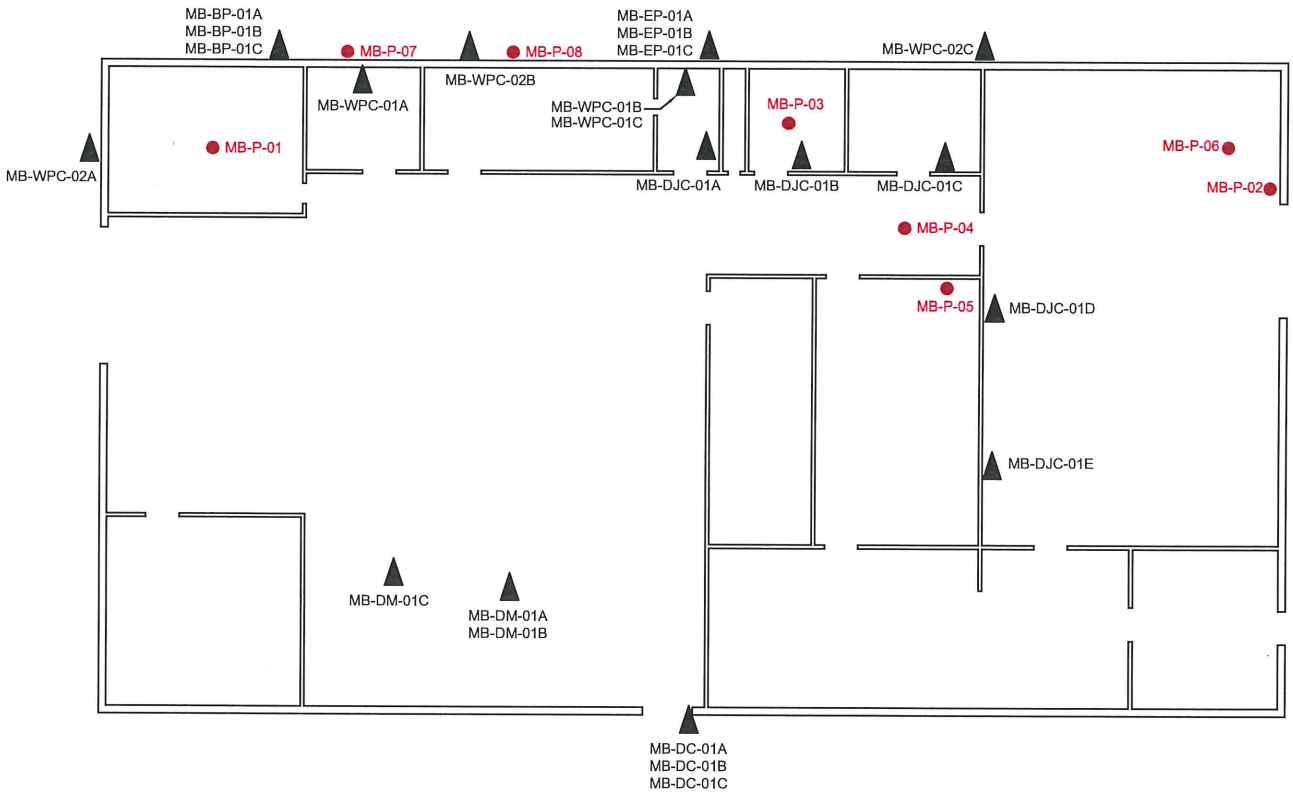
Identified grey asbestos-containing window caulking observed to be in poor condition, as listed in Table N-4.1.2, should be abated (removed) or repaired in accordance with the requirements of the Canada Labour Code and BC Reg. 296/97 It is expected that this will require the involvement of an experienced asbestos abatement contractor.

N-5.2 Lead

Lead-containing paint observed in poor condition on the exterior siding (where exposed) and window frames should be cleaned-up and/or addressed to mitigate potential for additional deterioration and dispersal of lead-containing paint chips/dust. Consideration should be given to re-painting surfaces to mitigate the potential for additional deterioration and hazards associated with the lead-containing paint chips/dust that may be created. If re-painting is completed, appropriate precautions to protect workers and work areas from exposure to lead will be required during painting preparation activities.

Provisions for worker protection and waste disposal related to the above are included in Section 5.2 of the main body of this report.

Stantec Consulting Ltd. © 2015



MAINTENANCE BUILDING

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTES: 1. BLACK WINDOW PANE CAULKING ON WINDOWS IS ASBESTOS-CONTAINING.
2. GREY WINDOW PANE CAULKING ON WINDOWS IS ASBESTOS-CONTAINING.
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070144 VM/DM
App'd By:	TW

Dwg. No.: N

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507154
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - MAINTENANCE BUILDING

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: MB-DM-01A ***Lab Sample ID:*** **551507154-0001**
Sample Description: BURGUNDY DUCT MASTIC/CENTRAL DUCT VENTS FOR SAWDUST

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Red	0.0%	100%	None Detected	

Client Sample ID: MB-DM-01B ***Lab Sample ID:*** **551507154-0002**
Sample Description: BURGUNDY DUCT MASTIC/CENTRAL DUCT VENTS FOR SAWDUST

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Red	0.0%	100%	None Detected	

Client Sample ID: MB-DM-01C ***Lab Sample ID:*** **551507154-0003**
Sample Description: BURGUNDY DUCT MASTIC/CENTRAL DUCT VENTS FOR SAWDUST

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Red	0.0%	100%	None Detected	

Client Sample ID: MB-BP-01A ***Lab Sample ID:*** **551507154-0004**
Sample Description: BLACK BUILDING PAPER/EXTERIOR NORTH WALL UNDER SIDING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: MB-BP-01B ***Lab Sample ID:*** **551507154-0005**
Sample Description: BLACK BUILDING PAPER/EXTERIOR NORTH WALL UNDER SIDING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: MB-BP-01C ***Lab Sample ID:*** **551507154-0006**
Sample Description: BLACK BUILDING PAPER/EXTERIOR NORTH WALL UNDER SIDING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: MB-DC-01A ***Lab Sample ID:*** **551507154-0007**
Sample Description: CLEAR DOOR CAULKING/SOUTH EXTERIOR MAIN DOOR ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507154
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: MB-DC-01B ***Lab Sample ID:*** **551507154-0008**
Sample Description: CLEAR DOOR CAULKING/SOUTH EXTERIOR MAIN DOOR ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: MB-DC-01C ***Lab Sample ID:*** **551507154-0009**
Sample Description: CLEAR DOOR CAULKING/SOUTH EXTERIOR MAIN DOOR ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: MB-WPC-01A ***Lab Sample ID:*** **551507154-0010**
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WINDOW ON NW ROOM ON WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	93.9%	**6.1% Chrysotile**	

Client Sample ID: MB-WPC-01B ***Lab Sample ID:*** **551507154-0011**
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WINDOW ON NW OFFICE ON WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Client Sample ID: MB-WPC-01C ***Lab Sample ID:*** **551507154-0012**
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WINDOW ON NW OFFICE ON WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Client Sample ID: MB-WPC-02A ***Lab Sample ID:*** **551507154-0013**
Sample Description: GREY WINDOW PANE CAULKING/EXTERIOR WINDOW ON WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White/Various	0.0%	99.3%	**0.71% Chrysotile**	

Client Sample ID: MB-WPC-02B ***Lab Sample ID:*** **551507154-0014**
Sample Description: GREY WINDOW PANE CAULKING/EXTERIOR WINDOW ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

Client Sample ID: MB-WPC-02C ***Lab Sample ID:*** **551507154-0015**
Sample Description: GREY WINDOW PANE CAULKING/EXTERIOR WINDOW ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015				Positive Stop (Not Analyzed)	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507154
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: MB-EP-01A **Lab Sample ID:** 551507154-0016
Sample Description: GREY ELECTRICAL PUTTY/EXTERIOR PENETATION ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: MB-EP-01B **Lab Sample ID:** 551507154-0017
Sample Description: GREY ELECTRICAL PUTTY/EXTERIOR PENETATION ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: MB-EP-01C **Lab Sample ID:** 551507154-0018
Sample Description: GREY ELECTRICAL PUTTY/EXTERIOR PENETATION ON NORTH SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: MB-DJC-01A **Lab Sample ID:** 551507154-0019
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR WALL IN NW OFFICE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: MB-DJC-01B **Lab Sample ID:** 551507154-0020
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR WALL IN MEN'S WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: MB-DJC-01C **Lab Sample ID:** 551507154-0021
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR WALL IN WOMEN'S WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: MB-DJC-01D **Lab Sample ID:** 551507154-0022
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR WALL IN EAST ROOM BY STAIRWELL TO LOFT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: MB-DJC-01E **Lab Sample ID:** 551507154-0023
Sample Description: DRYWALL JOINT COMPOUND/INTERIOR EAST WALL IN KITCHEN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507154
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

John Biesiadecki	PLM Grav. Reduction (10)
Natalie D'Amico	PLM (3)
Nicole Dimou	PLM (2) PLM Grav. Reduction (4)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:54:05

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507094
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - MAINTENANCE BUILDING**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
MB-P-01	*551507094-0001*		7/7/2015	2100 ppm
	Site: FLOOR IN NORTHWEST CORNER ROOM Desc: RED			
MB-P-02	*551507094-0002*		7/7/2015	1500 ppm
	Site: WOOS SLAT WALLS IN NORTHEAST ROOM Desc: GREEN/BLUE			
MB-P-03	*551507094-0003*		7/7/2015	2000 ppm
	Site: FLOOR IN MEN'S BATHROOM Desc: GREY			
MB-P-04	*551507094-0004*		7/7/2015	1800 ppm
	Site: FLOOR IN HALLWAY AT EAST END Desc: BROWN			
MB-P-05	*551507094-0005*		7/7/2015	<100 ppm
	Site: NORTH WALLS IN KITCHEN Desc: YELLOW Insufficient sample to reach reporting limit.			
MB-P-06	*551507094-0006*		7/7/2015	110 ppm
	Site: FLOOR IN NORTHEAST ROOM Desc: YELLOW			
MB-P-07	*551507094-0007*		7/7/2015	51000 ppm
	Site: EXTERIOR WINDOW FRAME ON NORTH SIDE Desc: BROWN WITH GREEN UNDERNEATH			
MB-P-08	*551507094-0008*		7/7/2015	66000 ppm
	Site: OLD EXTERIOR SIDING UNDERNEATH NEWER SIDING Desc: ON NORTH SIDE - WHITE			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:25:33

APPENDIX O
FINDINGS AND RECOMMENDATIONS
MAINTENANCE BUILDING SHEDS

O-4.0 FINDINGS—MAINTENANCE BUILDING SHEDS

The construction dates of the Maintenance Building Sheds are unknown and are listed below:

- Cream Transite Shed (comprised of cement panel walls)
- Wood Transite Shed (comprised of wood and cement panel walls)
- Yellow Shed (comprised of wood and cement panel walls)
- Caged Shed (comprised of wood walls)
- Chemical Storage (comprised of metal walls)
- Wooden Shed (comprised of wood walls)
- Recycling Shed (comprised of wood walls)

The results of the assessment for each of the considered hazardous materials within the buildings are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

A padlock was on the door of the Wooden Shed and available staff did not have a key during the assessment.

O-4.1 Asbestos

No suspected ACMs were observed pertaining to the following sheds:

- Chemical Storage Shed
- Wooden Shed

The following known or presumed ACMs were observed on and/or within the buildings:

- Labelled asbestos-containing cement board (transite) present as siding on one cream-coloured shed ("Cream Transite Shed")
- Labelled asbestos-containing cement board present as paneling on interior walls and door on one wood-sided shed ("Wood Transite Shed")

In addition to the above, Stantec identified and sampled the following suspected ACMs:

- Roofing shingle
- Cement panel
- Building paper
- Twine flooring
- Textured flooring

Seventeen samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

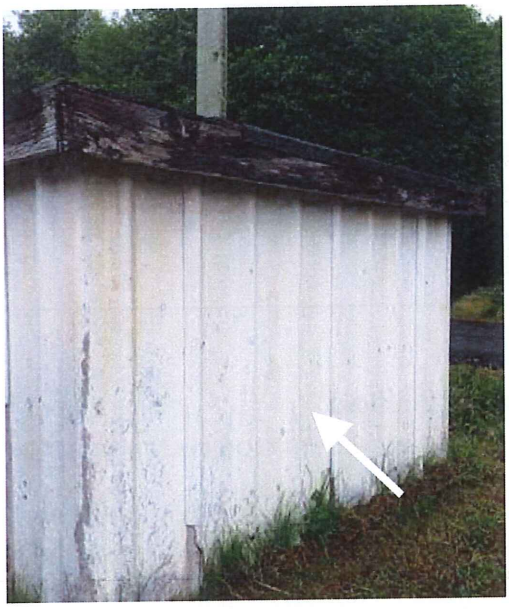
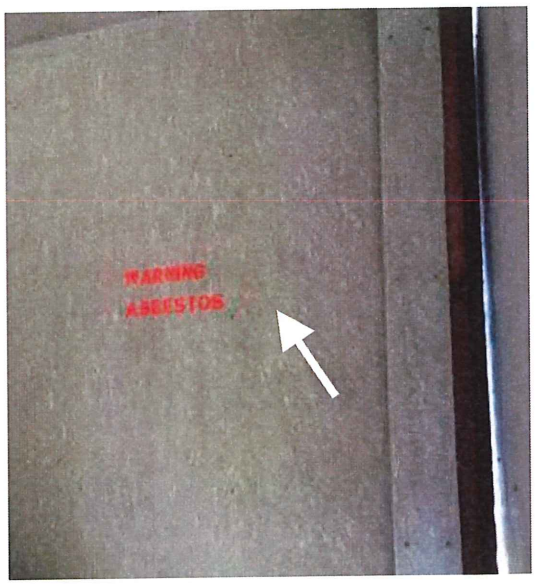
A summary of the sample types, locations and analytical results is presented in Table O-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table O-4.1.1 Suspected ACM Sample Collection and Analysis Summary Maintenance Building Sheds, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
Maintenance Building Shed – Cream Transite Shed			
CTS-RS-01A	Black roofing shingle	East roof of shed	None Detected
CTS-RS-01B	Black roofing shingle	East roof of shed	None Detected
CTS-RS-01C	Black roofing shingle	East roof of shed	None Detected
Maintenance Building Shed – Caged Shed			
CS-RS-01A	Black roofing shingle	North roof of shed	None Detected
CS-RS-01B	Black roofing shingle	North roof of shed	None Detected
CS-RS-01C	Black roofing shingle	North roof of shed	None Detected
Maintenance Building Shed – Lumber Shed			
LS-RS-01A	Black roofing shingle	North roof of shed	None Detected
LS-RS-01B	Black roofing shingle	North roof of shed	None Detected
LS-RS-01C	Black roofing shingle	North roof of shed	None Detected
Maintenance Building Shed – Yellow Shed			
YS-CP-01	New cement panel	Exterior west side	None Detected
YS-BP-01A	Black building paper	Exterior west side	None Detected
YS-BP-01B	Black building paper	Exterior west side	None Detected
YS-BP-01C	Black building paper	Exterior west side	None Detected
Maintenance Building Shed – Recycling Shed			
RS-TF-01	Blue twine flooring	Interior south side floor	None Detected
RS-TS-01A	Black textured flooring	Exterior step on east side	None Detected
RS-TS-01B	Black textured flooring	Exterior step on east side	None Detected
RS-TS-01C	**Black textured flooring**	**Exterior step on east side**	**0.50% Chrysotile**

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table O-4.1.2, below were identified as ACMs.

Table O-4.1.2 Summary of Identified ACMs Maintenance Building Sheds, Tofino, BC

Identified ACM Description and Condition Information		Photo
Siding on Cream Transite Shed.		
Friability	Non-friable	
Condition	Good	
Content	Not sampled, visually identified as known ACM	
Interior siding and door on Wood Transite Shed.		
Friability	Non-friable	
Condition	Good	
Content	Not sampled, visually identified as known ACM	

Black textured flooring on the exterior steps of the Recycling Shed.	
Friability	Non-friable
Condition	Good
Content	0.50% Chrysotile

O-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, four paint chip samples were obtained from the predominant suspected LCP applications associated with the buildings. No suspect LCPs were identified in the Cream Transite Shed, Yellow Shed, Caged Shed, Wood Transite Shed, Lumber Shed or exterior of the Wooden Shed, as such, no samples were taken. A summary of the sample types, locations and analytical results is presented in Table O-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table O-4.2.1 Suspected LCP Sample Collection and Analysis Summary Maintenance Building Sheds, Tofino, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
Maintenance Building Shed—Chemical Storage				
CH-P-01	Yellow	Exterior west side	<90	No
Maintenance Building Shed—Recycling Shed				
RS-P-01	Brown	Interior floor on north side	<310	No

Table O-4.2.1 Suspected LCP Sample Collection and Analysis Summary Maintenance Building Sheds, Tofino, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
RS-P-02	Yellow	Exterior walls on east end	280	No
RS-P-03	Green	Exterior tin roof at south end	<90	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

O-4.3 Polychlorinated Biphenyls

The one fluorescent light fixture within the Recycling Shed was observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

Other electrical equipment suspected to contain PCBs was not observed within the remainder of the sheds.

O-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in one fluorescent light fixture within the Recycling Shed.

Other pieces of equipment/items suspected to contain mercury were not observed within the remainder of the sheds.

O-4.5 Mould

No mould or moisture damage was observed during the assessment.

O-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

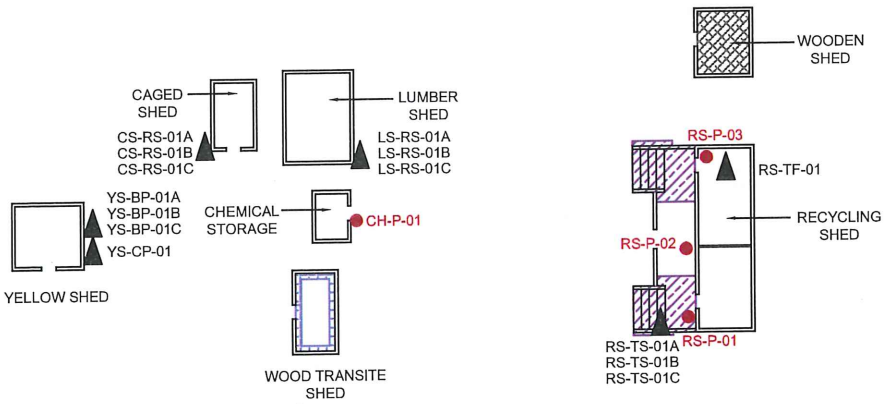
O-4.1 Silica

Silica is presumed to be present in concrete foundations of the subject buildings and cement panels.

O-5.0 RECOMMENDATIONS—MAINTENANCE BUILDING SHEDS

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



MAINTENANCE BUILDING SHEDS

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- ASBESTOS-CONTAINING CEMENT PANEL
- NO ACCESS
- ASBESTOS-CONTAINING TEXTURED FLOORING

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100035 DM/PK
App'd By:	TW

Dwg. No.: O

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507163
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - MAINTENANCE BUILDING SHED - CREAM TRANSITE SHED

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CTS-RS-01A ***Lab Sample ID:*** **551507163-0001**

Sample Description: BLACK ROOFING SHINGLE/EAST ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CTS-RS-01B ***Lab Sample ID:*** **551507163-0002**

Sample Description: BLACK ROOFING SHINGLE/EAST ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CTS-RS-01C ***Lab Sample ID:*** **551507163-0003**

Sample Description: BLACK ROOFING SHINGLE/EAST ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Analyst(s):

Natalie D'Amico PLM Grav. Reduction (2)
Nicole Dimou PLM Grav. Reduction (1)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201511:04:46

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507195
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - MAINTENANCE BUILDING SHED - CAGED SHED

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CS-RS-01A ***Lab Sample ID:*** **551507195-0001**

Sample Description: BLACK ROOFING SHINGLE/NORTH ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CS-RS-01B ***Lab Sample ID:*** **551507195-0002**

Sample Description: BLACK ROOFING SHINGLE/NORTH ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: CS-RS-01C ***Lab Sample ID:*** **551507195-0003**

Sample Description: BLACK ROOFING SHINGLE/NORTH ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki PLM Grav. Reduction (1)
Nicole Dimou PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:06:21

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507198
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - MAINTENANCE BUILDING SHED - LUMBER SHED

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: LS-RS-01A ***Lab Sample ID:*** **551507198-0001**

Sample Description: BLACK ROOFING SHINGLE/NORTH ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: LS-RS-01B ***Lab Sample ID:*** **551507198-0002**

Sample Description: BLACK ROOFING SHINGLE/NORTH ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: LS-RS-01C ***Lab Sample ID:*** **551507198-0003**

Sample Description: BLACK ROOFING SHINGLE/NORTH ROOF OF SHED

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki PLM Grav. Reduction (1)
Nicole Dimou PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:42:50

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507196
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - MAINTENANCE BUILDING SHED - YELLOW SHED

Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Client Sample ID: YS-CP-01 ***Lab Sample ID:*** **551507196-0001**

Sample Description: CEMENT PANEL/EXTERIOR WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	30%	70%	None Detected	

Client Sample ID: YS-BP-01A ***Lab Sample ID:*** **551507196-0002**

Sample Description: BLACK BUILDING PAPER/EXTERIOR WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown/Black	0.0%	100%	None Detected	

Client Sample ID: YS-BP-01B ***Lab Sample ID:*** **551507196-0003**

Sample Description: BLACK BUILDING PAPER/EXTERIOR WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown/Black	0.0%	100%	None Detected	

Client Sample ID: YS-BP-01C ***Lab Sample ID:*** **551507196-0004**

Sample Description: BLACK BUILDING PAPER/EXTERIOR WEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Brown/Black	0.0%	100%	None Detected	

Analyst(s):

Natalie D'Amico PLM Grav. Reduction (2)
Nicole Dimou PLM Grav. Reduction (1)
Romeo Samson PLM (1)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201522:15:16

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507197
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - MAINTENANCE BUILDING SHED - RECYCLING SHED

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RS-TF-01 ***Lab Sample ID:*** **551507197-0001**

Sample Description: BLUE TWINE FLOORING/INTERIOR SOUTH SIDE FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Green	0.0%	100%	None Detected	

Client Sample ID: RS-TS-01A ***Lab Sample ID:*** **551507197-0002**

Sample Description: BLACK TEXTURED FLOORING/EXTERIOR STEP ON EAST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RS-TS-01B ***Lab Sample ID:*** **551507197-0003**

Sample Description: BLACK TEXTURED FLOORING/EXTERIOR STEP ON EAST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RS-TS-01C ***Lab Sample ID:*** **551507197-0004**

Sample Description: BLACK TEXTURED FLOORING/EXTERIOR STEP ON EAST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Black	0.0%	99.5%	**0.50% Chrysotile**	

Analyst(s):

John Biesiadecki PLM Grav. Reduction (1)
Nicole Dimou PLM Grav. Reduction (3)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:17:58

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507107
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - MAINTENANCE BUILDING SHED - CHEMICAL STORAGE**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
CH-P-01	551507107-0001		7/6/2015	<90 ppm
	Site: EXTERIOR WEST SIDE - YELLOW			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:48:59

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507108
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - MAINTENANCE BUILDING SHED - RECYCLING SHED**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
RS-P-01	*551507108-0001*		7/7/2015	<310 ppm
	Site: INTERIOR FLOOR ON NORTH SIDE - BROWN Insufficient sample to reach reporting limit.			
RS-P-02	*551507108-0002*		7/7/2015	280 ppm
	Site: EXTERIOR WALLS ON EAST END - YELLOW			
RS-P-03	*551507108-0003*		7/7/2015	<90 ppm
	Site: EXTERIOR TIN ROOF AT SOUTH END - GREEN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:50:00

APPENDIX P
FINDINGS AND RECOMMENDATIONS
NETTLE PATROL CABIN

P-4.0 FINDINGS—NETTLE PATROL CABIN

The Nettle Patrol Cabin was reportedly constructed in 1975 and is a one storey residential structure, storage shed, outhouse and sauna on a barge.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

P-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Assorted sealants, caulkings and putties
- Cement panel
- Floor tile
- Building paper

Seventeen samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table P-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table P-4.1.1 Suspected ACM Sample Collection and Analysis Summary Nettle Patrol Cabin, West Coast Trail, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
NC-ES-01A	Clear electrical sealant	Exterior penetration on southwest side	None Detected
NC-ES-01B	Clear electrical sealant	Exterior penetration on southwest side	None Detected
NC-ES-01C	Clear electrical sealant	Exterior penetration on southwest side	None Detected
NC-CP-01	Cement panel	Sauna room by stove	None Detected
NC-WPC-01A	Grey window pane caulking	Bathroom window on southwest side	None Detected
NC-WPC-01B	Grey window pane caulking	Living room window on southwest side	None Detected

Table P-4.1.1 Suspected ACM Sample Collection and Analysis Summary Nettle Patrol Cabin, West Coast Trail, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
NC-WPC-01C	Grey window pane caulking	Pantry room on southeast side	None Detected
NC-FT-01	12"x12" blue and tan floor tile	Pantry and kitchen doorway	None Detected
NC-BP-01A	Black building paper	Inside on roof of sauna room	None Detected
NC-BP-01B	Black building paper	Inside on roof of sauna room	None Detected
NC-BP-01C	Black building paper	Inside on roof of sauna room	None Detected
NC-EPP-01A	Black electrical penetration putty	Interior penetration in north corner of kitchen	None Detected
NC-EPP-01B	Black electrical penetration putty	Interior penetration in north corner of kitchen	None Detected
NC-EPP-01C	Black electrical penetration putty	Interior penetration in north corner of kitchen	None Detected
NC-WFC-01A	Window frame caulking	Exterior window frame on southwest side	None Detected
NC-WFC-01B	Window frame caulking	Exterior window frame on southwest side	None Detected
NC-WFC-01C	Window frame caulking	Exterior window frame on southwest side	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

P-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, seven paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table P-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table P-4.2.1 Suspected LCP Sample Collection and Analysis Summary Nettle Patrol Cabin, West Coast Trail, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
NC-P-01	Green	Exterior walls on southeast side	130	No
NC-P-02	Brown	Exterior lower skirting on southeast side	<150	No
NC-P-03	White	Exterior door frame on north door to cabin	<130	No
NC-P-04	White	Interior pantry on southeast wall	310	No
NC-P-05	**Olive**	**Interior mud room on southeast wall**	**3,100**	**Yes**
NC-P-06	Blue	Floor in mud room in north corner	270	No
NC-P-07	**Brown**	**Exterior tin roof on west corner**	**750**	**Yes**

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table P-4.2.2, below were identified as LCPs.

Table P-4.2.2 Summary of Identified LCPs Nettle Patrol Cabin, West Coast Trail, BC

Identified LCP Description	Photo
Olive colored paint on the interior walls on the mud room. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

Table P-4.2.2 Summary of Identified LCPs
Nettle Patrol Cabin, West Coast Trail, BC

Identified LCP Description	Photo
Brown colored paint on the exterior tin roof. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

P-4.3 Polychlorinated Biphenyls

No suspected PCB-containing electrical equipment was observed.

P-4.4 Mercury

No suspected mercury-containing equipment was observed.

P-4.5 Mould

No mould or moisture damage was observed during the assessment.

P-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

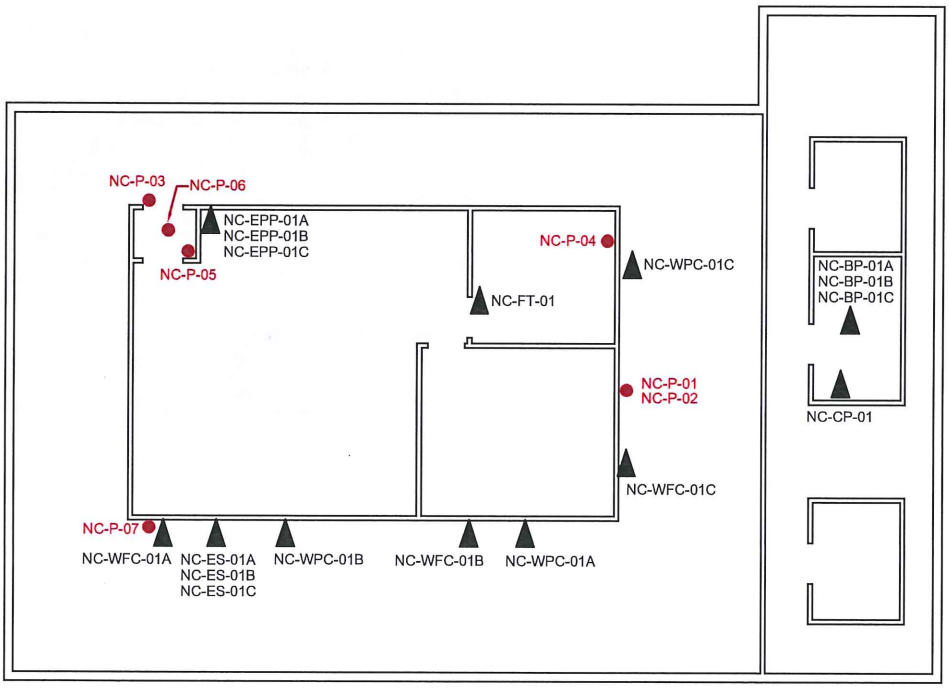
P-4.1 Silica

Silica is presumed to be present in vinyl floor tiles of the cabin.

P-5.0 RECOMMENDATIONS—NETTLE PATROL CABIN

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



NETTLE PATROL CABIN

LEGEND

- ▲ BULK SAMPLE FOR ASBESTOS
- ● PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL201510036 DM/PK
App'd By:	TW

Dwg. No.: P

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507186
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 - NETTLE CABIN

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: NC-ES-01A **Lab Sample ID:** 551507186-0001
Sample Description: CLEAR ELECTRICAL SEALANT/EXTERIOR PENETRATION ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Green/Clear	0.0%	100%	None Detected	

Client Sample ID: NC-ES-01B **Lab Sample ID:** 551507186-0002
Sample Description: CLEAR ELECTRICAL SEALANT/EXTERIOR PENETRATION ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Green/Clear	0.0%	100%	None Detected	

Client Sample ID: NC-ES-01C **Lab Sample ID:** 551507186-0003
Sample Description: CLEAR ELECTRICAL SEALANT/EXTERIOR PENETRATION ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Green/Clear	0.0%	100%	None Detected	

Client Sample ID: NC-CP-01 **Lab Sample ID:** 551507186-0004
Sample Description: CEMENT PANEL/SAUNA ROOM BY STOVE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	45%	55%	None Detected	

Client Sample ID: NC-WPC-01A **Lab Sample ID:** 551507186-0005
Sample Description: GREY WINDOW PANE CAULKING/BATHROOM WINDOW ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: NC-WPC-01B **Lab Sample ID:** 551507186-0006
Sample Description: GREY WINDOW PANE CAULKING/LIVING ROOM WINDOW ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: NC-WPC-01C **Lab Sample ID:** 551507186-0007
Sample Description: GREY WINDOW PANE CAULKING/PANTRY ROOM ON SOUTHEAST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507186
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: NC-FT-01 ***Lab Sample ID:*** **551507186-0008**
Sample Description: 12"x12" BLUE AND TAN FLOOR TILE/PANTRY AND KITCHEN DOORWAY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: NC-BP-01A ***Lab Sample ID:*** **551507186-0009**
Sample Description: BLACK BUILDING PAPER/INSIDE ON ROOF SAUNE ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: NC-BP-01B ***Lab Sample ID:*** **551507186-0010**
Sample Description: BLACK BUILDING PAPER/INSIDE ON ROOF SAUNE ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: NC-BP-01C ***Lab Sample ID:*** **551507186-0011**
Sample Description: BLACK BUILDING PAPER/INSIDE ON ROOF SAUNE ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: NC-EPP-01A ***Lab Sample ID:*** **551507186-0012**
Sample Description: BLACK ELECTRICAL PENETRATION PUTTY/INTERIOR PENETRATION IN NORTH CORNER OF KITCHEN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: NC-EPP-01B ***Lab Sample ID:*** **551507186-0013**
Sample Description: BLACK ELECTRICAL PENETRATION PUTTY/INTERIOR PENETRATION IN NORTH CORNER OF KITCHEN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: NC-EPP-01C ***Lab Sample ID:*** **551507186-0014**
Sample Description: BLACK ELECTRICAL PENETRATION PUTTY/INTERIOR PENETRATION IN NORTH CORNER OF KITCHEN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: NC-WFC-01A ***Lab Sample ID:*** **551507186-0015**
Sample Description: WINDOW FRAME CAULKING/EXTERIOR WINDOW FRAME ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White/Green	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507186
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: NC-WFC-01B ***Lab Sample ID:*** **551507186-0016**

Sample Description: WINDOW FRAME CAULKING/EXTERIOR WINDOW FRAME ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White/Red	0.0%	100%	None Detected	

Client Sample ID: NC-WFC-01C ***Lab Sample ID:*** **551507186-0017**

Sample Description: WINDOW FRAME CAULKING/EXTERIOR WINDOW FRAME ON SOUTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White/Green	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki PLM Grav. Reduction (5)
Natalie D'Amico PLM Grav. Reduction (11)
Romeo Samson PLM (1)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201516:50:48

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or 551507109
CustomerID: 55JACQ30L
CustomerPO: 123220330
ProjectID:

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - NETTLE CABIN**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
NC-P-01	*551507109-0001*		7/7/2015	130 ppm
	Site: EXTERIOR WALLS ON SOUTHEAST SIDE - GREEN			
NC-P-02	*551507109-0002*		7/7/2015	<150 ppm
	Site: EXTERIOR LOWER SKIRTING ON SOUTHEAST SIDE - BROWN			
	Insufficient sample to reach reporting limit.			
NC-P-03	*551507109-0003*		7/7/2015	<130 ppm
	Site: EXTERIOR DOOR FRAME ON NORTH DOOR TO CABIN - WHITE			
	Insufficient sample to reach reporting limit.			
NC-P-04	*551507109-0004*		7/7/2015	310 ppm
	Site: INTERIOR PANTRY ON SOUTHEAST WALL - WHITE			
NC-P-05	*551507109-0005*		7/7/2015	3100 ppm
	Site: INTERIOR MUD ROOM ON SOUTHEAST WALL - OLIVE			
NC-P-06	*551507109-0006*		7/7/2015	270 ppm
	Site: FLOOR IN MUD ROOM IN NORTH CORNER - BLUE			
NC-P-07	*551507109-0007*		7/7/2015	750 ppm
	Site: EXTERIOR TIN ROOF ON WEST CORNER - BROWN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:51:16

APPENDIX Q
FINDINGS AND RECOMMENDATIONS
PACHENA INFO CENTER

Q-4.0 FINDINGS—PACHENA INFO CENTER

The Pachena Info Center was reportedly constructed in 1977 and is a one storey structure with comprised mainly of wood finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

Q-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Roofing paper
- Assorted caulkings and sealants
- Assorted vinyl floor tiles
- Footing wrap
- Electrical wrap

Twenty samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table Q-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table Q-4.1.1 Suspected ACM Sample Collection and Analysis Summary Pachena Info Center, Bamfield, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PI-TP-01A	Black tar roofing paper	Exterior north corner roof	None Detected
PI-TP-01B	Black tar roofing paper	Exterior north corner roof	None Detected
PI-TP-01C	Black tar roofing paper	Exterior north corner roof	None Detected
PI-WPC-01A	**Grey window pane caulking**	**East exterior window**	**0.75% Chrysotile**
PI-WPC-01B	**Grey window pane caulking**	**East exterior window**	**Stop Positive (Not Analyzed)**

Table Q-4.1.1 Suspected ACM Sample Collection and Analysis Summary Pachena Info Center, Bamfield, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PI-WPC-01C	**Grey window pane caulking**	**East exterior window**	**Stop Positive (Not Analyzed)**
PI-WPC-02A	**Cream window pane caulking**	**Southeast exterior window**	**3.0% Chrysotile**
PI-WPC-02B	**Cream window pane caulking**	**Southeast exterior window**	**Stop Positive (Not Analyzed)**
PI-WPC-02C	**Cream window pane caulking**	**Southeast exterior window**	**Stop Positive (Not Analyzed)**
PI-FT-01	12"x12" grey tan and white smudged floor tile	Storage and washroom	None Detected
PI-FT-02	12"x12" blue and aqua smudged floor tile patch	Southeast of front counter	None Detected
PI-FW-01A	Brown footing wrap	Exterior east corner	None Detected
PI-FW-01B	Brown footing wrap	Exterior east corner	None Detected
PI-FW-01C	Brown footing wrap	Exterior east corner	None Detected
PI-EW-01A	Brown electrical wrap	East end of storage and washroom	None Detected
PI-EW-01B	Brown electrical wrap	East end of storage and washroom	None Detected
PI-EW-01C	Brown electrical wrap	East end of storage and washroom	None Detected
PI-WS-01A	**White window sealant**	**Interior window in east corner**	**<0.25% Chrysotile**
PI-WS-01B	**White window sealant**	**Interior window in east corner**	**1.3% Chrysotile**
PI-WS-01C	**White window sealant**	**Interior window in east corner**	**Stop Positive (Not Analyzed)**

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table Q-4.1.2, below were identified as ACMs.

Table Q-4.1.2 Summary of Identified ACMs Pachena Info Center, Bamfield, BC

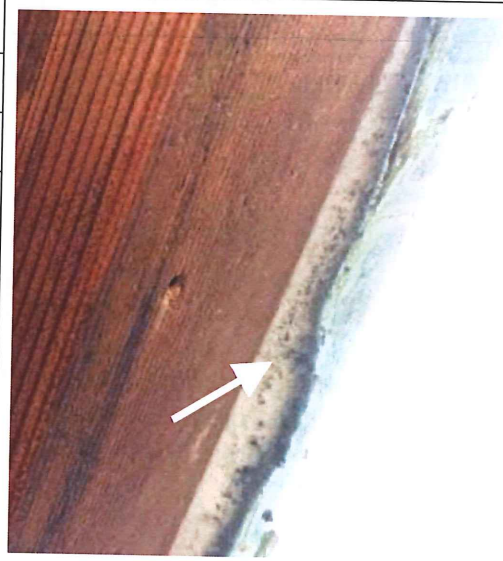
Identified ACM Description and Condition Information		Photo
Grey window pane caulking (painted green) on exterior windows.		
Friability	Non-friable	
Condition	Good	
Content	0.75% Chrysotile	
Cream window pane caulking on exterior windows.		
Friability	Non-friable	
Condition	Good	
Content	3.0% Chrysotile	

Table Q-4.1.2 Summary of Identified ACMs
Pachena Info Center, Bamfield, BC

Identified ACM Description and Condition Information		Photo
White window sealant on interior window in east corner.		
Friability	Non-friable	
Condition	Good	
Content	<0.25-1.3% Chrysotile	

Q-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment

With respect to paint, two paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table Q-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table Q-4.2.1 Suspected LCP Sample Collection and Analysis Summary Pachena Info Center, Bamfield, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
PI-P-01	Green	Exterior trim on south corner	<93	No
PI-P-02	Light green	Interior door frame on north exit	<340	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

Q-4.3 Polychlorinated Biphenyls

The three (3) fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

Q-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in three fluorescent light fixtures.

Q-4.5 Mould

No mould or moisture damage was observed during the assessment.

Q-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

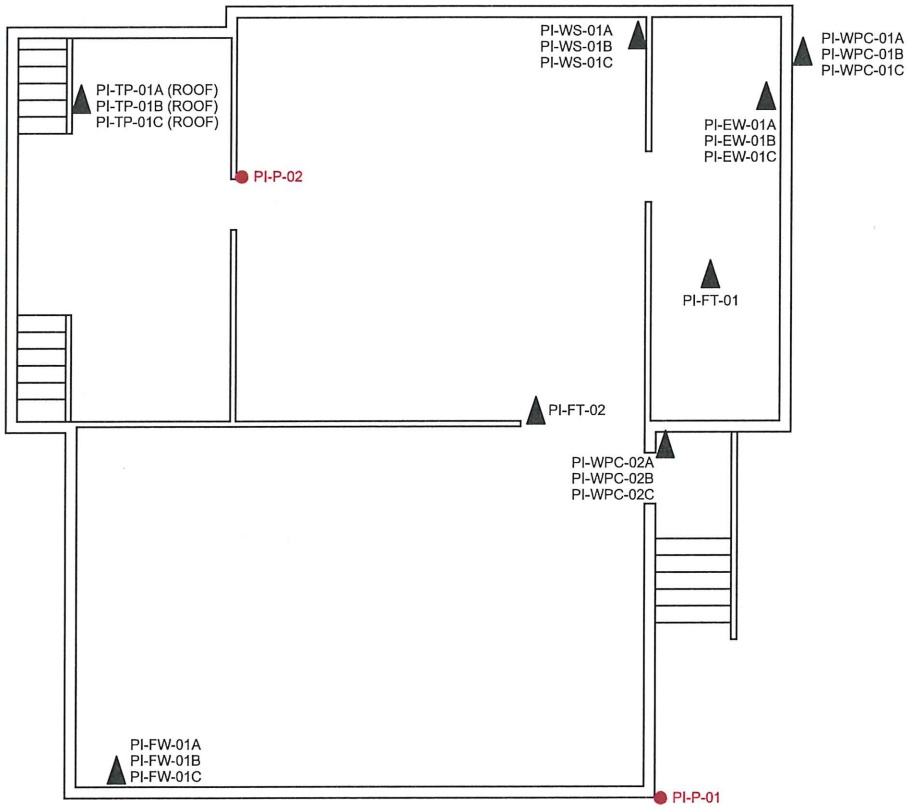
Q-4.1 Silica

Silica is presumed to be present in vinyl floor tiles and concrete foundation of the subject building.

Q-5.0 RECOMMENDATIONS—PACHENA INFO CENTER

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



PACHENA INFO CENTRE

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTES:
1. **GREY WINDOW PANE CAULKING ON WINDOWS IS ASBESTOS-CONTAINING.**
2. **CREAM WINDOW PANE CAULKING ON WINDOWS IS ASBESTOS-CONTAINING.**
3. **WHITE WINDOW SEALANT ON INTERIOR WINDOWS IS ASBESTOS-CONTAINING.**
4. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/07/17
Dwn. By:	CD SL2015070142 VM/DM
App'd By:	TW

Dwg. No.: Q

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507187
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 - PACHENA INFO CENTER

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PI-TP-01A **Lab Sample ID:** 551507187-0001
Sample Description: BLACK TAR ROOFING PAPER/EXTERIOR NORTH CORNER ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PI-TP-01B **Lab Sample ID:** 551507187-0002
Sample Description: BLACK TAR ROOFING PAPER/EXTERIOR NORTH CORNER ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PI-TP-01C **Lab Sample ID:** 551507187-0003
Sample Description: BLACK TAR ROOFING PAPER/EXTERIOR NORTH CORNER ROOF

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PI-WPC-01A **Lab Sample ID:** 551507187-0004
Sample Description: GREY WINDOW PANE CAULKING/EAST EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	99.2%	**0.75% Chrysotile**	

Client Sample ID: PI-WPC-01B **Lab Sample ID:** 551507187-0005
Sample Description: GREY WINDOW PANE CAULKING/EAST EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: PI-WPC-01C **Lab Sample ID:** 551507187-0006
Sample Description: GREY WINDOW PANE CAULKING/EAST EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Client Sample ID: PI-WPC-02A **Lab Sample ID:** 551507187-0007
Sample Description: CREAM WINDOW PANE CAULKING/SOUTHEAST EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Tan	0.0%	97.0%	**3.0% Chrysotile**	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507187
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PI-WPC-02B **Lab Sample ID:** 551507187-0008
Sample Description: CREAM WINDOW PANE CAULKING/SOUTHEAST EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015			Positive Stop (Not Analyzed)		

Client Sample ID: PI-WPC-02C **Lab Sample ID:** 551507187-0009
Sample Description: CREAM WINDOW PANE CAULKING/SOUTHEAST EXTERIOR WINDOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015			Positive Stop (Not Analyzed)		

Client Sample ID: PI-FT-01 **Lab Sample ID:** 551507187-0010
Sample Description: 12"x12" GREY TAN AND WHITE SMUDGED FLOOR TILE/STORAGE AND WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: PI-FT-02 **Lab Sample ID:** 551507187-0011
Sample Description: 12"x12" BLUE AND AQUA SMUDGED FLOOR TILE PATCH/SOUTHEAST OF FRONT COUNTER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: PI-FW-01A **Lab Sample ID:** 551507187-0012
Sample Description: BROWN FOOTING WRAP/EXTERIOR EAST CORNER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown	95%	5%	None Detected	

Client Sample ID: PI-FW-01B **Lab Sample ID:** 551507187-0013
Sample Description: BROWN FOOTING WRAP/EXTERIOR EAST CORNER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown	95%	5%	None Detected	

Client Sample ID: PI-FW-01C **Lab Sample ID:** 551507187-0014
Sample Description: BROWN FOOTING WRAP/EXTERIOR EAST CORNER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Brown	85%	15%	None Detected	

Client Sample ID: PI-EW-01A **Lab Sample ID:** 551507187-0015
Sample Description: BROWN ELECTRICAL WRAP/EAST END OF STORAGE AND WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown	95%	5%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507187
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PI-EW-01B **Lab Sample ID:** 551507187-0016
Sample Description: BROWN ELECTRICAL WRAP/EAST END OF STORAGE AND WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown	95%	5%	None Detected	

Client Sample ID: PI-EW-01C **Lab Sample ID:** 551507187-0017
Sample Description: BROWN ELECTRICAL WRAP/EAST END OF STORAGE AND WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Brown	90%	10%	None Detected	

Client Sample ID: PI-WS-01A **Lab Sample ID:** 551507187-0018
Sample Description: WHITE WINDOW SEALANT/INTERIOR WINDOW IN EAST CORNER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	**<0.25% Chrysotile**	

Client Sample ID: PI-WS-01B **Lab Sample ID:** 551507187-0019
Sample Description: WHITE WINDOW SEALANT/INTERIOR WINDOW IN EAST CORNER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	98.7%	**1.3% Chrysotile**	

Client Sample ID: PI-WS-01C **Lab Sample ID:** 551507187-0020
Sample Description: WHITE WINDOW SEALANT/INTERIOR WINDOW IN EAST CORNER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015				Positive Stop (Not Analyzed)	

Analyst(s):

John Biesiadecki	PLM (2) PLM Grav. Reduction (8)
Nicole Yeo	PLM Grav. Reduction (1)
Romeo Samson	PLM (4)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201516:43:01

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507110
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - PACHENA INFO CENTER**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
PI-P-01	*551507110-0001*		7/6/2015	<93 ppm
	Site: EXTERIOR TRIM ON SOUTH CORNER Desc: GREEN Insufficient sample to reach reporting limit.			
PI-P-02	*551507110-0002*		7/6/2015	<340 ppm
	Site: INTERIOR DOOR FRAME ON NORTH EXIT Desc: LIGHT GREEN Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:56:52

APPENDIX R
FINDINGS AND RECOMMENDATIONS
PORT RENFREW INFO CENTER

R-4.0 FINDINGS—PORT RENFREW INFO CENTER

The Port Renfrew Info Center was reportedly constructed in 1987 and is a one storey structure comprised mainly of wood finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

R-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Roofing shingle
- Roofing paper
- Ceiling tile
- Vinyl sheet flooring
- Vinyl floor tile
- Window pane caulking

Fourteen samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table R-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table R-4.1.1 Suspected ACM Sample Collection and Analysis Summary Port Renfrew Info Center, Port Renfrew, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PRI-RS-01A	Black roofing shingle	Exterior roof at south front entrance	None Detected
PRI-RS-01B	Black roofing shingle	Exterior roof at south front entrance	None Detected
PRI-RS-01C	Black roofing shingle	Exterior roof at south front entrance	None Detected
PRI-RP-01A	Black roofing paper	Exterior roof at north rear entrance	None Detected
PRI-RP-01B	Black roofing paper	Exterior roof at north rear entrance	None Detected
PRI-RP-01C	Black roofing paper	Exterior roof at north rear entrance	None Detected

Table R-4.1.1 Suspected ACM Sample Collection and Analysis Summary Port Renfrew Info Center, Port Renfrew, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PRI-CT-01A	Long white ceiling tile	Interior ceiling in washroom	None Detected
PRI-CT-01B	Long white ceiling tile	Interior ceiling in washroom	None Detected
PRI-CT-01C	Long white ceiling tile	Interior ceiling in washroom	None Detected
PRI-SF-01	Cream stone pattern sheet flooring	Northeast corner office	None Detected
PRI-FT-01	12"x12" cream floor tile	Washroom by tub	None Detected
PRI-WPC-01A	Grey window pane caulking	Southeast window in bathroom	None Detected
PRI-WPC-01B	Grey window pane caulking	Southwest window in staff area	None Detected
PRI-WPC-01C	Grey window pane caulking	Southeast window in staff area	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

R-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment

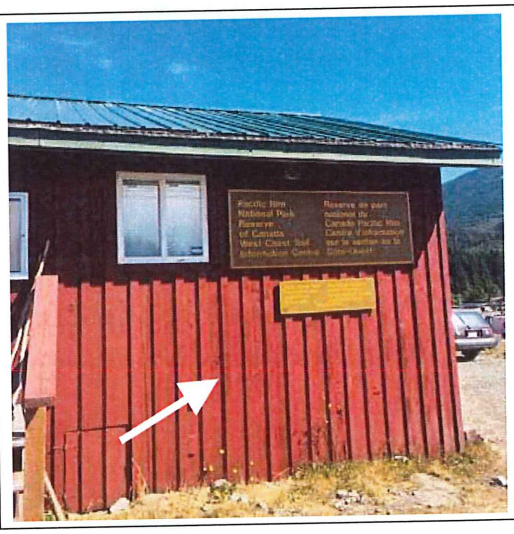
With respect to paint, three paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table R-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table R-4.2.1 Suspected LCP Sample Collection and Analysis Summary Port Renfrew Info Center, Port Renfrew, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
PRI-P-01	**Red**	**Exterior walls on northeast side**	**13,000**	**Yes**
PRI-P-02	Green	Exterior tin roof on north corner	100	No
PRI-P-03	Green	Interior green wall on southeast wall	<190	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the material presented in Table R-4.2.2, below was identified as an LCP.

Table R-4.2.2 Summary of Identified LCPs Port Renfrew Info Center, Port Renfrew, BC

Identified LCP Description	Photo
Red colored paint on the exterior walls. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

R-4.3 Polychlorinated Biphenyls

The five fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

R-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in five fluorescent light fixtures.

R-4.5 Mould/ Microbial Contamination

No mould or moisture damage was observed during the assessment.

It should be noted that rodent droppings were observed in various locations throughout the subject building.

R-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

R-4.1 Silica

Silica is presumed to be present in vinyl floor tiles and concrete foundation of the subject building.

R-5.0 RECOMMENDATIONS—PORT RENFREW INFO CENTER

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

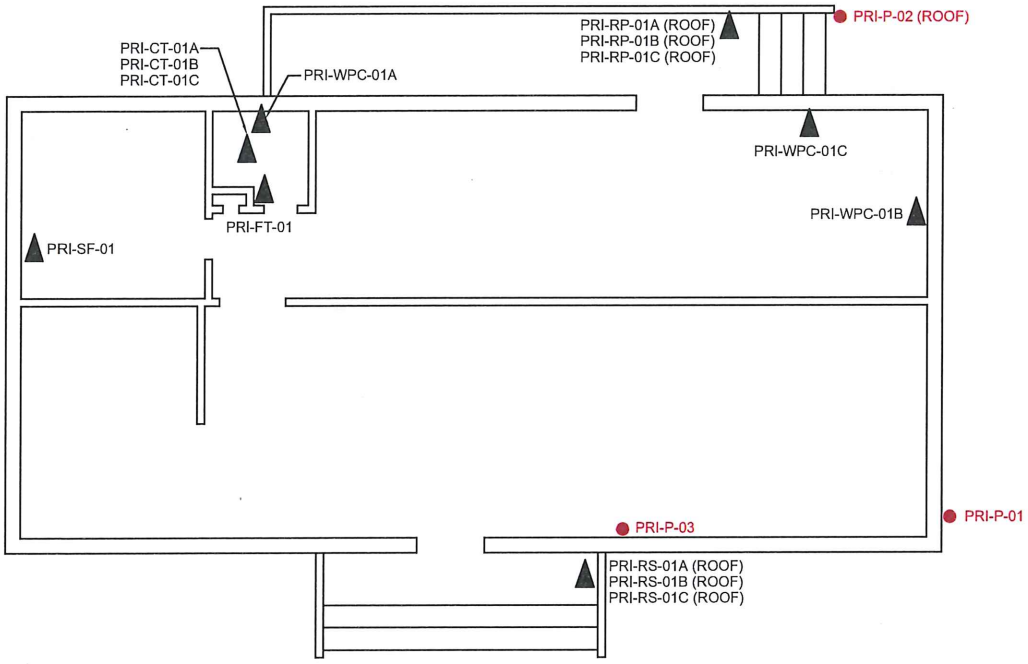
Additional building-specific recommendations to be considered are provided below.

R-5.5 Mould/ Microbial Contamination

Stantec recommends the following course of action within the subject building:

- Rodent droppings should be removed from interior work areas. Workers handling impacted materials should be respiratory protection and/or other personal protective equipment (PPE—e.g., rubber/nitrile gloves; protective clothing/coveralls) as deemed necessary for the work that they will be conducting. Dust control measures should be utilized to eliminate or reduce dust generation during the removal of droppings (e.g., misting with a low-pressure water spray [mixed with detergent or disinfectant] to reduce the amount of dust aerosolized).
- A pest control specialist should be consulted to address rodent issues to prevent recurrence.

Stantec Consulting Ltd. © 2015



PORT RENFREW INFO CENTRE

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100037 DM/PK
App'd By:	TW

Dwg. No.: R

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507189
Customer ID: 55JACQ30L
Customer PO: 132220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 132220330 - PORT RENFREW INFO CENTER

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PRI-RS-01A ***Lab Sample ID:*** **551507189-0001**
Sample Description: BLACK ROOFING SHINGLE/EXTERIOR ROOF AT SOUTH FRONT ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRI-RS-01B ***Lab Sample ID:*** **551507189-0002**
Sample Description: BLACK ROOFING SHINGLE/EXTERIOR ROOF AT SOUTH FRONT ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: PRI-RS-01C ***Lab Sample ID:*** **551507189-0003**
Sample Description: BLACK ROOFING SHINGLE/EXTERIOR ROOF AT SOUTH FRONT ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: PRI-RP-01A ***Lab Sample ID:*** **551507189-0004**
Sample Description: BLACK ROOFING PAPER/EXTERIOR ROOF AT NORTH REAR ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRI-RP-01B ***Lab Sample ID:*** **551507189-0005**
Sample Description: BLACK ROOFING PAPER/EXTERIOR ROOF AT NORTH REAR ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRI-RP-01C ***Lab Sample ID:*** **551507189-0006**
Sample Description: BLACK ROOFING PAPER/EXTERIOR ROOF AT NORTH REAR ENTRANCE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRI-CT-01A ***Lab Sample ID:*** **551507189-0007**
Sample Description: LONG WHITE CEILING TILE/INTERIOR CEILING IN WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown/White	50%	50%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507189
Customer ID: 55JACQ30L
Customer PO: 132220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PRI-CT-01B ***Lab Sample ID:*** **551507189-0008**
Sample Description: LONG WHITE CEILING TILE/INTERIOR CEILING IN WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown/White	55%	45%	None Detected	

Client Sample ID: PRI-CT-01C ***Lab Sample ID:*** **551507189-0009**
Sample Description: LONG WHITE CEILING TILE/INTERIOR CEILING IN WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Brown	75%	25%	None Detected	

Client Sample ID: PRI-SF-01 ***Lab Sample ID:*** **551507189-0010**
Sample Description: CREAM STONE PATTERN SHEET FLOORING/NORTHEAST CORNER OFFICE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: PRI-FT-01 ***Lab Sample ID:*** **551507189-0011**
Sample Description: 12"x12" CREAM FLOOR TILE/WASHROOM BY TUB

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White/Black	0.0%	100%	None Detected	

Client Sample ID: PRI-WPC-01A ***Lab Sample ID:*** **551507189-0012**
Sample Description: GREY WINDOW PANE CAULKING/SOUTHEAST WINDOW IN BATHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: PRI-WPC-01B ***Lab Sample ID:*** **551507189-0013**
Sample Description: GREY WINDOW PANE CAULKING/SOUTHEAST WINDOW IN AREA

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: PRI-WPC-01C ***Lab Sample ID:*** **551507189-0014**
Sample Description: GREY WINDOW PANE CAULKING/SOUTHEAST WINDOW IN AREA

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507189
Customer ID: 55JACQ30L
Customer PO: 132220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

John Biesiadecki	PLM (1) PLM Grav. Reduction (8)
Nicole Yeo	PLM Grav. Reduction (3)
Romeo Samson	PLM (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201516:35:21

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507111
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - PORT RENFREW INFO CENTER**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
PRI-P-01	*551507111-0001*		7/7/2015	13000 ppm
	Site: EXTERIOR WALLS ON NORTHEAST SIDE - RED			
PRI-P-02	*551507111-0002*		7/7/2015	100 ppm
	Site: EXTERIOR TIN ROOF ON NORTH CORNER - GREEN			
PRI-P-03	*551507111-0003*		7/7/2015	<190 ppm
	Site: INTERIOR GREEN WALL ON SOUTHEAST WALL - GREEN Insufficient sample to reach reporting limit.			

Podzyhun

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:58:06

APPENDIX S
FINDINGS AND RECOMMENDATIONS
PORT RENFREW WARDEN STATION

S-4.0 FINDINGS—PORT RENFREW WARDEN STATION

The Port Renfrew Warden Station construction date is unknown and is a two storey residential structure comprised of mainly drywall and wood walls.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

S-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Assorted vinyl sheet floorings
- Floor tile
- Drywall joint compound
- Ducting tape
- Ceiling texture coat
- Assorted caulkings
- Ceiling tile
- Roofing shingle
- Roofing felt

Thirty-four samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table S-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table S-4.1.1 Suspected ACM Sample Collection and Analysis Summary Port Renfrew Warden Station, Port Renfrew, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
RW-SF-01	12"x12" white and grey patterned sheet flooring	Second floor kitchen	None Detected
RW-SF-02	Brown sheet flooring	Under SF-01 and plywood in kitchen on second floor	None Detected

Table S-4.1.1 Suspected ACM Sample Collection and Analysis Summary Port Renfrew Warden Station, Port Renfrew, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
RW-SF-03	Tan and light brown square pattern sheet flooring	Second floor washroom	None Detected
RW-SF-04	**Tan sheet flooring**	**Under SF-03 in bathroom on second floor**	**5.9% Chrysotile**
RW-SF-05	Square tan and cream patterned sheet flooring	First floor bathroom	None Detected
RW-FT-01	**Pink floor tile**	**Under SF-05 in bathroom on first floor**	**4.1% Chrysotile**
RW-DJC-01A	**Drywall joint compound**	**Wall in bedroom 3 on second floor**	**<0.25% Chrysotile**
RW-DJC-01B	**Drywall joint compound**	**South closet wall in front of washroom on second floor**	**<0.25% Chrysotile**
RW-DJC-01C	**Drywall joint compound**	**Corner by south front door on second floor**	**None Detected**
RW-DJC-01D	**Drywall joint compound**	**East corner in hallway on first floor**	**1% Chrysotile**
RW-DJC-01E	**Drywall joint compound**	**East bedroom on first floor**	**Stop Positive (Not Analyzed)**
RW-DT-01A	**White ducting tape (Tectum)**	**First floor in southwest room on round vents**	**35% Chrysotile**
RW-DT-01B	**White ducting tape (Tectum)**	**First floor in southwest room on round vents**	**Stop Positive (Not Analyzed)**
RW-DT-01C	**White ducting tape (Tectum)**	**First floor in southwest room on round vents**	**Stop Positive (Not Analyzed)**
RW-CTC-01A	Ceiling texture coat	Second floor living room ceiling	None Detected
RW-CTC-01B	Ceiling texture coat	Second floor in bedroom 3 ceiling	None Detected
RW-CTC-01C	Ceiling texture coat	Second floor in bedroom 1 ceiling	None Detected
RW-CTC-01D	Ceiling texture coat	Second floor in hallway ceiling	None Detected
RW-CTC-01E	Ceiling texture coat	Second floor in bedroom 2 ceiling	None Detected
RW-WPC-01A	Black window pane caulking	Interior window on second floor living room	None Detected
RW-WPC-01B	Black window pane caulking	Interior window on second floor bedroom 3	None Detected
RW-WPC-01C	Black window pane caulking	Interior window on second floor living room	None Detected

Table S-4.1.1 Suspected ACM Sample Collection and Analysis Summary Port Renfrew Warden Station, Port Renfrew, BC

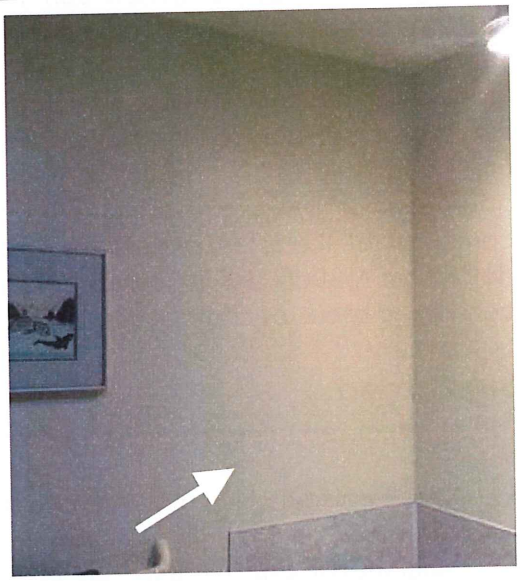
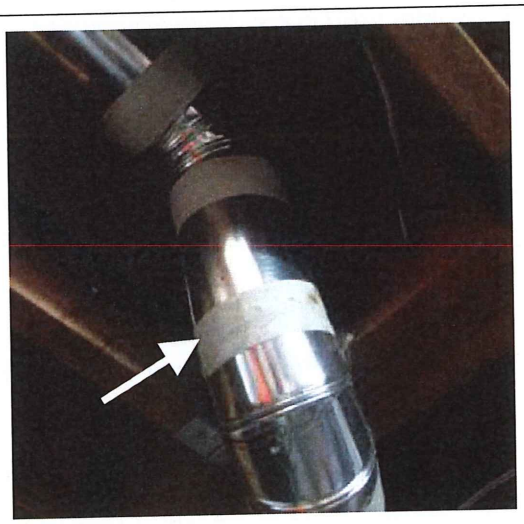
Sample Number	Material Description	Sample Location	Result (%/type asbestos)
RW-DFC-01A	White door frame caulking	Exterior first floor door on northwest side	None Detected
RW-DFC-01B	White door frame caulking	Exterior first floor door on northwest side	None Detected
RW-DFC-01C	White door frame caulking	Exterior first floor door on northwest side	None Detected
RW-CT-01A	White ceiling tile	Second floor ceiling at top of stairs	None Detected
RW-CT-01B	White ceiling tile	Second floor ceiling at top of stairs	None Detected
RW-CT-01C	White ceiling tile	Second floor ceiling at top of stairs	None Detected
RW-RS-01A	Black roofing shingle	Exterior roof shingle over carport	None Detected
RW-RS-01B	Black roofing shingle	Exterior roof shingle over carport	None Detected
RW-RS-01C	Black roofing shingle	Exterior roof shingle over carport	None Detected
RW-RF-01A	Black roofing felt	Exterior roof shingle over carport	None Detected
RW-RF-01B	Black roofing felt	Exterior roof shingle over carport	None Detected
RW-RF-01C	Black roofing felt	Exterior roof shingle over carport	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table S-4.1.2, below were identified as ACMs.

Table S-4.1.2 Summary of Identified ACMs Port Renfrew Warden Station, Port Renfrew, BC

Identified ACM Description and Condition Information		Photo
Tan sheet flooring under tan and light brown square pattern sheet flooring in bathroom on second floor.		
Friability	Non-friable	
Condition	Good	
Content	5.9% Chrysotile	
Pink floor tile under square tan and cream patterned sheet flooring in bathroom on first floor.		
Friability	Non-friable	
Condition	Good	
Content	4.1% Chrysotile	

Table S-4.1.2 Summary of Identified ACMs Port Renfrew Warden Station, Port Renfrew, BC

Identified ACM Description and Condition Information		Photo
Drywall joint compound throughout interior drywall walls and ceilings.		
Friability	Non-friable in situ, potentially friable during removal/disturbance	
Condition	Good	
Content	<0.25-1% Chrysotile	
White ducting tape (Tectum) on round furnace vents throughout.		
Friability	Friable	
Condition	Good	
Content	35% Chrysotile	

S.4.1.1 Drywall Joint Compound

Chrysotile asbestos was detected in three of five samples (two of which were less than the method detection limit) of drywall joint compound, which were collected from various application types (interior partition, perimeter, ceilings, bulkheads, etc.) within the subject building. As visual distinction between asbestos-containing drywall joint compound and non-asbestos-containing drywall joint compound is not practical (it is likely that over the years there were several renovations where drywall joint compound may have been layered; finished drywall walls and ceilings are covered with multiple layers of paint, and finishing is conducted to blend different types of wall materials such that the surface is continuous) and as the asbestos content of this material may be inconsistent (the application of drywall joint compound was often conducted by hand-mixing the components), the extent of asbestos-containing drywall joint compound is difficult to determine. As such, drywall joint compound throughout the subject building should be considered asbestos-containing

S-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used on domestic water lines
- Solder used in bell fittings for cast iron pipes
- Solder used in electrical equipment
- Vent and pipe flashings

With respect to paint, five paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table S-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table S-4.2.1 Suspected LCP Sample Collection and Analysis Summary Port Renfrew Warden Station, Port Renfrew, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
RW-P-01	Grey	Interior cement floor in northwest basement room	<90	No
RW-P-02	White	Interior walls in second floor washroom	<90	No
RW-P-03	**Yellow**	**Interior walls in southeast closet on the second floor by washroom**	**750**	**Yes**

Table S-4.2.1 Suspected LCP Sample Collection and Analysis Summary Port Renfrew Warden Station, Port Renfrew, BC

Sample No.	Sample Colour	Sample Location	Lab Result (ppm)	Lead Containing (Yes/No)
RW-P-04	Blue	Exterior walls on southwest side of house	<110	No
RW-P-05	**White**	**Exterior pillar in carport**	**1,300**	**Yes**

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table S-4.2.2, below were identified as LCPs.

Table S-4.2.2 Summary of Identified LCPs Port Renfrew Warden Station, Port Renfrew, BC

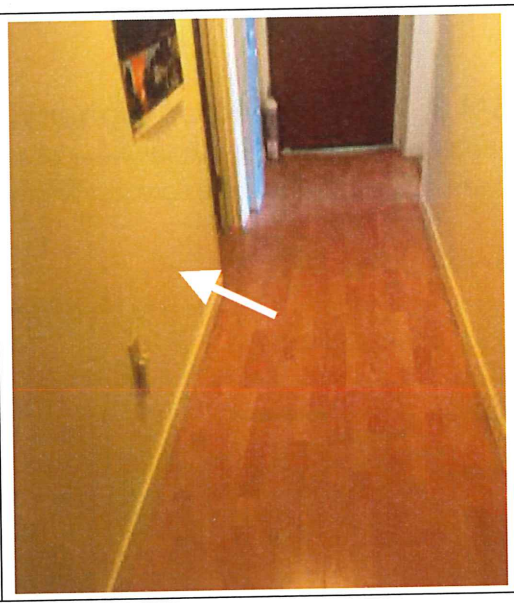
Identified LCP Description	Photo
Yellow colored paint on the interior walls on the second floor. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

Table S-4.2.2 Summary of Identified LCPs
Port Renfrew Warden Station, Port Renfrew, BC

Identified LCP Description	Photo
White colored paint on the exterior pillars and trim. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

S-4.3 Polychlorinated Biphenyls

The six fluorescent light fixtures were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

S-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in six fluorescent light fixtures.

S-4.5 Mould

Mould/moisture damage was observed as summarized in Table S-4.5.1, below.

Table S-4.5.1 Summary of Identified Mould and/or Moisture-Impacted Materials Port Renfrew Warden Station, Port Renfrew, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture-impacted drywall and applied ceiling texture coat was observed on the ceiling of the second floor in bedroom 3. The suspected source of moisture is roof or pipe leaks.	

S-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

S-4.1 Silica

Silica is presumed to be present in vinyl floor tiles, ceiling tiles and concrete of the subject building.

S-5.0 RECOMMENDATIONS—PORT RENFREW WARDEN STATION

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

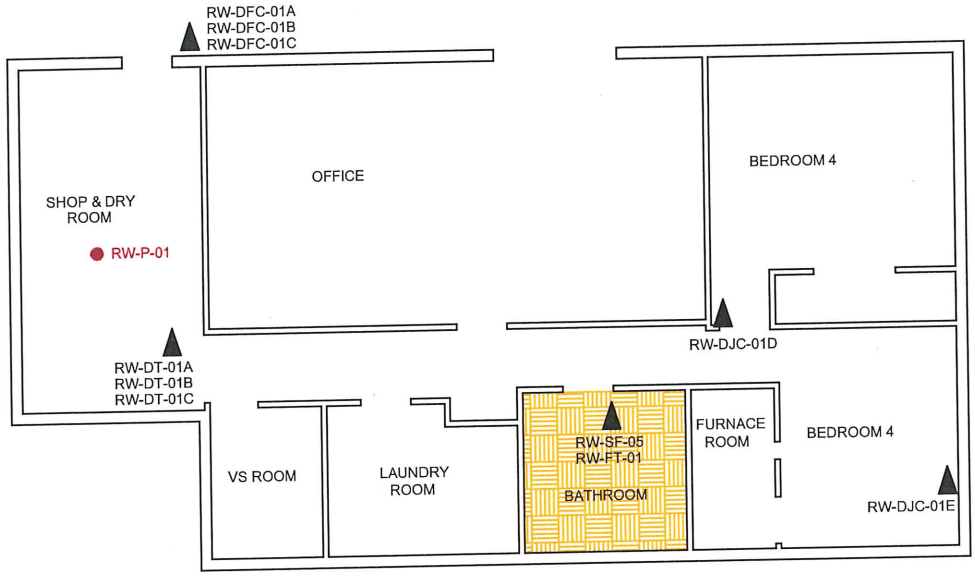
Additional building-specific recommendations to be considered are provided below.

S-5.5 Mould

Stantec recommends the following course of action within the subject building:

- Remove and replace moisture-stained drywall and applied ceiling texture coat from the ceiling in bedroom 3 with new. If staining re-appears on the new coating, the source of moisture should be identified and corrected. This work must be conducted by an asbestos abatement contractor, as the drywall throughout the building is asbestos-containing.

Stantec Consulting Ltd. © 2015



PORT RENFREW WARDEN STATION
FIRST FLOOR

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- CONCEALED ASBESTOS-CONTAINING VINYL FLOOR TILE

NOTES: 1. **DRYWALL JOINT COMPOUND THROUGHOUT IS ASBESTOS-CONTAINING.**
2. **WHITE DUCTING TAPE THROUGHOUT IS ASBESTOS-CONTAINING.**
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

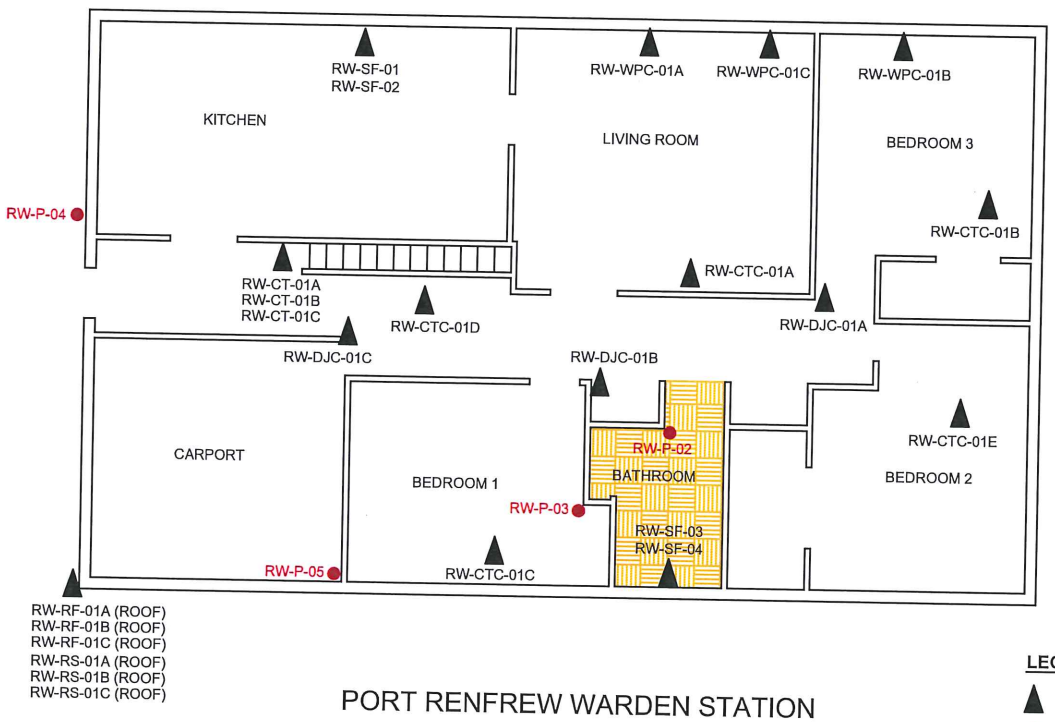
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100039 DM/PK
App'd By:	TW

Dwg. No.: S1

Stantec

Stantec Consulting Ltd. © 2015



PORT RENFREW WARDEN STATION
SECOND FLOOR

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD
- CONCEALED ASBESTOS-CONTAINING VINYL FLOOR TILE

NOTES: 1. DRYWALL JOINT COMPOUND THROUGHOUT IS ASBESTOS-CONTAINING.
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK RESERVE, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220330-600.100
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100038 DM/PK
App'd By:	TW

Dwg. No.: S2

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507191
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/09/2015

Proj: 123220330 -PORT RENFREW WARDEN STATION

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RW-SF-01 ***Lab Sample ID:*** **551507191-0001**

Sample Description: 12"x12" WHITE AND GREY PATTERNED SHEET FLOORING/SECOND FLOOR KITCHEN

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: RW-SF-02 ***Lab Sample ID:*** **551507191-0002**

Sample Description: BROWN SHEET FLOORING/UNDER SF-01 AND PLYWOOD IN KITCHEN ON SECOND FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: RW-SF-03 ***Lab Sample ID:*** **551507191-0003**

Sample Description: TAN AND LIGHT BROWN SQUARE PATTERN SHEET FLOORING/SECOND FLOOR WASHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: RW-SF-04 ***Lab Sample ID:*** **551507191-0004**

Sample Description: TAN SHEET FLOORING/UNDER SF-03 IN BATHROOM ON SECOND FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Tan	0.0%	94.1%	**5.9% Chrysotile**	

Client Sample ID: RW-SF-05 ***Lab Sample ID:*** **551507191-0005**

Sample Description: SQUARE TAN AND CREAM PATTERNED SHEET FLOORING/FIRST FLOOR BATHROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	None Detected	

Client Sample ID: RW-FT-01 ***Lab Sample ID:*** **551507191-0006**

Sample Description: PINK FLOOR TILE/UNDER SF-05 IN BATHROOM ON FIRST FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Pink	0.0%	95.9%	**4.1% Chrysotile**	

Client Sample ID: RW-DJC-01A ***Lab Sample ID:*** **551507191-0007**

Sample Description: DRYWALL JOINT COMPOUND/WALL IN BEDROOM 3 ON SECOND FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	**<1% Chrysotile**	
400 PLM Pt Ct	7/08/2015	White	0%	100%	**<0.25% Chrysotile**	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507191
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RW-DJC-01B ***Lab Sample ID:*** **551507191-0008**

Sample Description: DRYWALL JOINT COMPOUND/SOUTH CLOSET WALL IN FRONT OF WASHROOM ON SECOND FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	<1% Chrysotile	
400 PLM Pt Ct	7/08/2015	White	0%	100%	<0.25% Chrysotile	

Client Sample ID: RW-DJC-01C ***Lab Sample ID:*** **551507191-0009**

Sample Description: DRYWALL JOINT COMPOUND/CORNER BY SOUTH FRONT DOOR ON SECOND FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: RW-DJC-01D ***Lab Sample ID:*** **551507191-0010**

Sample Description: DRYWALL JOINT COMPOUND/EAST CORNER IN HALLWAY ON FIRST FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	99%	1% Chrysotile	

Client Sample ID: RW-DJC-01E ***Lab Sample ID:*** **551507191-0011**

Sample Description: DRYWALL JOINT COMPOUND/EAST BEDROOM ON FIRST FLOOR

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015				Stop Positive (Not Analyzed)	

Client Sample ID: RW-DT-01A ***Lab Sample ID:*** **551507191-0012**

Sample Description: WHITE DUCTING TAPE (TECTUM)/BASEMENT IN SOUTHWEST ROOM ON ROUND VENTS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Gray	0%	65%	35% Chrysotile	

Client Sample ID: RW-DT-01B ***Lab Sample ID:*** **551507191-0013**

Sample Description: WHITE DUCTING TAPE (TECTUM)/BASEMENT IN SOUTHWEST ROOM ON ROUND VENTS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015				Stop Positive (Not Analyzed)	

Client Sample ID: RW-DT-01C ***Lab Sample ID:*** **551507191-0014**

Sample Description: WHITE DUCTING TAPE (TECTUM)/BASEMENT IN SOUTHWEST ROOM ON ROUND VENTS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015				Stop Positive (Not Analyzed)	

Client Sample ID: RW-CTC-01A ***Lab Sample ID:*** **551507191-0015**

Sample Description: CEILING TEXTURE COAT/SECOND FLOOR LIVING ROOM CEILING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507191
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RW-CTC-01B **Lab Sample ID:** 551507191-0016
Sample Description: CEILING TEXTURE COAT/SECOND FLOOR IN BEDROOM 3 CEILING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: RW-CTC-01C **Lab Sample ID:** 551507191-0017
Sample Description: CEILING TEXTURE COAT/SECOND FLOOR IN BEDROOM 1 CEILING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	White	0%	100%	None Detected	

Client Sample ID: RW-CTC-01D **Lab Sample ID:** 551507191-0018
Sample Description: CEILING TEXTURE COAT/SECOND FLOOR IN HALLWAY CEILING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: RW-CTC-01E **Lab Sample ID:** 551507191-0019
Sample Description: CEILING TEXTURE COAT/SECOND FLOOR IN BEDROOM 2 CEILING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	White	0%	100%	None Detected	

Client Sample ID: RW-WPC-01A **Lab Sample ID:** 551507191-0020
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WINDOW ON SECOND FLOOR LIVING ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RW-WPC-01B **Lab Sample ID:** 551507191-0021
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WINDOW ON SECOND FLOOR BEDROOM 3

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RW-WPC-01C **Lab Sample ID:** 551507191-0022
Sample Description: BLACK WINDOW PANE CAULKING/INTERIOR WINDOW ON SECOND FLOOR LIVING ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RW-DFC-01A **Lab Sample ID:** 551507191-0023
Sample Description: WHITE DOOR FRAME CAULKING/EXTERIOR FIRST FLOOR DOOR ON NORTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507191
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RW-DFC-01B
Lab Sample ID: **551507191-0024**
Sample Description: WHITE DOOR FRAME CAULKING/EXTERIOR FIRST FLOOR DOOR ON NORTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	None Detected	

Client Sample ID: RW-DFC-01C
Lab Sample ID: **551507191-0025**
Sample Description: WHITE DOOR FRAME CAULKING/EXTERIOR FIRST FLOOR DOOR ON NORTHWEST SIDE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	White	0.0%	100%	None Detected	

Client Sample ID: RW-CT-01A
Lab Sample ID: **551507191-0026**
Sample Description: WHITE CEILING TILE/SECOND FLOOR CEILING AT TOP OF STAIRS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown	80%	20%	None Detected	

Client Sample ID: RW-CT-01B
Lab Sample ID: **551507191-0027**
Sample Description: WHITE CEILING TILE/SECOND FLOOR CEILING AT TOP OF STAIRS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/08/2015	Brown	85%	15%	None Detected	

Client Sample ID: RW-CT-01C
Lab Sample ID: **551507191-0028**
Sample Description: WHITE CEILING TILE/SECOND FLOOR CEILING AT TOP OF STAIRS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	7/09/2015	Tan	85%	15%	None Detected	

Client Sample ID: RW-RS-01A
Lab Sample ID: **551507191-0029**
Sample Description: BLACK ROOFING SHINGLE/EXTERIOR ROOF SHINGLE OVER CARPORT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RW-RS-01B
Lab Sample ID: **551507191-0030**
Sample Description: BLACK ROOFING SHINGLE/EXTERIOR ROOF SHINGLE OVER CARPORT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RW-RS-01C
Lab Sample ID: **551507191-0031**
Sample Description: BLACK ROOFING SHINGLE/EXTERIOR ROOF SHINGLE OVER CARPORT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507191
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RW-RF-01A **Lab Sample ID:** 551507191-0032
Sample Description: BLACK ROOFING FELT/EXTERIOR ROOF SHINGLE OVER CARPORT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RW-RF-01B **Lab Sample ID:** 551507191-0033
Sample Description: BLACK ROOFING FELT/EXTERIOR ROOF SHINGLE OVER CARPORT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RW-RF-01C **Lab Sample ID:** 551507191-0034
Sample Description: BLACK ROOFING FELT/EXTERIOR ROOF SHINGLE OVER CARPORT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/09/2015	Black	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki	PLM (4)
Jon Delos Santos	PLM Grav. Reduction (6)
Romeo Samson	PLM (9) 400 PLM Pt Ct (2) PLM Grav. Reduction (12)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/09/201520:41:08

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551507112
CustomerID:	55JACQ30L
CustomerPO:	123220330
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 07/02/15 11:11 AM
Collected:

Project: **123220330 - PORT RENFREW WARDEN STATION**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
RW-P-01	*551507112-0001*		7/7/2015	<90 ppm
	Site: INTERIOR CEMENT FLOOR IN NORTHWEST BASEMENT ROOM Desc: GREY			
RW-P-02	*551507112-0002*		7/7/2015	<90 ppm
	Site: INTERIOR WALLS IN SECOND FLOOR WASHROOM Desc: WHITE			
RW-P-03	*551507112-0003*		7/7/2015	750 ppm
	Site: INTERIOR WALLS IN SOUTHEAST CLOSET ON THE SECOND Desc: FLOOR BY WASHROOM - YELLOW			
RW-P-04	*551507112-0004*		7/7/2015	<110 ppm
	Site: EXTERIOR WALLS ON SOUTHWEST SIDE OF HOUSE Desc: BLUE Insufficient sample to reach reporting limit.			
RW-P-05	*551507112-0005*		7/7/2015	1300 ppm
	Site: EXTERIOR PILLAR IN CARPORT Desc: WHITE			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 07/09/2015 07:59:31

APPENDIX T
FINDINGS AND RECOMMENDATIONS INTERPRETIVE WORKSHOP

T-4.0 FINDINGS—INTERPRETIVE WORKSHOP

The Interpretive workshop was reportedly constructed in 1989 and is a one storey structure comprised mainly of drywall and wood finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

T-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Caulkings and mastics (various types)
- Acoustic ceiling tile
- Vinyl sheet flooring
- Roofing materials
- Drywall joint compound

Twenty-seven samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table T-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table T-4.1.1 Suspected ACM Sample Collection and Analysis Summary Interpretive Workshop, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
IW-DC-01A	Grey door caulking	Exterior doors	None Detected
IW-DC-01B	Grey door caulking	Exterior doors	None Detected
IW-DC-01C	Grey door caulking	Exterior doors	None Detected
IW-WPC-01A	**Black window pane caulking**	**Interior windows**	**0.79% Chrysotile**
IW-WPC-01B	**Black window pane caulking**	**Interior windows**	**Stop Positive (Not Analyzed)**

Table T-4.1.1 Suspected ACM Sample Collection and Analysis Summary Interpretive Workshop, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
IW-WPC-01C	**Black window pane caulking**	**Interior windows**	**Stop Positive (Not Analyzed)**
IW-SC-01A	White sink counter caulking	Washroom counter	None Detected
IW-SC-01B	White sink counter caulking	Washroom counter	None Detected
IW-SC-01C	White sink counter caulking	Washroom counter	None Detected
IW-CT-01A	Long acoustic ceiling tiles	Washroom	None Detected
IW-CT-01B	Long acoustic ceiling tiles	Washroom	None Detected
IW-CT-01C	Long acoustic ceiling tiles	Washroom	None Detected
IW-SF-01	Tan smeared vinyl sheet flooring	Southeast storage room	None Detected
IW-RP-01A	Black roofing paper	Roof on northeast side	None Detected
IW-RP-01B	Black roofing paper	Roof on northeast side	None Detected
IW-RP-01C	Black roofing paper	Roof on northeast side	None Detected
IW-RS-01A	Black roofing shingle	Roof on northeast side	None Detected
IW-RS-01B	Black roofing shingle	Roof on northeast side	None Detected
IW-RS-01C	Black roofing shingle	Roof on northeast side	None Detected
IW-FM-01A	Black foundation mastic	Cement foundation on exterior	None Detected
IW-FM-01B	Black foundation mastic	Cement foundation on exterior	None Detected
IW-FM-01C	Black foundation mastic	Cement foundation on exterior	None Detected
IW-DJC-01A	Drywall joint compound	Library	None Detected
IW-DJC-01B	Drywall joint compound	Front door closet	None Detected
IW-DJC-01C	Drywall joint compound	Storage	None Detected
IW-DJC-01D	Drywall joint compound	Washroom	None Detected
IW-DJC-01E	Drywall joint compound	Library	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the material presented in Table T-4.1.2, below was identified as an ACM.

Table T-4.1.2 Summary of Identified ACMs
Interpretive Workshop, Tofino, BC

Identified ACM Description and Condition Information		Photo
Black window pane caulking on windows throughout.		
Friability	Non-friable	
Condition	Good	
Content	0.79% Chrysotile	

T-4.2 Lead

Lead is expected to be present in the following:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, five paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table T-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table T-4.2.1 Suspected LCP Sample Collection and Analysis Summary Interpretive Workshop, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
IW-LP-01	Interior walls	Cream	110	No
IW-LP-02	Exterior siding	Light blue	<90	No
IW-LP-03	Exterior stairs	Grey	<90	No
IW-LP-04	Exterior doors	White	<90	No
IW-LP-05	Exterior railings, gutters and downspouts	Black	<120	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

T-4.3 Polychlorinated Biphenyls

The majority of the approximately 22 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building; some of which may have PCB-containing ballasts.

T-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 22 fluorescent light fixtures.

T-4.5 Mould

Mould/moisture damage was observed as summarized in Table T-4.5.1, below.

Table T-4.5.1: Summary of Identified Mould and/or Moisture-Impacted Materials Interpretive Workshop, Tofino, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture-impacted ceiling tiles were observed in the bathroom. The suspected source of moisture is pipe or roof leaks.	

T-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

T-4.1 Silica

Silica is presumed to be present in ceiling tiles and concrete of the subject building.

T-5.0 RECOMMENDATIONS—INTERPRETIVE WORKSHOP

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

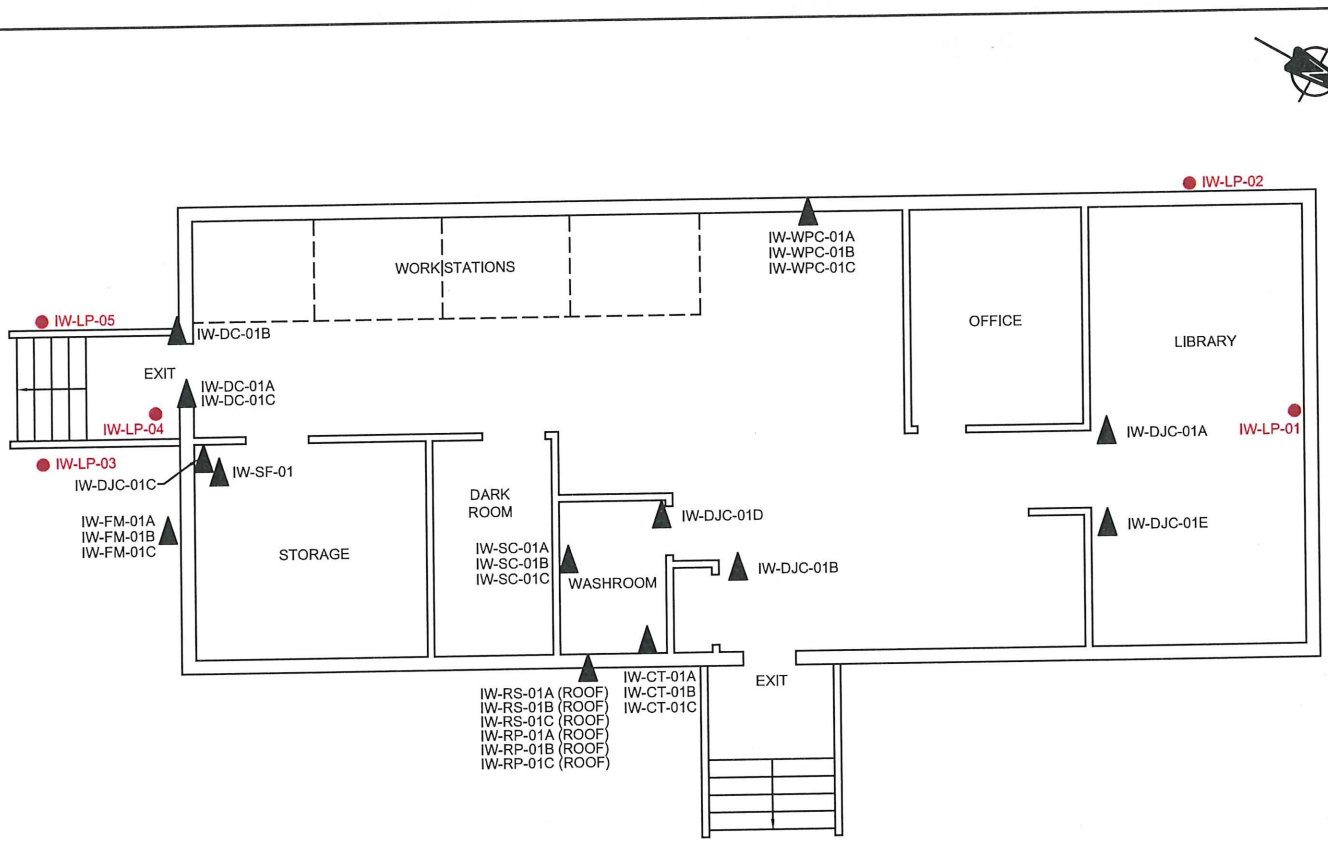
Additional building-specific recommendations to be considered are provided below.

T-5.5 Mould

Stantec recommends the following course of action within the subject building:

- Remove and replace moisture-stained ceiling tiles with new tiles. If staining re-appears on the new tiles, the source of moisture should be identified and corrected. This work can be conducted by regular facility maintenance staff, if conducted prior to the onset of mould growth.

Stantec Consulting Ltd. © 2015



INTERPRETIVE WORKSHOP

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTES: 1. BLACK WINDOW PANE CAULKING ON INTERIOR WINDOWS IS ASBESTOS-CONTAINING.
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/08/28
Dwn. By:	CD SL2015050249 VM/DM
App'd By:	TW

Dwg. No.: T

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Proj: 123220283

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: IW-DC-01A
Lab Sample ID: **551503876-0001**
Sample Description: EXTERIOR DOORS/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: IW-DC-01B
Lab Sample ID: **551503876-0002**
Sample Description: EXTERIOR DOORS/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: IW-DC-01C
Lab Sample ID: **551503876-0003**
Sample Description: EXTERIOR DOORS/GREY DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: IW-WPC-01A
Lab Sample ID: **551503876-0004**
Sample Description: INTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	99.2%	**0.79% Chrysotile**	

Client Sample ID: IW-WPC-01B
Lab Sample ID: **551503876-0005**
Sample Description: INTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: IW-WPC-01C
Lab Sample ID: **551503876-0006**
Sample Description: INTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: IW-SC-01A
Lab Sample ID: **551503876-0007**
Sample Description: BATHROOM COUNTER/WHITE SINK COUNTER CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Beige	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: IW-SC-01B **Lab Sample ID:** 551503876-0008
Sample Description: BATHROOM COUNTER/WHITE SINK COUNTER CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: IW-SC-01C **Lab Sample ID:** 551503876-0009
Sample Description: BATHROOM COUNTER/WHITE SINK COUNTER CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: IW-CT-01A **Lab Sample ID:** 551503876-0010
Sample Description: INTERIOR THROUGHOUT/LONG CEILING TILES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	90%	10%	None Detected	

Client Sample ID: IW-CT-01B **Lab Sample ID:** 551503876-0011
Sample Description: INTERIOR THROUGHOUT/LONG CEILING TILES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	90%	10%	None Detected	

Client Sample ID: IW-CT-01C **Lab Sample ID:** 551503876-0012
Sample Description: INTERIOR THROUGHOUT/LONG CEILING TILES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	80%	20%	None Detected	

Client Sample ID: IW-SF-01 **Lab Sample ID:** 551503876-0013
Sample Description: THROUGHOUT/TAN SMEARED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Beige	0.0%	100%	None Detected	

Client Sample ID: IW-RP-01A **Lab Sample ID:** 551503876-0014
Sample Description: ROOF/BLACK ROOFING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: IW-RP-01B **Lab Sample ID:** 551503876-0015
Sample Description: ROOF/BLACK ROOFING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: IW-RP-01C **Lab Sample ID:** 551503876-0016
Sample Description: ROOF/BLACK ROOFING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: IW-RS-01A **Lab Sample ID:** 551503876-0017
Sample Description: ROOF/BLACK ROOFING SHINGLES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: IW-RS-01B **Lab Sample ID:** 551503876-0018
Sample Description: ROOF/BLACK ROOFING SHINGLES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: IW-RS-01C **Lab Sample ID:** 551503876-0019
Sample Description: ROOF/BLACK ROOFING SHINGLES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Black	0.0%	100%	None Detected	

Client Sample ID: IW-FM-01A **Lab Sample ID:** 551503876-0020
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: IW-FM-01B **Lab Sample ID:** 551503876-0021
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: IW-FM-01C **Lab Sample ID:** 551503876-0022
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: IW-DJC-01A **Lab Sample ID:** 551503876-0023
Sample Description: LIBRARY/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: IW-DJC-01B **Lab Sample ID:** 551503876-0024
Sample Description: FRONT DOOR CLOSET/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: IW-DJC-01C **Lab Sample ID:** 551503876-0025
Sample Description: EQUIPMENT STORAGE/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: IW-DJC-01D **Lab Sample ID:** 551503876-0026
Sample Description: WASHROOM/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: IW-DJC-01E **Lab Sample ID:** 551503876-0027
Sample Description: LIBRARY/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Analyst(s):

Arabee Sathiaseelan	PLM Grav. Reduction (12)
Natalie D'Amico	PLM (5)
Nicole Dimou	PLM (3)
Nicole Yeo	PLM Grav. Reduction (5)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Report amended: 05/26/201512:53:50 Replaces initial report from: 04/24/201518:04:36 Reason Code: Data Entry-Change to Sample ID

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551503875
CustomerID:	55JACQ30L
CustomerPO:	123220283
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
IW-LP-01	*551503875-0001*		4/23/2015	110 ppm
	Site: INTERIOR WALLS Desc: CREAM			
IW-LP-02	*551503875-0002*		4/23/2015	<90 ppm
	Site: EXTERIOR SIDING Desc: LIGHT BLUE			
IW-LP-03	*551503875-0003*		4/23/2015	<90 ppm
	Site: EXTERIOR STAIRS Desc: GREY			
IW-LP-04	*551503875-0004*		4/23/2015	<90 ppm
	Site: EXTERIOR DOORS Desc: WHITE			
IW-LP-05	*551503875-0005*		4/23/2015	<120 ppm
	Site: EXTERIOR RAILING, GUTTERS & DOWNSPOUTS Desc: BLACK Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:14:25

APPENDIX U
FINDINGS AND RECOMMENDATIONS
RESOURCE CONSERVATION BUILDING

U-4.0 FINDINGS—RESOURCE CONSERVATION BUILDING

The construction date of the Resource Conservation Building was not provided and is a one storey structure comprised mainly of drywall and wood finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

U-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Sealants and putties (various types)
- Vinyl sheet flooring
- Attic insulation liner
- Acoustic ceiling tiles
- Roofing shingles
- Drywall joint compound

Twenty-five samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table U-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table U-4.1.1 Suspected ACM Sample Collection and Analysis Summary Resource Conservation Building, Tofino, BC

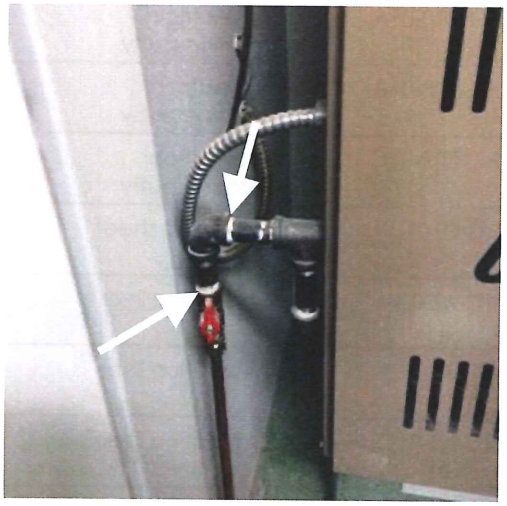
Sample Number	Material Description	Sample Location	Result (%/type asbestos)
RC-PS-01A	White pipe sealant	Northeast furnace room within the mechanical room on gas lines	1.3% Chrysotile
RC-PS-01B	White pipe sealant	East furnace room adjacent to the open area on gas lines	Positive Stop (Not Analyzed)
RC-PS-01C	White pipe sealant	Northwest furnace room within the workshop on gas lines	Positive Stop (Not Analyzed)
RC-PS-02A	Grey penetration sealant	Northeast furnace room within the mechanical room	None Detected

Table U-4.1.1 Suspected ACM Sample Collection and Analysis Summary Resource Conservation Building, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
RC-PS-02B	Grey penetration sealant	Northeast furnace room within the mechanical room	None Detected
RC-PS-02C	Grey penetration sealant	Northeast furnace room within the mechanical room	None Detected
RC-EPP-01A	Clear electrical penetration putty	Electrical penetration on south exterior side	None Detected
RC-EPP-01B	Clear electrical penetration putty	Electrical penetration on south exterior side	None Detected
RC-EPP-01C	Clear electrical penetration putty	Electrical penetration on south exterior side	None Detected
RC-SF-01	Blue smeared sheet flooring	Locker room by crawlspace hatch	None Detected
RC-AL-01A	Attic insulation liner	Between wood and fiberglass insulation	None Detected
RC-AL-01B	Attic insulation liner	Between wood and fiberglass insulation	None Detected
RC-AL-01C	Attic insulation liner	Between wood and fiberglass insulation	None Detected
RC-FS-01A	Red floor penetration sealant	Mechanical room	None Detected
RC-FS-01B	Red floor penetration sealant	Mechanical room	None Detected
RC-FS-01C	Red floor penetration sealant	Mechanical room	None Detected
RC-CT-01A	Cream ceiling tile	Mechanical room	None Detected
RC-CT-01B	Cream ceiling tile	Mechanical room	None Detected
RC-CT-01C	Cream ceiling tile	Mechanical room	None Detected
RC-RS-01A	Roofing shingle	Roof on southeast entrance	None Detected
RC-RS-01B	Roofing shingle	Roof on southeast entrance	None Detected
RC-RS-01C	Roofing shingle	Roof on southeast entrance	None Detected
RC-DJC-01A	Drywall joint compound	Corridor near southeast entrance	None Detected
RC-DJC-01B	Drywall joint compound	Corridor near southeast entrance	None Detected
RC-DJC-01C	Drywall joint compound	Corridor near southeast entrance	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the material presented in Table U-4.1.2, below was identified as an ACM.

Table U-4.1.2 Summary of Identified ACMs
Resource Conservation Building, Tofino, BC

Identified ACM Description and Condition Information		Photo
White pipe fitting sealant on gas lines in the furnace rooms and presumed to present on the gas lines in the crawlspace.		
Friability	Non-friable	
Condition	Good	
Content	1.3% Chrysotile	

U-4.2 Lead

Lead is expected to be present in the following:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, four paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table U-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table U-4.2.1 Suspected LCP Sample Collection and Analysis Summary Resource Conservation Building, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
RC-P-01	Exterior siding	Light blue	<90	No
RC-P-02	Interior walls	White	<90	No
RC-P-03	Exterior doors	Blue	340	No
RC-P-04	**Gutters and downspouts**	**Brown**	**4,700**	**Yes**

Based on our observations and on our interpretations of suspected LCP sample analytical results, the material presented in Table U-4.2.2, below was identified as an LCP.

Table U-4.2.2 Summary of Identified LCPs Resource Conservation Building, Tofino, BC

Identified LCP Description	Photo
Brown colored paint on the gutters and downspouts. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

U-4.3 Polychlorinated Biphenyls

The majority of the approximately 40 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts.

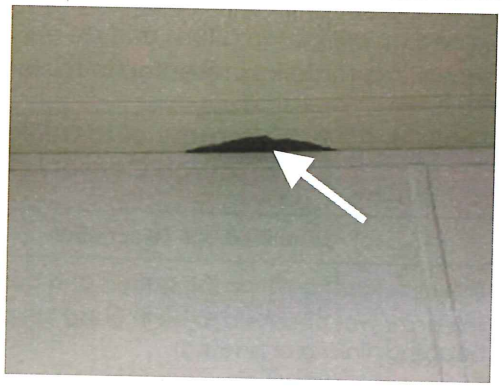
U-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 40 fluorescent light fixtures.

U-4.5 Mould

Mould/moisture damage was observed as summarized in Table U-4.5.1, below.

Table U-4.5.1 Summary of Identified Mould and/or Moisture-Impacted Materials Resource Conservation Building, Tofino, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture-impacted ceiling tiles were observed in various locations throughout. The suspected source of moisture is pipe or roof leaks.	

U-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

U-4.1 Silica

Silica is presumed to be present in ceiling tiles and concrete foundation of the subject building.

U-5.0 RECOMMENDATIONS – RESOURCE CONSERVATION BUILDING

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

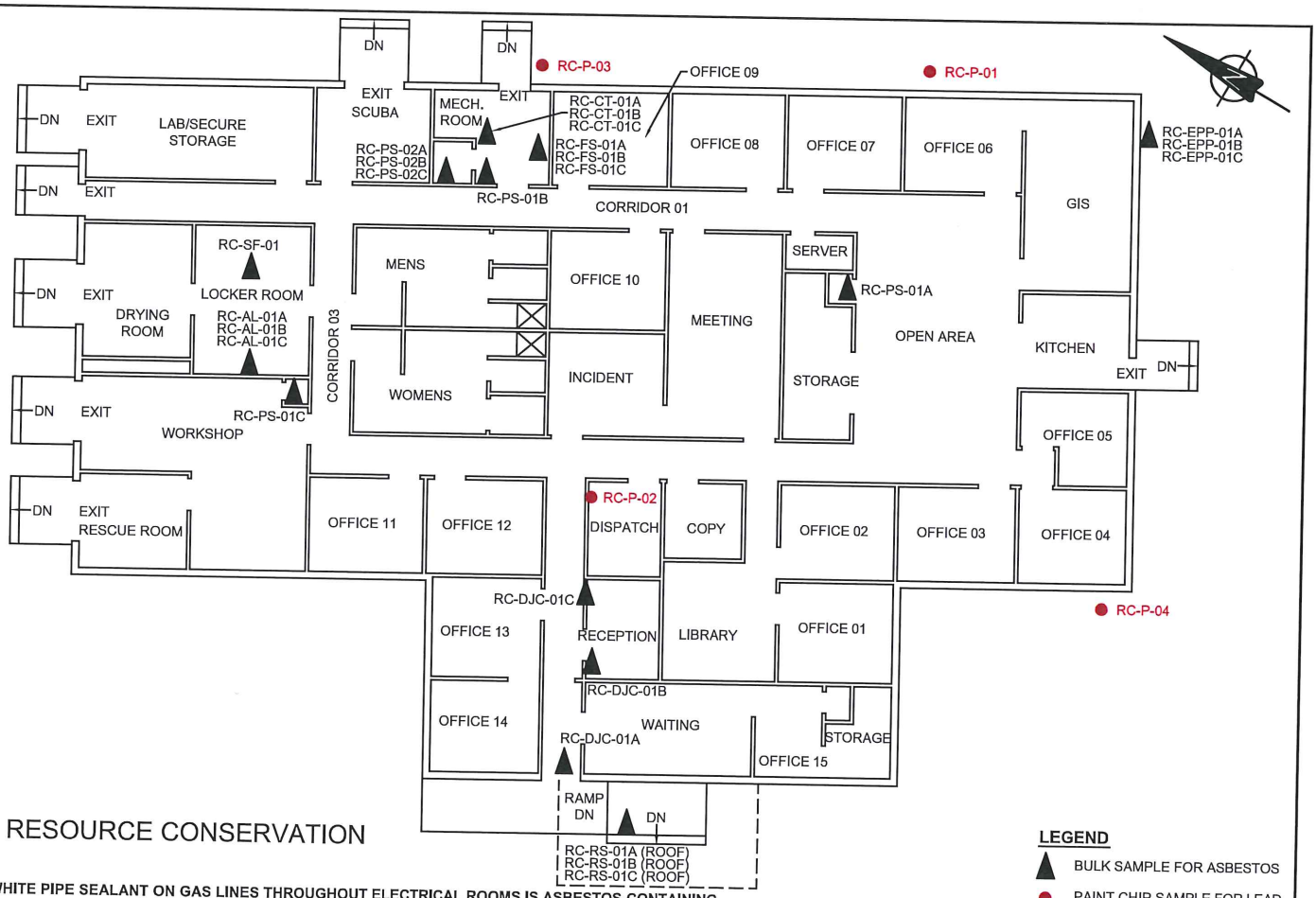
Additional building-specific recommendations to be considered are provided below.

U-5.5 Mould

Stantec recommends the following course of action within the subject building:

- Remove and replace moisture-stained ceiling tiles with new tiles. If staining re-appears on the new tiles, the source of moisture should be identified and corrected. This work can be conducted by regular facility maintenance staff, if conducted prior to the onset of mould growth.

Stantec Consulting Ltd. © 2015



RESOURCE CONSERVATION

LEGEND

▲ BULK SAMPLE FOR ASBESTOS

● PAINT CHIP SAMPLE FOR LEAD

NOTES: 1. **WHITE PIPE SEALANT ON GAS LINES THROUGHOUT ELECTRICAL ROOMS IS ASBESTOS-CONTAINING.**
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/08/29
Dwn. By:	CD SL2015080266 PK/DM
App'd By:	TW

Dwg. No.: U

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Proj: 123220283

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RC-PS-01A — ***Lab Sample ID:*** 551503876-0028
Sample Description: ELECTRICAL ROOMS ON GAS LINES/WHITE PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	98.7%	1.3% Chrysotile	

Client Sample ID: RC-PS-01B — ***Lab Sample ID:*** 551503876-0029
Sample Description: ELECTRICAL ROOMS ON GAS LINES/WHITE PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: RC-PS-01C — ***Lab Sample ID:*** 551503876-0030
Sample Description: ELECTRICAL ROOMS ON GAS LINES/WHITE PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: RC-PS-02A — ***Lab Sample ID:*** 551503876-0031
Sample Description: WALL PENETRATIONS FOR DUCTING THROUGHOUT/GREY PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: RC-PS-02B — ***Lab Sample ID:*** 551503876-0032
Sample Description: WALL PENETRATIONS FOR DUCTING THROUGHOUT/GREY PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: RC-PS-02C — ***Lab Sample ID:*** 551503876-0033
Sample Description: WALL PENETRATIONS FOR DUCTING THROUGHOUT/GREY PENETRATION SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: RC-EPP-01A — ***Lab Sample ID:*** 551503876-0034
Sample Description: ELECTRICAL PENETRATION ON SOUTH EXTERIOR SIDE &/EXTERIOR DOOR FRAMES- CLEAR ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Blue	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RC-EPP-01B ***Lab Sample ID:*** **551503876-0035**

Sample Description: ELECTRICAL PENETRATION ON SOUTH EXTERIOR SIDE &/EXTERIOR DOOR FRAMES- CLEAR ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Blue	0.0%	100%	None Detected	

Client Sample ID: RC-EPP-01C ***Lab Sample ID:*** **551503876-0036**

Sample Description: ELECTRICAL PENETRATION ON SOUTH EXTERIOR SIDE &/EXTERIOR DOOR FRAMES- CLEAR ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Blue	0.0%	100%	None Detected	

Client Sample ID: RC-SF-01 ***Lab Sample ID:*** **551503876-0037**

Sample Description: THROUGHOUT/BLUE SMEARED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Green	0.0%	100%	None Detected	

Client Sample ID: RC-AL-01A ***Lab Sample ID:*** **551503876-0038**

Sample Description: BETWEEN WOOD & FIBERGLASS INSULATION/ATTIC LINER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	White/Black	0.0%	100%	None Detected	

Client Sample ID: RC-AL-01B ***Lab Sample ID:*** **551503876-0039**

Sample Description: BETWEEN WOOD & FIBERGLASS INSULATION/ATTIC LINER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	White/Black	0.0%	100%	None Detected	

Client Sample ID: RC-AL-01C ***Lab Sample ID:*** **551503876-0040**

Sample Description: BETWEEN WOOD & FIBERGLASS INSULATION/ATTIC LINER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	White/Black	0.0%	100%	None Detected	

Client Sample ID: RC-FS-01A ***Lab Sample ID:*** **551503876-0041**

Sample Description: MECHANICAL ROOM/RED FLOOR SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: RC-FS-01B ***Lab Sample ID:*** **551503876-0042**

Sample Description: MECHANICAL ROOM/RED FLOOR SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RC-FS-01C — ***Lab Sample ID:*** 551503876-0043
Sample Description: MECHANICAL ROOM/RED FLOOR SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: RC-CT-01A — ***Lab Sample ID:*** 551503876-0044
Sample Description: THROUGHOUT/CREAM CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	90%	10%	None Detected	

Client Sample ID: RC-CT-01B — ***Lab Sample ID:*** 551503876-0045
Sample Description: THROUGHOUT/CREAM CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	90%	10%	None Detected	

Client Sample ID: RC-CT-01C — ***Lab Sample ID:*** 551503876-0046
Sample Description: THROUGHOUT/CREAM CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	80%	20%	None Detected	

Client Sample ID: RC-RS-01A — ***Lab Sample ID:*** 551503876-0047
Sample Description: ROOF/ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RC-RS-01B — ***Lab Sample ID:*** 551503876-0048
Sample Description: ROOF/ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: RC-RS-01C — ***Lab Sample ID:*** 551503876-0049
Sample Description: ROOF/ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Black	0.0%	100%	None Detected	

Client Sample ID: RC-DJC-01A — ***Lab Sample ID:*** 551503876-0050
Sample Description: CORRIDOR/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: RC-DJC-01B
Sample Description: CORRIDOR/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0051**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: RC-DJC-01C
Sample Description: CORRIDOR/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0052**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Analyst(s):

Arabee Sathiaseelan	PLM Grav. Reduction (12)
Natalie D'Amico	PLM (4)
Nicole Dimou	PLM (2)
Nicole Yeo	PLM Grav. Reduction (5)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 04/24/201518:04:36

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551503875
CustomerID:	55JACQ30L
CustomerPO:	123220283
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
RC-P-01	*551503875-0006*		4/23/2015	<90 ppm
	Site: EXTERIOR SIDING Desc: LIGHT BLUE			
RC-P-02	*551503875-0007*		4/23/2015	<90 ppm
	Site: INTERIOR WALLS Desc: WHITE			
RC-P-03	*551503875-0008*		4/23/2015	340 ppm
	Site: EXTERIOR DOORS Desc: BLUE			
RC-P-04	*551503875-0009*		4/23/2015	4700 ppm
	Site: GUTTERS & DOWNSPOUTS Desc: BROWN			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:17:07

APPENDIX V
FINDINGS AND RECOMMENDATIONS
KWISITIS VISITOR CENTER

V-4.0 FINDINGS—KWISITIS VISITOR CENTER

The Kwisitis Visitor Center was reportedly constructed in 1965 and is a two storey structure comprised mainly of drywall and wood finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

V-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Gaskets
- Roof shingles
- Mastics, putties and caulkings (various types)
- Vinyl floor tiles
- Cement panel
- Textured flooring
- Parging cement
- Ceramic tile grout
- Building paper
- Drywall joint compound
- Fitting insulation

Eighty-three samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table V-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

It should be noted that the samples of vinyl floor tile were further separated into layers (tile and mastic) during laboratory analysis.

Table V-4.1.1 Suspected ACM Sample Collection and Analysis Summary Kwisitis Visitor Center, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
KC-SG-01A	Red gasket	Roof stack	None Detected
KC-SG-01B	Red gasket	Roof stack	None Detected
KC-SG-01C	Red gasket	Roof stack	None Detected
KC-SG-02A	Red gasket	Roof stack - round vents	None Detected
KC-SG-02B	Red gasket	Roof stack - round vents	None Detected
KC-SG-02C	Red gasket	Roof stack. round vents	None Detected
KC-RS-01A	Roofing shingle	Roof	None Detected
KC-RS-01B	Roofing shingle	Roof	None Detected
KC-RS-01C	Roofing shingle	Roof	None Detected
KC-SC-01A	Clear mastic	South skylight – west side	None Detected
KC-SC-01B	Clear mastic	South skylight – west side	None Detected
KC-SC-01C	Clear mastic	South skylight – west side	None Detected
KC-SC-02A	Black mastic	South skylight – east side	None Detected
KC-SC-02B	Black mastic	South skylight – east side	None Detected
KC-SC-02C	Black mastic	South skylight – east side	None Detected
KC-FT-01	**12"x12" tan floor tile with brown smears**	**Main floor storage room**	**4.9% Chrysotile**
KC-FT-01 Mastic	Mastic on 12"x12" tan floor tile with brown smears	Main floor storage room	None Detected
KC-FT-02	12"x12" tan floor tile with brown smudges	Main floor east storage room (kitchen storage)	None Detected
KC-FT-02 Mastic	Mastic on 12"x12" tan floor tile with brown smudges	Main floor east storage room (kitchen storage)	None Detected
KC-FT-03	**12"x12" tan floor tile with brown smears**	**Basement electrical room**	**2.3% Chrysotile**
KC-FT-03 Mastic	Mastic on 12"x12" tan floor tile with brown smears	Basement electrical room	None Detected
KC-DM-01A	Grey duct mastic	On ducting on upper level storage room in northeast corner	None Detected
KC-DM-01B	Grey duct mastic	On ducting on upper level storage room in northeast corner	None Detected
KC-DM-01C	Grey duct mastic	On ducting on upper level storage room in northeast corner	None Detected
KC-PP-01A	**Black penetration putty**	**Basement electrical room**	**25.0% Chrysotile**

Table V-4.1.1 Suspected ACM Sample Collection and Analysis Summary Kwisitis Visitor Center, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
KC-PP-01B	**Black penetration putty**	**Basement electrical room**	**Positive Stop (Not Analyzed)**
KC-PP-01C	**Black penetration putty**	**Basement electrical room**	**Positive Stop (Not Analyzed)**
KC-PP-02A	**Black piping putty on elbow**	**Exterior north side piping**	**4.7% Chrysotile**
KC-PP-02B	**Black piping putty on elbow**	**Exterior north side piping**	**Positive Stop (Not Analyzed)**
KC-PP-02C	**Black piping putty on elbow**	**Exterior north side piping**	**Positive Stop (Not Analyzed)**
KC-CP-01	**White cement panel**	**Basement electrical room**	**10% Amosite 4% Chrysotile**
KC-FM-01A	Black foundation mastic	Cement foundation on exterior	None Detected
KC-FM-01B	Black foundation mastic	Cement foundation on exterior	None Detected
KC-FM-01C	Black foundation mastic	Cement foundation on exterior	None Detected
KC-TF-01A	Black textured flooring	Kitchen	None Detected
KC-TF-01C	Black textured flooring	Kitchen	None Detected
KC-TF-01C	Black textured flooring	Kitchen	None Detected
KC-PC-01A	Parging cement	Basement electrical room on floor penetrations	None Detected
KC-PC-01B	Parging cement	Basement electrical room on floor penetrations	None Detected
KC-PC-01C	Parging cement	Basement electrical room on floor penetrations	None Detected
KC-REM-01A	Brown mastic on steps	Projection room	None Detected
KC-REM-01B	Brown mastic on steps	Projection room	None Detected
KC-REM-01C	Brown mastic on steps	Projection room	None Detected
KC-CTG-01A	Ceramic tile grout	Kitchen	None Detected
KC-CTG-01B	Ceramic tile grout	Kitchen	None Detected
KC-CTG-01C	Ceramic tile grout	Kitchen	None Detected
KC-WPC-01A	**Black window pane caulking**	**Exterior windows**	**5.1% Chrysotile**
KC-WPC-01B	**Black window pane caulking**	**Exterior windows**	**Positive Stop (Not Analyzed)**

Table V-4.1.1 Suspected ACM Sample Collection and Analysis Summary Kwisitis Visitor Center, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
KC-WPC-01C	**Black window pane caulking**	**Exterior windows**	**Positive Stop (Not Analyzed)**
KC-BP-01A	Black building paper	Roof	None Detected
KC-BP-01B	Black building paper	Roof	None Detected
KC-BP-01C	Black building paper	Roof	None Detected
KC-EPP-01A	Grey exterior penetration putty	Vent on north side	None Detected
KC-EPP-01B	Grey exterior penetration putty	Vent on north side	None Detected
KC-EPP-01C	Grey exterior penetration putty	Vent on north side	None Detected
KC-EPP-02A	Grey electrical penetration putty	East side on small electrical building	None Detected
KC-EPP-02B	Grey electrical penetration putty	East side on small electrical building	None Detected
KC-EPP-02C	Grey electrical penetration putty	East side on small electrical building	None Detected
KC-EDC-01A	**Grey exterior door caulking**	**East exterior door by loading zone**	**None Detected**
KC-EDC-01B	**Grey exterior door caulking**	**East exterior door by loading zone**	**1.1% Chrysotile**
KC-EDC-01C	**Grey exterior door caulking**	**East exterior door by loading zone**	**Positive Stop (Not Analyzed)**
KC-EDC-02A	Clear door caulking	East exterior door behind envirotank	None Detected
KC-EDC-02B	Clear door caulking	East exterior door behind envirotank	None Detected
KC-EDC-02C	Clear door caulking	East exterior door behind envirotank	None Detected
KC-EDC-03A	Brown door caulking	East exterior door behind envirotank	None Detected
KC-EDC-03B	Brown door caulking	East exterior door behind envirotank	None Detected
KC-EDC-03C	Brown door caulking	East exterior door behind envirotank	None Detected
KC-DJC-01A	Drywall joint compound	Main floor northeast janitor and storage room	None Detected
KC-DJC-01B	Drywall joint compound	Main floor storage room by staff room	None Detected
KC-DJC-01C	Drywall joint compound	Main floor exhibit area	None Detected
KC-DJC-01D	Drywall joint compound	Main floor disabled washroom	None Detected

Table V-4.1.1 Suspected ACM Sample Collection and Analysis Summary Kwisitis Visitor Center, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
KC-DJC-01E	Drywall joint compound	Main floor east stairwell	None Detected
KC-DJC-02A	Drywall joint compound	Upper floor north exit stairwell	None Detected
KC-DJC-02B	Drywall joint compound	Upper floor projector room	None Detected
KC-DJC-02C	Drywall joint compound	Upper floor observation room	None Detected
KC-DJC-03A	Drywall joint compound	Basement electrical room	None Detected
KC-DJC-03B	Drywall joint compound	Basement hallway	None Detected
KC-DJC-03C	Drywall joint compound	Basement bulk storage	None Detected
KC-DJC-03D	Drywall joint compound	Basement cooled archive room	None Detected
KC-DJC-03E	Drywall joint compound	Basement hallway at bottom of stairs	None Detected
KC-DJC-04A	Drywall joint compound	Kitchen	None Detected
KC-DJC-04B	Drywall joint compound	Kitchen	None Detected
KC-DJC-04C	Drywall joint compound	Kitchen	None Detected
KC-FI-01A	White fitting insulation	Mechanical room	None Detected
KC-FI-01B	White fitting insulation	Mechanical room	None Detected
KC-FI-01C	White fitting insulation	Mechanical room	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table V-4.1.2, below were identified as ACMs.

Table V-4.1.2 Summary of Identified ACMs Kwisitis Visitor Center, Tofino, BC

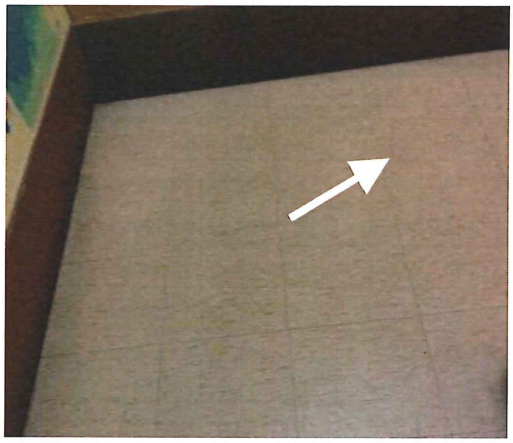
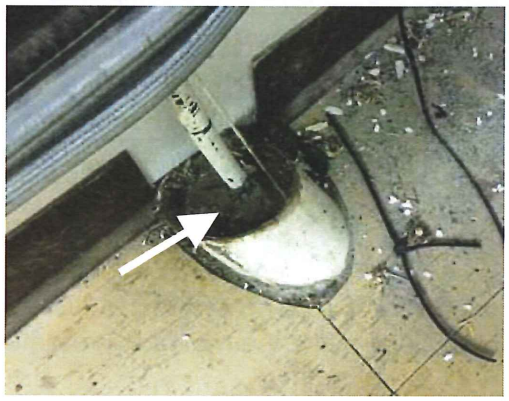
Identified ACM Description and Condition Information		Photo
12"x12" tan floor tile with brown smears in the following locations: • **Main floor: storage rooms, staff room, janitor and storage, east stairwell and kitchen pantry and bathroom.** • **Second floor: projector room, north storage closet, north exit stairwell and east stairwell.** • **Basement in all rooms (except Garage room).**		
Friability	Non-friable	
Condition	Good	
Content	2.3-4.9% Chrysotile	
Black penetration putty in basement electrical room around electrical conduits.		
Friability	Non-friable	
Condition	Good	
Content	25.0% Chrysotile	

Table V-4.1.2 Summary of Identified ACMs Kwisitis Visitor Center, Tofino, BC

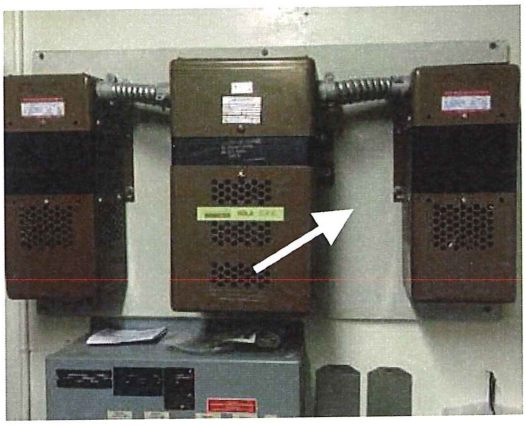
Identified ACM Description and Condition Information		Photo
Black piping putty on elbow on exterior North side piping.		
Friability	Non-friable	
Condition	Good	
Content	4.7% Chrysotile	
White cement panel in basement electrical room behind wall mounted transformers.		
Friability	Non-friable	
Condition	Good	
Content	10% Amosite 4% Chrysotile	

Table V-4.1.2 Summary of Identified ACMs Kwisitis Visitor Center, Tofino, BC

Identified ACM Description and Condition Information		Photo
Black window pane caulking on windows.		
Friability	Non-friable	
Condition	Good	
Content	5.1% Chrysotile	
Grey exterior door caulking on east exterior door by loading zone.		No photo available.
Friability	Non-friable	
Condition	Good	
Content	1.1% Chrysotile	

V-4.2 Lead

Lead is expected to be present in the following:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, seven paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table V-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table V-4.2.1 Suspected LCP Sample Collection and Analysis Summary Kwisitis Visitor Center, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
KC-P-01	**Interior basement walls**	**White**	**1,400**	**Yes**
KC-P-02	Interior second floor and main floor walls	Cream	<90	No
KC-P-03	Interior walls in kitchen	Cream	190	No
KC-P-04	**Exterior north vent**	**Brown**	**1,400**	**Yes**
KC-P-05	Exterior propane lines	Grey	<90	No
KC-P-06	Envirotank	White	<180	No
KC-P-07	Shed on east side	Grey	<160	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table V-4.2.2, below were identified as LCPs.

Table V-4.2.2 Summary of Identified LCPs Kwisitis Visitor Center, Tofino, BC

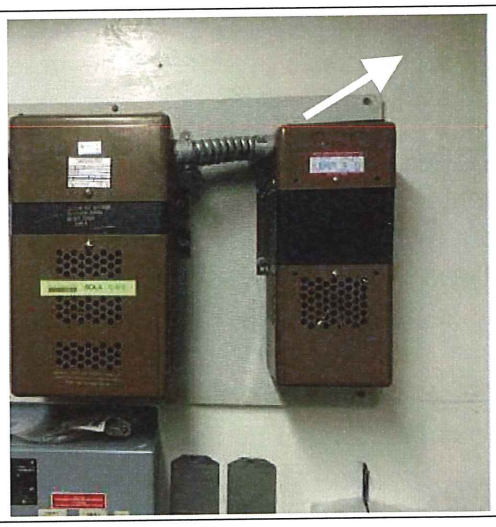
Identified LCP Description	Photo
White colored paint on the interior basement walls. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

Table V-4.2.2 Summary of Identified LCPs
Kwisitis Visitor Center, Tofino, BC

Identified LCP Description	Photo
Brown colored paint on the exterior north vent. This paint was observed to be in poor condition (bubbling, flaking or peeling).	

V-4.3 Polychlorinated Biphenyls

The majority of the approximate 42 fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs. Fluorescent light fixtures of older vintage may still be present in the subject building some of which may have PCB-containing ballasts.

V-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in 42 fluorescent light fixtures.

In addition one suspected mercury-containing thermostat was observed in the Kwistis Visitor Center, as indicated on the attached floor plan drawings.

V-4.5 Mould

No mould or moisture impacted building materials were observed.

V-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

V-4.1 Silica

Silica is presumed to be present in ceramic tiles and concrete of the subject building.

V-5.0 RECOMMENDATIONS—KWISITIS VISITOR CENTER

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

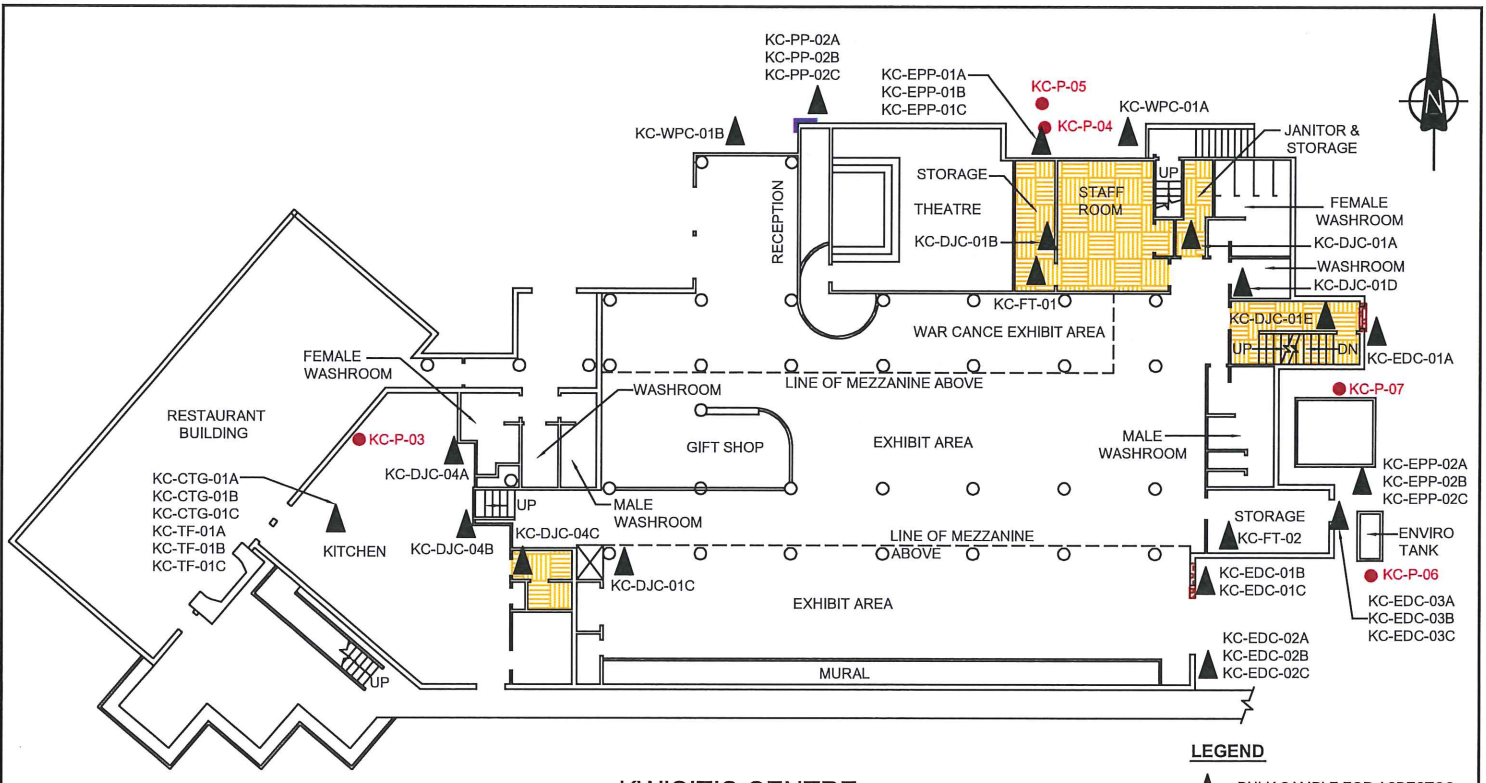
Additional building-specific recommendations to be considered are provided below.

V-5.2 Lead

Lead-containing paint observed in poor condition on an exterior vent located on the north side of the building should be cleaned-up and/or addressed to mitigate potential for additional deterioration and dispersal of lead-containing paint chips/dust. Consideration should be given to re-painting surfaces to mitigate the potential for additional deterioration and hazards associated with the lead-containing paint chips/dust that may be created. If re-painting is completed, appropriate precautions to protect workers and work areas from exposure to lead will be required during painting preparation activities.

Provisions for worker protection and waste disposal related to the above are included in Section 5.2 of the main body of this report.

Stantec Consulting Ltd. © 2015



KWISITIS CENTRE
MAIN FLOOR

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLES FOR LEAD
- ASBESTOS-CONTAINING DOOR CAULKING
- ASBESTOS-CONTAINING PIPING PUTTY
- ASBESTOS-CONTAINING FLOOR TILES

NOTES: 1. BLACK WINDOW PANE CAULKING ON EXTERIOR WINDOWS IS ASBESTOS-CONTAINING.
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

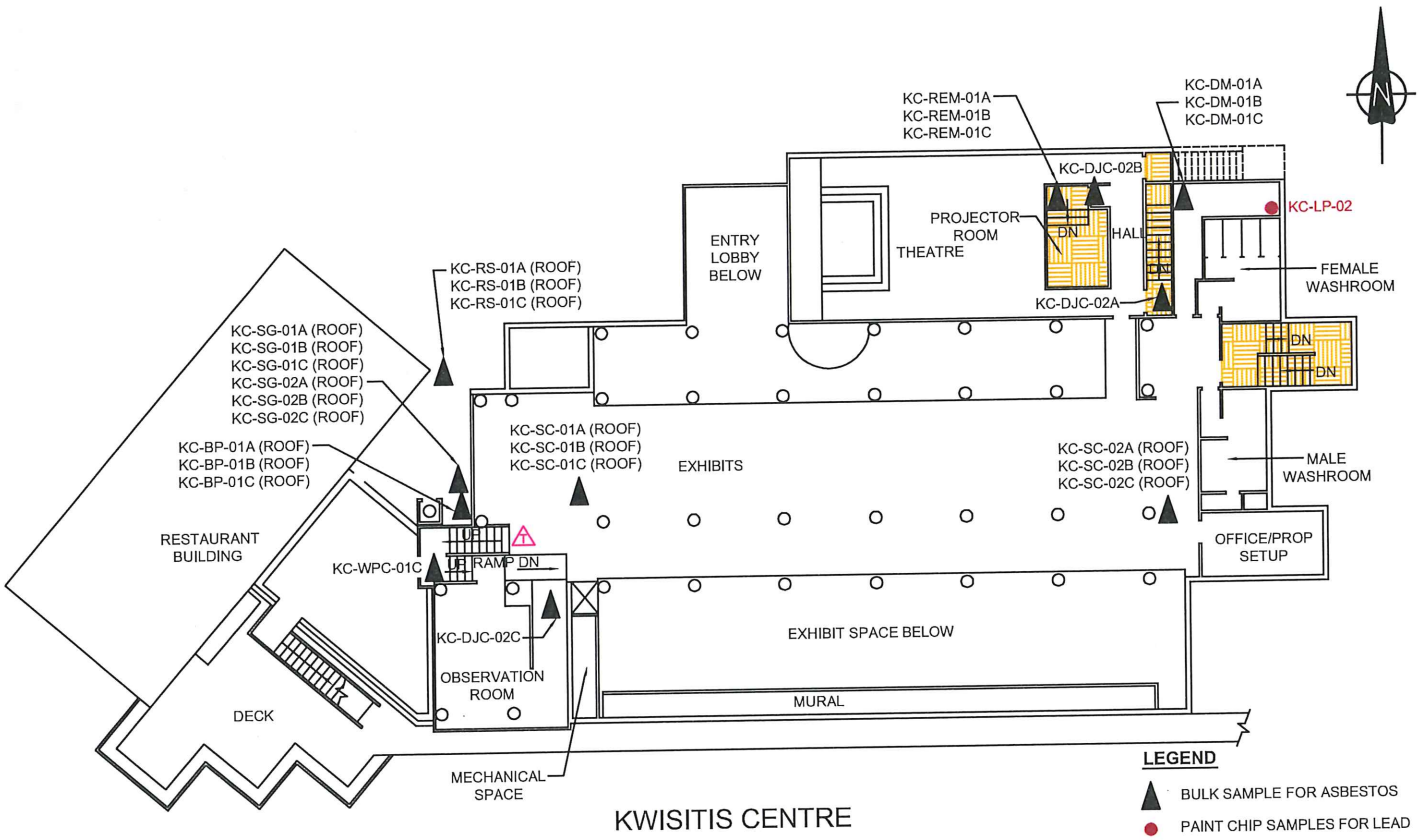
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100040 VM/DM
App'd By:	TW

Dwg. No.: V1

Stantec

Stantec Consulting Ltd. © 2015



KWISITIS CENTRE
UPPER LEVEL

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLES FOR LEAD
- ASBESTOS-CONTAINING FLOOR TILES
- MERCURY-CONTAINING THERMOSTAT

NOTES: 1. **BLACK WINDOW PANE CAULKING ON EXTERIOR WINDOWS IS ASBESTOS-CONTAINING.**
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

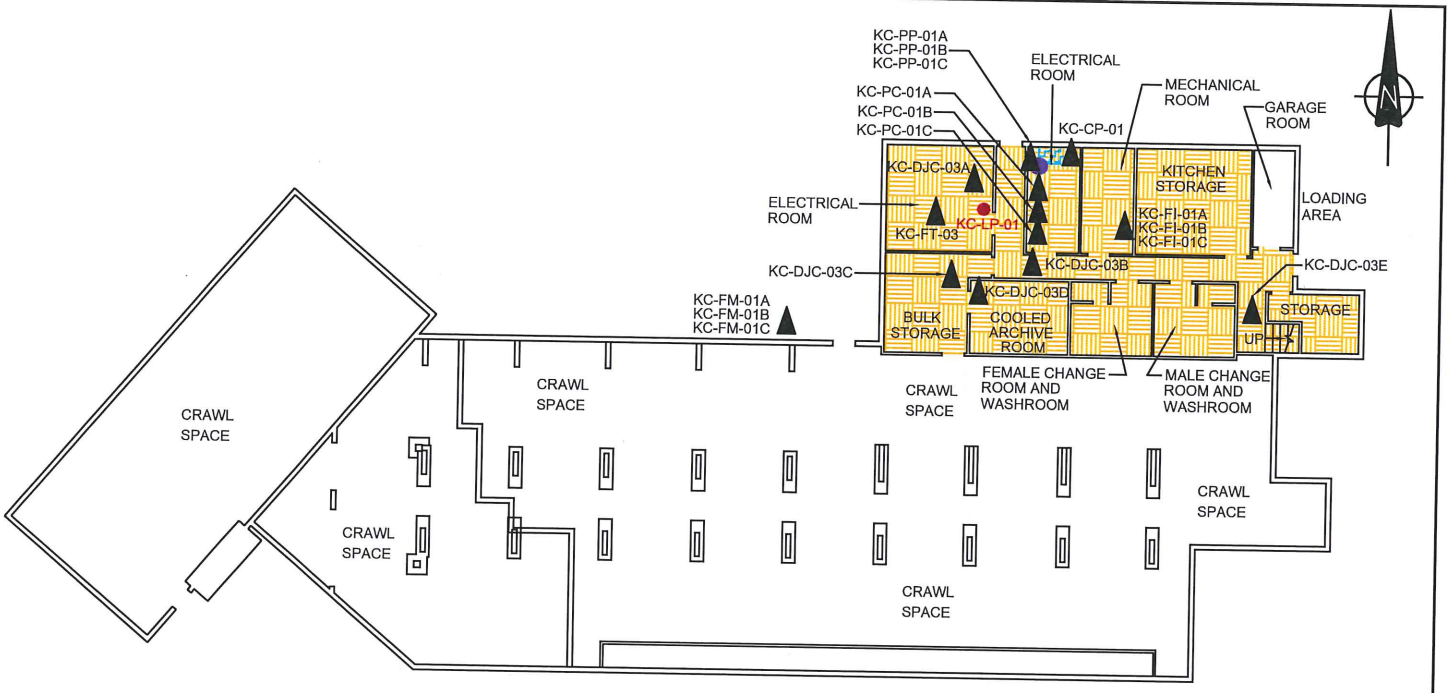
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/08/28
Dwn. By:	CD SL2015080251 VM/DM
App'd By:	TW

Dwg. No.: V2

Stantec

Stantec Consulting Ltd. © 2015



KWISITIS CENTRE
BASEMENT

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLES FOR LEAD
- ASBESTOS-CONTAINING FLOOR TILES
- ASBESTOS-CONTAINING CEMENT PANEL
- ASBESTOS-CONTAINING PENETRATION PUTTY

NOTES: 1. BLACK WINDOW PANE CAULKING ON EXTERIOR WINDOWS IS ASBESTOS-CONTAINING.
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100041 VM/DM
App'd By:	TW

Dwg. No.: V3

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Proj: 123220283

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-SG-01A
Lab Sample ID: 551503876-0053
Sample Description: ROOF STACK/RED GASKET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: KC-SG-01B
Lab Sample ID: 551503876-0054
Sample Description: ROOF STACK/RED GASKET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: KC-SG-01C
Lab Sample ID: 551503876-0055
Sample Description: ROOF STACK/RED GASKET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: KC-SG-02A
Lab Sample ID: 551503876-0056
Sample Description: ROOF STACK ROUND VENTS/RED GASKET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: KC-SG-02B
Lab Sample ID: 551503876-0057
Sample Description: ROOF STACK ROUND VENTS/RED GASKET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: KC-SG-02C
Lab Sample ID: 551503876-0058
Sample Description: ROOF STACK ROUND VENTS/RED GASKET

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Red	0.0%	100%	None Detected	

Client Sample ID: KC-RS-01A
Lab Sample ID: 551503876-0059
Sample Description: ROOF/ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-RS-01B ***Lab Sample ID:*** **551503876-0060**
Sample Description: ROOF/ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Black	0.0%	100%	None Detected	

Client Sample ID: KC-RS-01C ***Lab Sample ID:*** **551503876-0061**
Sample Description: ROOF/ROOFING SHINGLE

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Black	0.0%	100%	None Detected	

Client Sample ID: KC-SC-01A ***Lab Sample ID:*** **551503876-0062**
Sample Description: SOUTH SKYLIGHT- WEST SIDE/CLEAR MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Yellow	0.0%	100%	None Detected	

Client Sample ID: KC-SC-01B ***Lab Sample ID:*** **551503876-0063**
Sample Description: SOUTH SKYLIGHT- WEST SIDE/CLEAR MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	'arious/Yellow/Clea	0.0%	100%	None Detected	

Client Sample ID: KC-SC-01C ***Lab Sample ID:*** **551503876-0064**
Sample Description: SOUTH SKYLIGHT- WEST SIDE/CLEAR MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Yellow/Clear	0.0%	100%	None Detected	

Client Sample ID: KC-SC-02A ***Lab Sample ID:*** **551503876-0065**
Sample Description: SOUTH SKYLIGHT- EAST SIDE/BLACK MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: KC-SC-02B ***Lab Sample ID:*** **551503876-0066**
Sample Description: SOUTH SKYLIGHT- EAST SIDE/BLACK MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: KC-SC-02C ***Lab Sample ID:*** **551503876-0067**
Sample Description: SOUTH SKYLIGHT- EAST SIDE/BLACK MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-FT-01 ***Lab Sample ID:*** **551503876-0068**

Sample Description: MAIN & SECOND FLOOR STORAGE ROOMS/12"X12" TAN FLOOR TILE WITH BROWN SMEARS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Beige	0.0%	95.1%	**4.9% Chrysotile**	

Client Sample ID: KC-FT-01-Mastic ***Lab Sample ID:*** **551503876-0068A**

Sample Description: MAIN & SECOND FLOOR STORAGE ROOMS/12"X12" TAN FLOOR TILE WITH BROWN SMEARS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: KC-FT-02 ***Lab Sample ID:*** **551503876-0069**

Sample Description: MAIN FLOOR EAST STORAGE/12"X12" TAN FLOOR TILE WITH BROWN SMUDGES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	White/Various	0.0%	100%	None Detected	

Client Sample ID: KC-FT-02-Mastic ***Lab Sample ID:*** **551503876-0069A**

Sample Description: MAIN FLOOR EAST STORAGE/12"X12" TAN FLOOR TILE WITH BROWN SMUDGES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: KC-FT-03 ***Lab Sample ID:*** **551503876-0070**

Sample Description: BASEMENT/12"X12" TAN FLOOR TILE WITH BROWN SMEARS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Beige	0.0%	97.7%	**2.3% Chrysotile**	

Client Sample ID: KC-FT-03-Mastic ***Lab Sample ID:*** **551503876-0070A**

Sample Description: BASEMENT/12"X12" TAN FLOOR TILE WITH BROWN SMEARS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: KC-DM-01A ***Lab Sample ID:*** **551503876-0071**

Sample Description: DUCTING THROUGHOUT/GREY DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KC-DM-01B ***Lab Sample ID:*** **551503876-0072**

Sample Description: DUCTING THROUGHOUT/GREY DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-DM-01C **Lab Sample ID:** 551503876-0073
Sample Description: DUCTING THROUGHOUT/GREY DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KC-PP-01A **Lab Sample ID:** 551503876-0074
Sample Description: BASEMENT ELECTRICAL ROOM/BLACK PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	75.0%	**25.0% Chrysotile**	

Client Sample ID: KC-PP-01B **Lab Sample ID:** 551503876-0075
Sample Description: BASEMENT ELECTRICAL ROOM/BLACK PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: KC-PP-01C **Lab Sample ID:** 551503876-0076
Sample Description: BASEMENT ELECTRICAL ROOM/BLACK PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: KC-PP-02A **Lab Sample ID:** 551503876-0077
Sample Description: EXTERIOR NORTH SIDE PIPING/BLACK PIPING PUTTY ON ELBOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	95.3%	**4.7% Chrysotile**	

Client Sample ID: KC-PP-02B **Lab Sample ID:** 551503876-0078
Sample Description: EXTERIOR NORTH SIDE PIPING/BLACK PIPING PUTTY ON ELBOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: KC-PP-02C **Lab Sample ID:** 551503876-0079
Sample Description: EXTERIOR NORTH SIDE PIPING/BLACK PIPING PUTTY ON ELBOW

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: KC-CP-01 **Lab Sample ID:** 551503876-0080
Sample Description: BASEMENT ELECTRICAL ROOM/WHITE CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	86%	**10% Amosite** **4% Chrysotile**	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-FM-01A **Lab Sample ID:** 551503876-0081
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: KC-FM-01B **Lab Sample ID:** 551503876-0082
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: KC-FM-01C **Lab Sample ID:** 551503876-0083
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: KC-TF-01A **Lab Sample ID:** 551503876-0084
Sample Description: KITCHEN/BLACK TEXTURED FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: KC-TF-01B **Lab Sample ID:** 551503876-0085
Sample Description: KITCHEN/BLACK TEXTURED FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: KC-TF-01C **Lab Sample ID:** 551503876-0086
Sample Description: KITCHEN/BLACK TEXTURED FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/Black	0.0%	100%	None Detected	

Client Sample ID: KC-PC-01A **Lab Sample ID:** 551503876-0087
Sample Description: KITCHEN/PARGING CEMENT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

Client Sample ID: KC-PC-01B **Lab Sample ID:** 551503876-0088
Sample Description: KITCHEN/PARGING CEMENT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-PC-01C ***Lab Sample ID:*** **551503876-0089**
Sample Description: KITCHEN/PARGING CEMENT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

Client Sample ID: KC-REM-01A ***Lab Sample ID:*** **551503876-0090**
Sample Description: PROJECTION ROOM/BROWN MASTIC ON STEPS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: KC-REM-01B ***Lab Sample ID:*** **551503876-0091**
Sample Description: PROJECTION ROOM/BROWN MASTIC ON STEPS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: KC-REM-01C ***Lab Sample ID:*** **551503876-0092**
Sample Description: PROJECTION ROOM/BROWN MASTIC ON STEPS

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: KC-CTG-01A ***Lab Sample ID:*** **551503876-0093**
Sample Description: KITCHEN/CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

Client Sample ID: KC-CTG-01B ***Lab Sample ID:*** **551503876-0094**
Sample Description: KITCHEN/CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

Client Sample ID: KC-CTG-01C ***Lab Sample ID:*** **551503876-0095**
Sample Description: KITCHEN/CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

Client Sample ID: KC-WPC-01A ***Lab Sample ID:*** **551503876-0096**
Sample Description: EXTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	94.9%	**5.1% Chrysotile**	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-WPC-01B **Lab Sample ID:** 551503876-0097
Sample Description: EXTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: KC-WPC-01C **Lab Sample ID:** 551503876-0098
Sample Description: EXTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: KC-BP-01A **Lab Sample ID:** 551503876-0099
Sample Description: ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: KC-BP-01B **Lab Sample ID:** 551503876-0100
Sample Description: ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown/Black	0.0%	100%	None Detected	

Client Sample ID: KC-BP-01C **Lab Sample ID:** 551503876-0101
Sample Description: ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown/Black	0.0%	100%	None Detected	

Client Sample ID: KC-EPP-01A **Lab Sample ID:** 551503876-0102
Sample Description: VENT ON NORTH SIDE/GREY EXTERIOR PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KC-EPP-01B **Lab Sample ID:** 551503876-0103
Sample Description: VENT ON NORTH SIDE/GREY EXTERIOR PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KC-EPP-01C **Lab Sample ID:** 551503876-0104
Sample Description: VENT ON NORTH SIDE/GREY EXTERIOR PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-EPP-02A ***Lab Sample ID:*** **551503876-0105**

Sample Description: EAST SIDE ON SMALL ELECTRICAL BUILDING/GREY ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KC-EPP-02B ***Lab Sample ID:*** **551503876-0106**

Sample Description: EAST SIDE ON SMALL ELECTRICAL BUILDING/GREY ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KC-EPP-02C ***Lab Sample ID:*** **551503876-0107**

Sample Description: EAST SIDE ON SMALL ELECTRICAL BUILDING/GREY ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/Various	0.0%	100%	None Detected	

Client Sample ID: KC-EDC-01A ***Lab Sample ID:*** **551503876-0108**

Sample Description: EAST EXTERIOR DOOR BY LOADING ZONE/GREY EXTERIOR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/Various	0.0%	100%	None Detected	

Client Sample ID: KC-EDC-01B ***Lab Sample ID:*** **551503876-0109**

Sample Description: EAST EXTERIOR DOOR BY LOADING ZONE/GREY EXTERIOR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown/Gray	0.0%	98.9%	**1.1% Chrysotile**	

Client Sample ID: KC-EDC-01C ***Lab Sample ID:*** **551503876-0110**

Sample Description: EAST EXTERIOR DOOR BY LOADING ZONE/GREY EXTERIOR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: KC-EDC-02A ***Lab Sample ID:*** **551503876-0111**

Sample Description: EAST EXTERIOR DOOR BEHIND ENVIROTANK/CLEAR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: KC-EDC-02B ***Lab Sample ID:*** **551503876-0112**

Sample Description: EAST EXTERIOR DOOR BEHIND ENVIROTANK/CLEAR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Clear	0.0%	100%	None Detected	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-EDC-02C ***Lab Sample ID:*** **551503876-0113**
Sample Description: EAST EXTERIOR DOOR BEHIND ENVIROTANK/CLEAR DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: KC-EDC-03A ***Lab Sample ID:*** **551503876-0114**
Sample Description: EAST EXTERIOR DOOR BEHIND ENVIROTANK/BROWN DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: KC-EDC-03B ***Lab Sample ID:*** **551503876-0115**
Sample Description: EAST EXTERIOR DOOR BEHIND ENVIROTANK/BROWN DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: KC-EDC-03C ***Lab Sample ID:*** **551503876-0116**
Sample Description: EAST EXTERIOR DOOR BEHIND ENVIROTANK/BROWN DOOR CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown/Various	0.0%	100%	None Detected	

Client Sample ID: KC-DJC-01A ***Lab Sample ID:*** **551503876-0117**
Sample Description: MAIN FLOOR/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-01B ***Lab Sample ID:*** **551503876-0118**
Sample Description: MAIN FLOOR/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-01C ***Lab Sample ID:*** **551503876-0119**
Sample Description: MAIN FLOOR/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-01D ***Lab Sample ID:*** **551503876-0120**
Sample Description: MAIN FLOOR/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-DJC-01E
Sample Description: MAIN FLOOR/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0121**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-02A
Sample Description: SECOND FLOOR/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0122**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-02B
Sample Description: SECOND FLOOR/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0123**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-02C
Sample Description: SECOND FLOOR/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0124**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-03A
Sample Description: BASEMENT/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0125**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-03B
Sample Description: BASEMENT/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0126**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-03C
Sample Description: BASEMENT/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0127**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-03D
Sample Description: BASEMENT/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0128**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KC-DJC-03E
Sample Description: BASEMENT/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0129**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-04A
Sample Description: KITCHEN/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0130**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-04B
Sample Description: KITCHEN/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0131**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: KC-DJC-04C
Sample Description: KITCHEN/DRYWALL JOINT COMPOUND
Lab Sample ID: **551503876-0132**

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Analyst(s):

Arabee Sathiaseelan	PLM Grav. Reduction (36)
Natalie D'Amico	PLM (15)
Nicole Dimou	PLM (8)
Nicole Yeo	PLM Grav. Reduction (17)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 04/24/201518:04:36

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or 551503875
CustomerID: 55JACQ30L
CustomerPO: 123220283
ProjectID:

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	Lab ID	Collected	Analyzed	Lead Concentration
KC-P-01	551503875-0010		4/23/2015	1400 ppm
	Site: INTERIOR BASEMENT WALLS Desc: WHITE			
KC-P-02	551503875-0011		4/23/2015	<90 ppm
	Site: INTERIOR SECOND FLOOR & MAIN FLOOR WALLS Desc: CREAM			
KC-P-03	551503875-0012		4/23/2015	190 ppm
	Site: INTERIOR WALLS IN KITCHEN Desc: CREAM			
KC-P-04	551503875-0013		4/23/2015	1400 ppm
	Site: EXTERIOR NORTH VENTS Desc: BROWN			
KC-P-05	551503875-0014		4/23/2015	<90 ppm
	Site: EXTERIOR PROPANE LINES Desc: GREY			
KC-P-06	551503875-0015		4/23/2015	<180 ppm
	Site: ENVIROTANK Desc: WHITE Insufficient sample to reach reporting limit.			
KC-P-07	551503875-0016		4/23/2015	<160 ppm
	Site: SHED ON EAST SIDE Desc: GREY Insufficient sample to reach reporting limit.			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:20:50

APPENDIX W
FINDINGS AND RECOMMENDATIONS
PACIFIC RIM VISITOR CENTER

W-4.0 FINDINGS—PACIFC RIM VISITOR CENTER

The Pacific Rim Visitor Center was presumed to be constructed between the 1970s and 1980s and is a one storey structure comprised mainly of drywall walls and wood finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

W-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Sheet flooring
- Caulkings, mastics and sealants
- Acoustic ceiling tiles
- Drywall joint compound
- Building paper
- Cement panels

Thirty-six samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table W-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table W-4.1.1 Suspected ACM Sample Collection and Analysis Summary Pacific Rim Visitor Center, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PR-SF-01	Tan and blue square sheet flooring	Library and kitchen	None Detected
PR-SF-02	White and grey spotted sheet flooring	Front and rear entrance in exhibit area	None Detected
PR-SF-03	Tan and brown sheet flooring	Under tan and blue square sheet flooring in library and kitchen	None Detected
PR-WPC-01A	**Grey window pane caulking**	**East exterior of windows**	**None Detected**

Table W-4.1.1 Suspected ACM Sample Collection and Analysis Summary Pacific Rim Visitor Center, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PR-WPC-01B	Grey window pane caulking	East exterior of windows	3.8% Chrysotile
PR-WPC-01C	Grey window pane caulking	East exterior of windows	Positive Stop (Not Analyzed)
PR-WPC-02A	Black window pane caulking	West exterior of windows	4.3% Chrysotile
PR-WPC-02B	Black window pane caulking	West exterior of windows	Positive Stop (Not Analyzed)
PR-WPC-02C	Black window pane caulking	West exterior of windows	Positive Stop (Not Analyzed)
PR-IWPC-01A	Grey window pane caulking	Interior of windows	None Detected
PR-IWPC-01B	Grey window pane caulking	Interior of windows	None Detected
PR-IWPC-01C	Grey window pane caulking	Interior of windows	None Detected
PR-IWPC-02A	Black window pane caulking	Interior of windows	5.5% Chrysotile
PR-IWPC-02B	Black window pane caulking	Interior of windows	Positive Stop (Not Analyzed)
PR-IWPC-02C	Black window pane caulking	Interior of windows	Positive Stop (Not Analyzed)
PR-WFC-01A	Black window frame caulking	Interior windows	None Detected
PR-WFC-01B	Black window frame caulking	Interior windows	None Detected
PR-WFC-01C	Black window frame caulking	Interior windows	None Detected
PR-FM-01A	Black foundation mastic	Cement foundation on exterior	None Detected
PR-FM-01B	Black foundation mastic	Cement foundation on exterior	None Detected
PR-FM-01C	Black foundation mastic	Cement foundation on exterior	None Detected
PR-CT-01A	Long acoustic ceiling tiles	Library and kitchen	None Detected
PR-CT-01B	Long acoustic ceiling tiles	Library and kitchen	None Detected
PR-CT-01C	Long acoustic ceiling tiles	Library and kitchen	None Detected
PR-DJC-01A	Drywall joint compound	Hallway	None Detected
PR-DJC-01B	Drywall joint compound	Exhibit area	2% Chrysotile

Table W-4.1.1 Suspected ACM Sample Collection and Analysis Summary Pacific Rim Visitor Center, Tofino, BC

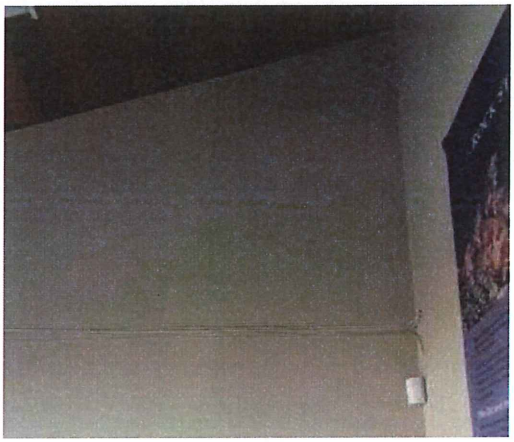
Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PR-DJC-01C	**Drywall joint compound**	**Exhibit area**	**2% Chrysotile**
PR-BP-01A	Black building paper	Exterior walls and roof	None Detected
PR-BP-01B	Black building paper	Exterior walls and roof	None Detected
PR-BP-01C	Black building paper	Exterior walls and roof	None Detected
PR-CP-01A	Cement panel	Exterior lower siding	None Detected
PR-CP-01B	Cement panel	Exterior lower siding	None Detected
PR-CP-01C	Cement panel	Exterior lower siding	None Detected
PR-CPS-01A	Clear cement panel sealant	Exterior cement panel seams	None Detected
PR-CPS-01B	Clear cement panel sealant	Exterior cement panel seams	None Detected
PR-CPS-01C	Clear cement panel sealant	Exterior cement panel seams	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the materials presented in Table W-4.1.2, below were identified as ACMs.

Table W-4.1.2 Summary of Identified ACMs Pacific Rim Visitor Center, Tofino, BC

Identified ACM Description and Condition Information		Photo
Window pane caulking (interior and exterior – between glass and frame) on windows throughout.		
Friability	Non-friable	
Condition	Good	
Content	3.8 – 5.5% Chrysotile	

Table W-4.1.2 Summary of Identified ACMs Pacific Rim Visitor Center, Tofino, BC

Identified ACM Description and Condition Information		Photo
Drywall joint compound on interior walls and ceilings throughout.		
Friability	Non-friable in situ, potentially friable during removal/disturbance	
Condition	Good	
Content	2% Chrysotile	

W-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, three paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table W-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table W-4.2.1 Suspected LCP Sample Collection and Analysis Summary Pacific Rim Visitor Center, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
PR-P-01	Exterior siding	Green	<90	No
PR-P-02	Interior walls	White	<90	No
PR-P-03	Interior trim	Green	<90	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

W-4.3 Polychlorinated Biphenyls

The majority of the seven fluorescent light fixtures throughout were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

W-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in seven fluorescent light fixtures.

W-4.5 Mould

Mould/moisture damage was observed as summarized in Table W-4.5.1, below.

Table W-4.5.1 Summary of Identified Mould and/or Moisture-Impacted Materials Pacific Rim Visitor Center, Tofino, BC

Identified Mould and/or Moisture Impacted Materials Description	Photo
Moisture-impacted ceiling tiles were observed in the kitchen and library. The suspected source of moisture is roof leaks.	

W-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

W-4.1 Silica

Silica is presumed to be present in ceiling tiles and concrete of the subject building.

W-5.0 RECOMMENDATIONS—PACIFIC RIM VISITOR CENTER

In general, identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

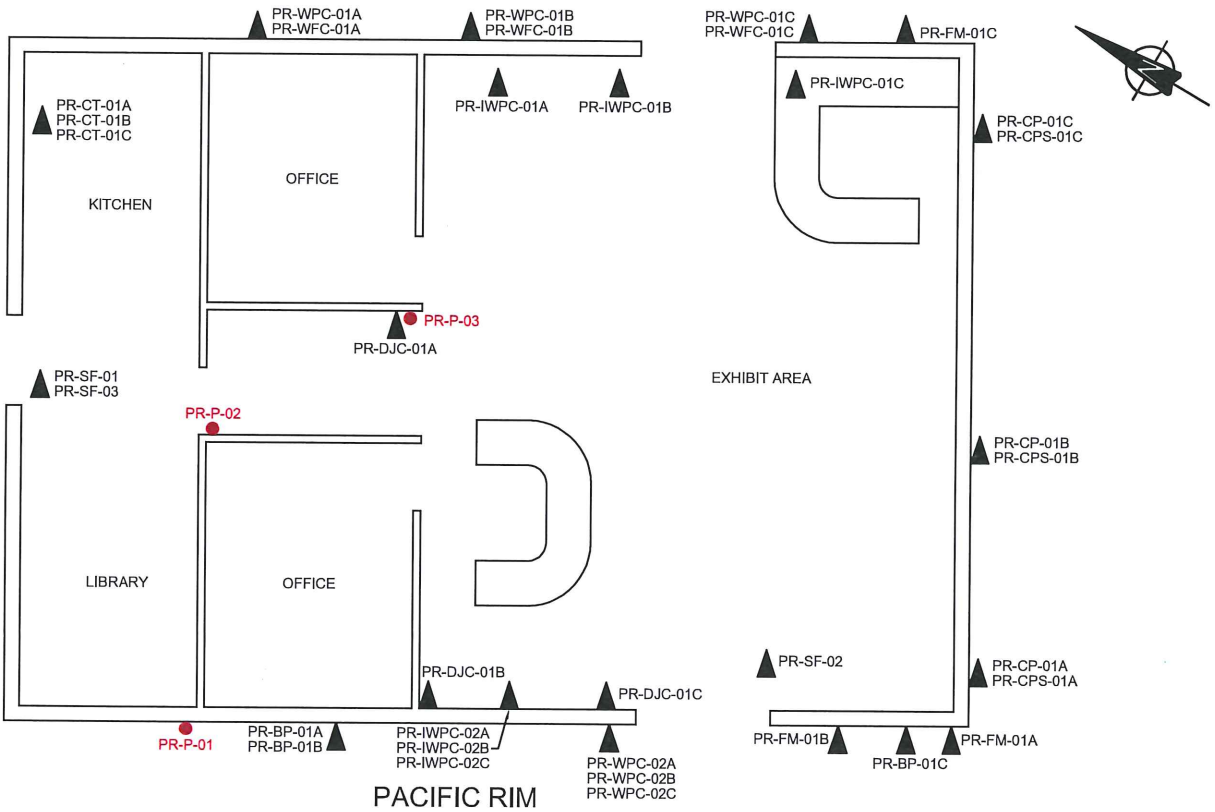
Additional building-specific recommendations to be considered are provided below.

W-5.5 Mould

Stantec recommends the following course of action within the subject building:

- Remove and replace moisture-stained ceiling tiles with new tiles. If staining re-appears on the new tiles, the source of moisture should be identified and corrected. This work can be conducted by regular facility maintenance staff, if conducted prior to the onset of mould growth.

Stantec Consulting Ltd. © 2015



PACIFIC RIM VISITORS CENTER

LEGEND

- ▲ BULK SAMPLE FOR ASBESTOS
- ● PAINT CHIP SAMPLE FOR LEAD

NOTES: 1. WINDOW PANE CAULKING ON WINDOWS THROUGHOUT IS ASBESTOS-CONTAINING.
2. DRYWALL JOINT COMPOUND ON INTERIOR WALLS AND CEILINGS THROUGHOUT IS ASBESTOS-CONTAINING.
3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100042 VM/DM
App'd By:	TW

Dwg. No.: W

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Proj: 123220283

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PR-SF-01 ***Lab Sample ID:*** **551503876-0133**
Sample Description: LIBRARY & KITCHEN/TAN & BLUE SQUARE SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Beige	0.0%	100%	None Detected	

Client Sample ID: PR-SF-02 ***Lab Sample ID:*** **551503876-0134**
Sample Description: FRONT & REAR ENTRANCE IN EXHIBIT AREA/WHITE & GREY SPOTTED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	White/Various/Beig	0.0%	100%	None Detected	

Client Sample ID: PR-SF-03 ***Lab Sample ID:*** **551503876-0135**
Sample Description: UNDER SF-01 IN LIBRARY & KITCHEN/TAN & BROWN SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Tan/Blue	0.0%	100%	None Detected	

Client Sample ID: PR-WPC-01A ***Lab Sample ID:*** **551503876-0136**
Sample Description: EXTERIOR WINDOWS/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-WPC-01B ***Lab Sample ID:*** **551503876-0137**
Sample Description: EXTERIOR WINDOWS/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	96.2%	**3.8% Chrysotile**	

Client Sample ID: PR-WPC-01C ***Lab Sample ID:*** **551503876-0138**
Sample Description: EXTERIOR WINDOWS/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: PR-WPC-02A ***Lab Sample ID:*** **551503876-0139**
Sample Description: EXTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	95.7%	**4.3% Chrysotile**	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PR-WPC-02B **Lab Sample ID:** 551503876-0140
Sample Description: EXTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: PR-WPC-02C **Lab Sample ID:** 551503876-0141
Sample Description: EXTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: PR-IWPC-01A **Lab Sample ID:** 551503876-0142
Sample Description: INTERIOR WINDOWS/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: PR-IWPC-01B **Lab Sample ID:** 551503876-0143
Sample Description: INTERIOR WINDOWS/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: PR-IWPC-01C **Lab Sample ID:** 551503876-0144
Sample Description: INTERIOR WINDOWS/GREY WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: PR-IWPC-02A **Lab Sample ID:** 551503876-0145
Sample Description: INTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Black	0.0%	94.5%	5.5% Chrysotile	

Client Sample ID: PR-IWPC-02B **Lab Sample ID:** 551503876-0146
Sample Description: INTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

Client Sample ID: PR-IWPC-02C **Lab Sample ID:** 551503876-0147
Sample Description: INTERIOR WINDOWS/BLACK WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015				Positive Stop (Not Analyzed)	

EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PR-WFC-01A **Lab Sample ID:** 551503876-0148
Sample Description: INTERIOR WINDOWS/BLACK WINDOW FRAME CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-WFC-01B **Lab Sample ID:** 551503876-0149
Sample Description: INTERIOR WINDOWS/BLACK WINDOW FRAME CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-WFC-01C **Lab Sample ID:** 551503876-0150
Sample Description: INTERIOR WINDOWS/BLACK WINDOW FRAME CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-FM-01A **Lab Sample ID:** 551503876-0151
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-FM-01B **Lab Sample ID:** 551503876-0152
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-FM-01C **Lab Sample ID:** 551503876-0153
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-CT-01A **Lab Sample ID:** 551503876-0154
Sample Description: LIBRARY & KITCHEN/LONG CEILING TILES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	90%	10%	None Detected	

Client Sample ID: PR-CT-01B **Lab Sample ID:** 551503876-0155
Sample Description: LIBRARY & KITCHEN/LONG CEILING TILES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	90%	10%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PR-CT-01C ***Lab Sample ID:*** **551503876-0156**
Sample Description: LIBRARY & KITCHEN/LONG CEILING TILES

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Brown	80%	20%	None Detected	

Client Sample ID: PR-DJC-01A ***Lab Sample ID:*** **551503876-0157**
Sample Description: HALLWAY/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	100%	None Detected	

Client Sample ID: PR-DJC-01B ***Lab Sample ID:*** **551503876-0158**
Sample Description: EXHIBIT AREA/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	98%	2% Chrysotile	

Client Sample ID: PR-DJC-01C ***Lab Sample ID:*** **551503876-0159**
Sample Description: EXHIBIT AREA/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Tan	0%	98%	2% Chrysotile	

Client Sample ID: PR-BP-01A ***Lab Sample ID:*** **551503876-0160**
Sample Description: EXTERIOR WALLS & ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-BP-01B ***Lab Sample ID:*** **551503876-0161**
Sample Description: EXTERIOR WALLS & ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-BP-01C ***Lab Sample ID:*** **551503876-0162**
Sample Description: EXTERIOR WALLS & ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PR-CP-01A ***Lab Sample ID:*** **551503876-0163**
Sample Description: EXTERIOR LOWER SIDING/CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	25%	75%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PR-CP-01B **Lab Sample ID:** 551503876-0164
Sample Description: EXTERIOR LOWER SIDING/CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

Client Sample ID: PR-CP-01C **Lab Sample ID:** 551503876-0165
Sample Description: EXTERIOR LOWER SIDING/CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	100%	None Detected	

Client Sample ID: PR-CPS-01A **Lab Sample ID:** 551503876-0166
Sample Description: EXTERIOR CEMENT PANEL SEAMS/CLEAR CEMENT PANEL SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Various/Clear	0.0%	100%	None Detected	

Client Sample ID: PR-CPS-01B **Lab Sample ID:** 551503876-0167
Sample Description: EXTERIOR CEMENT PANEL SEAMS/CLEAR CEMENT PANEL SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Clear	0.0%	100%	None Detected	

Client Sample ID: PR-CPS-01C **Lab Sample ID:** 551503876-0168
Sample Description: EXTERIOR CEMENT PANEL SEAMS/CLEAR CEMENT PANEL SEALANT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Clear	0.0%	100%	None Detected	

Analyst(s):

Arabee Sathiaseelan	PLM Grav. Reduction (17)
Natalie D'Amico	PLM (6)
Nicole Dimou	PLM (3)
Nicole Yeo	PLM Grav. Reduction (5)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Report amended: 05/26/201512:53:50 Replaces initial report from: 04/24/201518:04:36 Reason Code: Data Entry-Change to Sample ID

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or 551503875
CustomerID: 55JACQ30L
CustomerPO: 123220283
ProjectID:

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
PR-P-01	*551503875-0017* Site: EXTERIOR SIDING Desc: GREEN		4/23/2015	<90 ppm
PR-P-02	*551503875-0018* Site: INTERIOR WALLS Desc: WHITE		4/23/2015	<90 ppm
PR-P-03	*551503875-0019* Site: INTERIOR TRIM Desc: GREEN		4/23/2015	<90 ppm

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:22:08

APPENDIX X
FINDINGS AND RECOMMENDATIONS
WICKANINNISH BEACH WASHROOM

X-4.0 FINDINGS—WICKANINNISH BEACH WASHROOM

The Wickaninnish Beach Washroom construction date was not provided and is a one storey structure comprised mainly of masonry block walls.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

X-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Penetration putty
- Window caulking

Six samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table X-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table X-4.1.1 Suspected ACM Sample Collection and Analysis Summary Wickaninnish Beach Washroom, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
KCW-EPP-01A	Grey electrical penetration putty	Exterior penetrations on north side	None Detected
KCW-EPP-01B	Grey electrical penetration putty	Exterior penetrations on north side	None Detected
KCW-EPP-01C	Grey electrical penetration putty	Exterior penetrations on north side	None Detected
KCW-WPC-01A	White window pane caulking	Exterior windows on north side	None Detected
KCW-WPC-01B	White window pane caulking	Exterior windows on north side	None Detected
KCW-WPC-01C	White window pane caulking	Exterior windows on north side	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

X-4.1.1 Potential for Vermiculite Insulation

Vermiculite, a potential ACM, may be present in masonry block walls as loose-fill insulation. Masonry block walls cavities were assessed at openings on the tops of walls, and were observed to be filled with concrete.

X-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

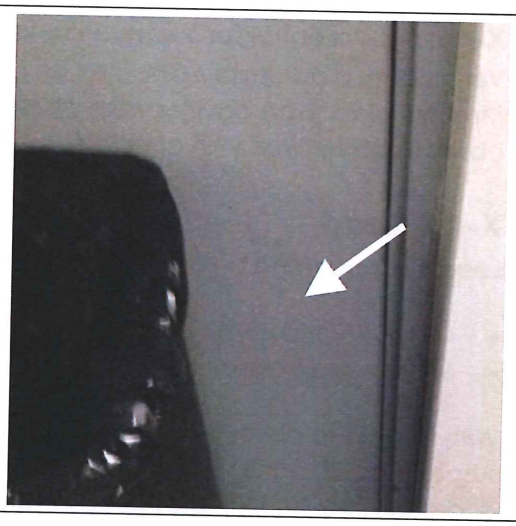
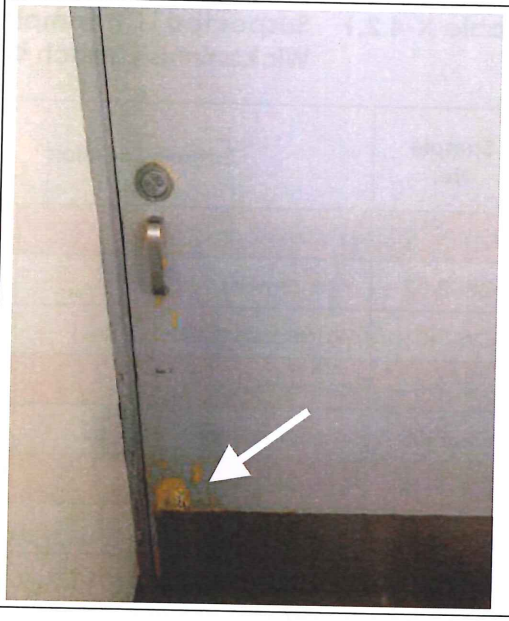
With respect to paint, seven paint chip samples were obtained from the predominant suspected LCP applications within the building. A summary of the sample types, locations and analytical results is presented in Table X-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table X-4.2.1 Suspected LCP Sample Collection and Analysis Summary Wickaninnish Beach Washroom, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
KCW-P-01	**Interior doors**	**Light blue**	**1,600**	**Yes**
KCW-P-02	Interior walls	White	<90	No
KCW-P-03	Washroom stalls	Dark blue	<320	No
KCW-P-04	**Interior trim**	**Green**	**3,100**	**Yes**
KCW-P-05	Interior trusses	Black	<230	No
KCW-P-06	**Interior door (men's)**	**Yellow**	**3,500**	**Yes**
KCW-P-07	Exterior siding	Light blue	<90	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, the materials presented in Table X-4.2.2, below were identified as LCPs.

Table X-4.2.2 Summary of Identified LCPs Wickaninnish Beach Washroom, Tofino, BC

Identified LCP Description	Photo
Light blue colored paint on interior doors. This paint was observed to be in good condition (not bubbling, flaking or peeling).	
Green colored paint on interior trim. This paint was observed to be in good condition (not bubbling, flaking or peeling).	No photo available.
Yellow colored paint on interior door (men's - potentially below blue paint on other doors throughout). This paint was observed to be in good condition (not bubbling, flaking or peeling).	

X-4.3 Polychlorinated Biphenyls

Six fluorescent light fixtures throughout the washrooms were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

X-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in six (6) fluorescent light fixtures.

X-4.5 Mould

No mould or moisture impacted building materials were observed.

X-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

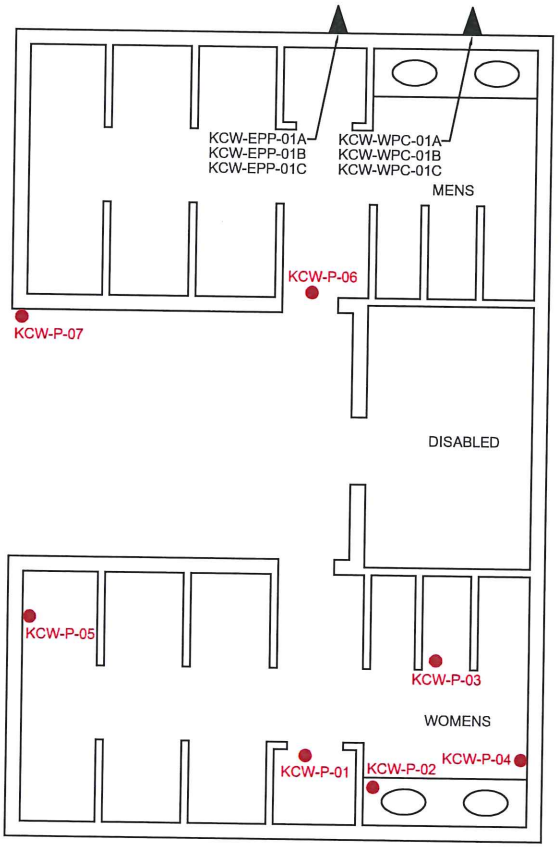
X-4.1 Silica

Silica is presumed to be present in concrete foundation of the subject building.

X-5.0 RECOMMENDATIONS—WICKANINNISH BEACH WASHROOM

Identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



WICKANINNISH BEACH
WASHROOM

LEGEND

- ▲ BULK SAMPLE FOR ASBESTOS
- ● PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/08/28
Dwn. By:	CD SL2015080253 PK/DM
App'd By:	TW

Dwg. No.: X

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Proj: 123220283

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: KCW-EPP-01A
Lab Sample ID: 551503876-0169
Sample Description: EXTERIOR PENETRATIONS/GREY ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KCW-EPP-01B
Lab Sample ID: 551503876-0170
Sample Description: EXTERIOR PENETRATIONS/GREY ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KCW-EPP-01C
Lab Sample ID: 551503876-0171
Sample Description: EXTERIOR PENETRATIONS/GREY ELECTRICAL PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: KCW-WPC-01A
Lab Sample ID: 551503876-0172
Sample Description: EXTERIOR WINDOWS/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/White	0.0%	100%	None Detected	

Client Sample ID: KCW-WPC-01B
Lab Sample ID: 551503876-0173
Sample Description: EXTERIOR WINDOWS/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/White	0.0%	100%	None Detected	

Client Sample ID: KCW-WPC-01C
Lab Sample ID: 551503876-0174
Sample Description: EXTERIOR WINDOWS/WHITE WINDOW PANE CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/White	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

Arabee Sathiaseelan PLM Grav. Reduction (4)
Nicole Yeo PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 04/24/201518:04:36

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551503875
CustomerID:	55JACQ30L
CustomerPO:	123220283
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
KCW-P-01	*551503875-0020* Site: INTERIOR DOORS Desc: LIGHT BLUE		4/23/2015	1600 ppm
KCW-P-02	*551503875-0021* Site: INTERIOR WALLS Desc: WHITE		4/23/2015	<90 ppm
KCW-P-03	*551503875-0022* Site: WASHROOM STALLS Desc: DARK BLUE Insufficient sample to reach reporting limit.		4/23/2015	<320 ppm
KCW-P-04	*551503875-0023* Site: INTERIOR TRIM Desc: GREEN		4/23/2015	3100 ppm
KCW-P-05	*551503875-0024* Site: INTERIOR TRUSSES Desc: BLACK Insufficient sample to reach reporting limit.		4/23/2015	<230 ppm
KCW-P-06	*551503875-0025* Site: INTERIOR DOOR (MENS) Desc: YELLOW		4/23/2015	3500 ppm
KCW-P-07	*551503875-0026* Site: EXTERIOR SIDING Desc: LIGHT BLUE		4/23/2015	<90 ppm

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:23:16

APPENDIX Y
FINDINGS AND RECOMMENDATIONS
PACIFIC RIM VISITORS CENTER
WASHROOM

Y-4.0 FINDINGS—PACIFIC RIM VISITORS CENTER WASHROOM

The Pacific Rim Visitor Center Washroom construction date was not provided and is a one storey structure comprised mainly of drywall walls and wood finishes.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

Y-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Mastic
- Sheet flooring
- Textured flooring
- Drywall joint compound

Ten samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table Y-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table Y-4.1.1 Suspected ACM Sample Collection and Analysis Summary Pacific Rim Visitor Center Washroom, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PRW-SF-01	Tan and grey sheet flooring	Women's washroom	None Detected
PRW-FM-01A	Black foundation mastic	Cement foundation on exterior	None Detected
PRW-FM-01B	Black foundation mastic	Cement foundation on exterior	None Detected
PRW-FM-01C	Black foundation mastic	Cement foundation on exterior	None Detected
PRW-TF-01A	Black textured nonslip flooring	Exterior steps on east side	None Detected
PRW-TF-01B	Black textured nonslip flooring	Exterior steps on east side	None Detected

Table Y-4.1.1 Suspected ACM Sample Collection and Analysis Summary Pacific Rim Visitor Center Washroom, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
PRW-TF-01C	Black textured nonslip flooring	Exterior steps and stairs	None Detected
PRW-DJC-01A	**Drywall joint compound**	**Men's washroom on the south wall**	**1% Chrysotile**
PRW-DJC-01B	**Drywall joint compound**	**Women's washroom on the south wall**	**1% Chrysotile**
PRW-DJC-01C	**Drywall joint compound**	**Wheelchair accessible washroom on the ceiling**	**1% Chrysotile**

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, the material presented in Table Y-4.1.2, below was identified as an ACM.

Table Y-4.1.2 Summary of Identified ACMs Pacific Rim Visitors Center Washroom, Tofino, BC

Identified ACM Description and Condition Information		Photo
Joint compound on drywall walls and ceilings throughout.		
Friability	Non-friable in situ, potentially friable during removal/disturbance	
Condition	Good	
Content	1% Chrysotile	

Y-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, two paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table Y-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table Y-4.2.1 Suspected LCP Sample Collection and Analysis Summary Pacific Rim Visitor Center Washroom, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
PRW-P-01	Interior walls	White	440	No
PRW-P-02	**Exterior beams and trusses**	**Grey**	**1,300**	**Yes**

Based on our observations and on our interpretations of suspected LCP sample analytical results, the material presented in Table Y-4.2.2, below was identified as an LCP.

Table Y-4.2.2 Summary of Identified LCPs Pacific Rim Visitors Center Washroom, Tofino, BC

Identified LCP Description	Photo
Grey colored paint on exterior beams and trusses. This paint was observed to be in good condition (not bubbling, flaking or peeling).	

Y-4.3 Polychlorinated Biphenyls

Six fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

Y-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in six fluorescent light fixtures.

Y-4.5 Mould

No mould or moisture impacted building materials were observed.

Y-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

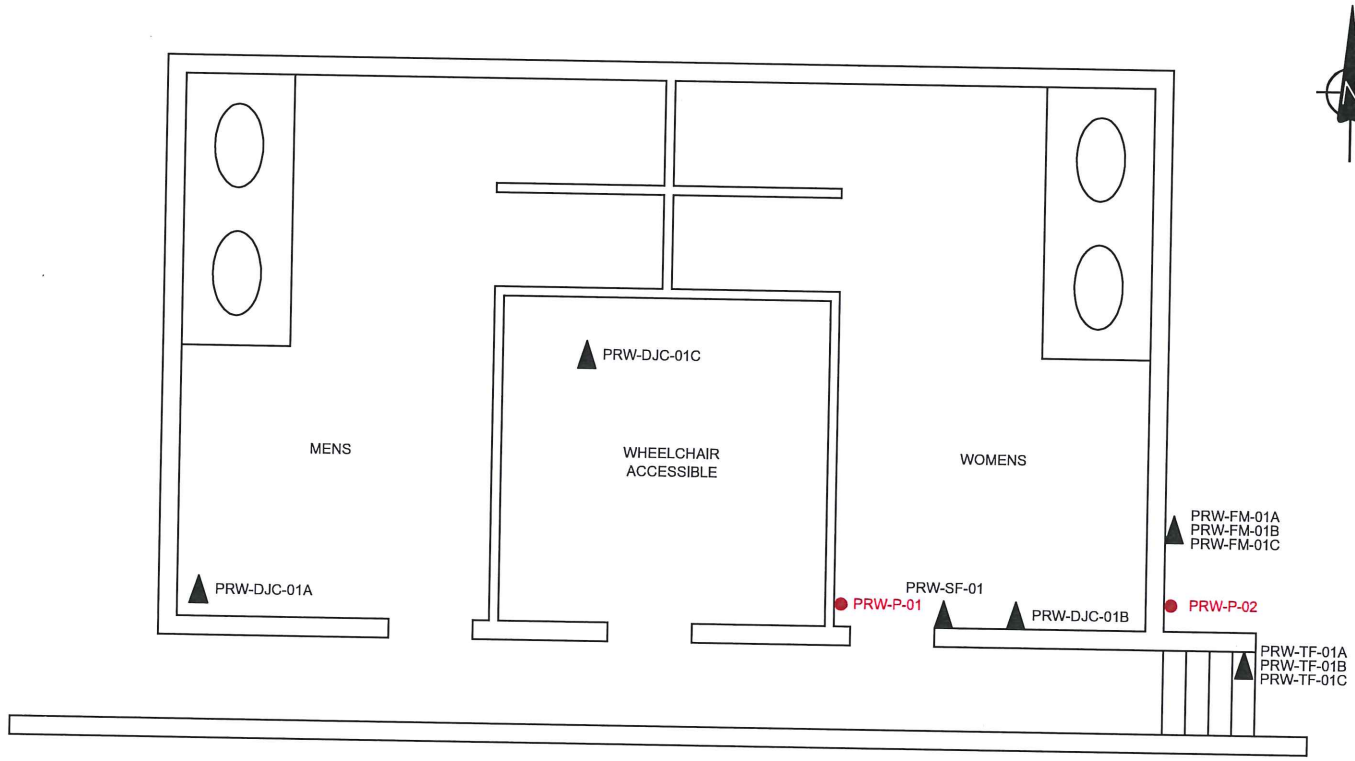
Y-4.1 Silica

Silica is presumed to be present in ceramic tiles and concrete foundation of the subject building.

Y-5.0 RECOMMENDATIONS—PACIFIC RIM VISITORS CENTER WASHROOM

Identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



PACIFIC RIM VISITOR CENTER
WASHROOM

LEGEND

- ▲ BULK SAMPLE FOR ASBESTOS
- ● PAINT CHIP SAMPLE FOR LEAD

NOTES: 1. **DRYWALL JOINT COMPOUND THROUGHOUT IS ASBESTOS-CONTAINING.**
2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/08/28
Dwn. By:	CD SL2015080254 PK/DM
App'd By:	TW

Dwg. No.: Y

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Proj: 123220283

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PRW-SF-01 ***Lab Sample ID:*** **551503876-0175**
Sample Description: THROUGHOUT/TAN & GREY SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray/Tan	0.0%	100%	None Detected	

Client Sample ID: PRW-FM-01A ***Lab Sample ID:*** **551503876-0176**
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRW-FM-01B ***Lab Sample ID:*** **551503876-0177**
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRW-FM-01C ***Lab Sample ID:*** **551503876-0178**
Sample Description: CEMENT FOUNDATION ON EXTERIOR/BLACK FOUNDATION MASTIC

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRW-TF-01A ***Lab Sample ID:*** **551503876-0179**
Sample Description: EXTERIOR STEPS & STAIRS/BLACK TEXTURED NONSLIP FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRW-TF-01B ***Lab Sample ID:*** **551503876-0180**
Sample Description: EXTERIOR STEPS & STAIRS/BLACK TEXTURED NONSLIP FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

Client Sample ID: PRW-TF-01C ***Lab Sample ID:*** **551503876-0181**
Sample Description: EXTERIOR STEPS & STAIRS/BLACK TEXTURED NONSLIP FLOORING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Black	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PRW-DJC-10A ***Lab Sample ID:*** **551503876-0182**

Sample Description: MEN'S WASHROOM/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	99%	1% Chrysotile	

Client Sample ID: PRW-DJC-10B ***Lab Sample ID:*** **551503876-0183**

Sample Description: WOMEN'S WASHROOM/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	White	0%	99%	1% Chrysotile	

Client Sample ID: PRW-DJC-10C ***Lab Sample ID:*** **551503876-0184**

Sample Description: HANDICAP CEILING WASHROOM/DRYWALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/24/2015	Gray	0%	99%	1% Chrysotile	

Analyst(s):

Arabee Sathiaseelan	PLM Grav. Reduction (5)
Natalie D'Amico	PLM (2)
Nicole Dimou	PLM (1)
Nicole Yeo	PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 04/24/201518:04:36

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551503875
CustomerID:	55JACQ30L
CustomerPO:	123220283
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
PRW-P-01	*551503875-0027*		4/23/2015	440 ppm
	Site: INTERIOR WALLS Desc: WHITE			
PRW-P-02	*551503875-0028*		4/23/2015	1300 ppm
	Site: EXTERIOR BEAMS & TRUSSES Desc: GREY			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:24:35

APPENDIX Z
FINDINGS AND RECOMMENDATIONS
LONG BEACH NORTH WASHROOM

Z-4.0 FINDINGS—LONG BEACH NORTH WASHROOM

The Long Beach North Washroom was reportedly constructed in 1977 and is a one storey structure comprised mainly of masonry block walls.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

Z-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Exterior caulking
- Penetration putties

Nine samples of the above-noted suspected ACMs were collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table Z-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table Z-4.1.1 Suspected ACM Sample Collection and Analysis Summary Long Beach North Washroom, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
LBW-MBC-01A	Clear meter block caulking	Exterior north side	None Detected
LBW-MBC-01B	Clear meter block caulking	Exterior north side	None Detected
LBW-MBC-01C	Clear meter block caulking	Exterior north side	None Detected
LBW-PP-01A	Grey penetration putty	Exterior penetrations on north side	None Detected
LBW-PP-01B	Grey penetration putty	Exterior penetrations on north side	None Detected
LBW-PP-01C	Grey penetration putty	Exterior penetrations on north side	None Detected
LBN-PP-01A	Grey penetration putty	Mechanical room	None Detected
LBN-PP-01B	Grey penetration putty	Mechanical room	None Detected
LBN-PP-01C	Grey penetration putty	Mechanical room	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

H-4.1.1 Potential for Vermiculite Insulation

Vermiculite, a potential ACM, may be present in masonry block walls as loose-fill insulation. Masonry block walls cavities were assessed at openings on the tops of walls, and were observed to be filled with concrete.

Z-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, five paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table Z-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table Z-4.2.1 Suspected LCP Sample Collection and Analysis Summary Long Beach North Washroom, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
LBN-P-01	Interior trusses	Brown	<210	No
LBN-P-02	Interior walls	White	<240	No
LBN-P-03	Interior doors and frames	Blue	<110	No
LBN-P-04	Exterior cinderblock shower walls	White	<90	No
LBN-P-05	Exterior siding	Grey	130	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

Z-4.3 Polychlorinated Biphenyls

Eight fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

Z-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in eight fluorescent light fixtures.

Z-4.5 Mould

No mould or moisture impacted building materials were observed.

Z-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

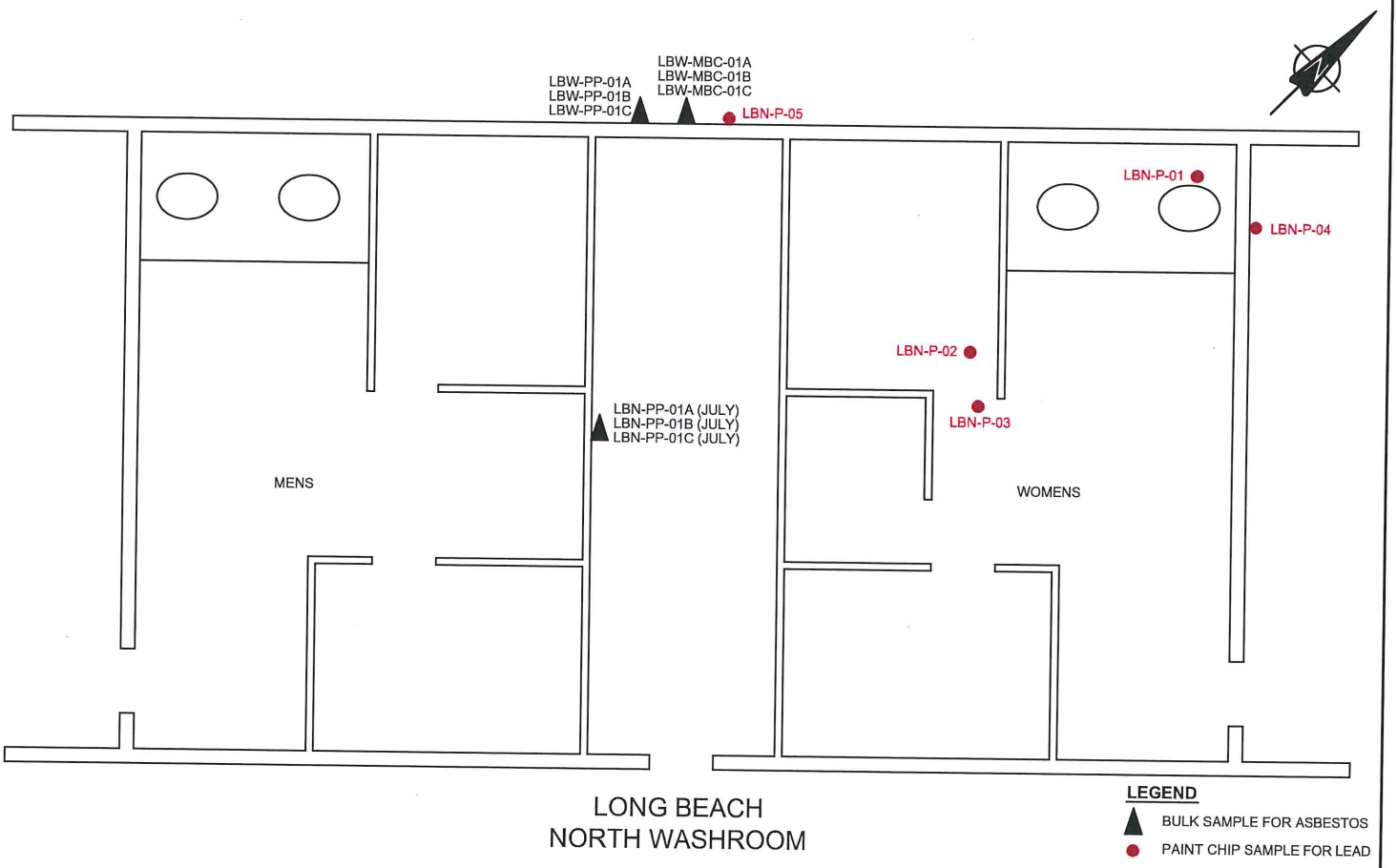
Z-4.1 Silica

Silica is presumed to be present in concrete of the subject building.

Z-5.0 RECOMMENDATIONS—LONG BEACH NORTH WASHROOM

Identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



LONG BEACH
NORTH WASHROOM

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/10/01
Dwn. By:	CD SL2015100043 PK/DM
App'd By:	TW

Dwg. No.: Z

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Proj: 123220283

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: LBW-MBC-01A **Lab Sample ID:** 551503876-0185
Sample Description: EXTERIOR NORTH SIDE/CLEAR METER BLOCK CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: LBW-MBC-01B **Lab Sample ID:** 551503876-0186
Sample Description: EXTERIOR NORTH SIDE/CLEAR METER BLOCK CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: LBW-MBC-01C **Lab Sample ID:** 551503876-0187
Sample Description: EXTERIOR NORTH SIDE/CLEAR METER BLOCK CAULKING

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: LBW-PP-01A **Lab Sample ID:** 551503876-0188
Sample Description: EXTERIOR PENETRATIONS ON NORTH SIDE/GREY PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: LBW-PP-01B **Lab Sample ID:** 551503876-0189
Sample Description: EXTERIOR PENETRATIONS ON NORTH SIDE/GREY PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: LBW-PP-01C **Lab Sample ID:** 551503876-0190
Sample Description: EXTERIOR PENETRATIONS ON NORTH SIDE/GREY PENETRATION PUTTY

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

Arabee Sathiaseelan	PLM Grav. Reduction (4)
Nicole Yeo	PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 04/24/201518:04:36

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507199
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - LONG BEACH NORTH WASHROOM

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: LBN-PP-01A ***Lab Sample ID:*** **551507199-0001**
Sample Description: GREY PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: LBN-PP-01B ***Lab Sample ID:*** **551507199-0002**
Sample Description: GREY PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: LBN-PP-01C ***Lab Sample ID:*** **551507199-0003**
Sample Description: GREY PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Analyst(s):

John Biesiadecki PLM Grav. Reduction (1)
Nicole Dimou PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201515:57:56

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551503875
CustomerID:	55JACQ30L
CustomerPO:	123220283
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
LBN-P-01	*551503875-0029*		4/23/2015	<210 ppm
	Site: INTERIOR TRUSSES Desc: BROWN Insufficient sample to reach reporting limit.			
LBN-P-02	*551503875-0030*		4/23/2015	<240 ppm
	Site: INTERIOR WALLS Desc: WHITE Insufficient sample to reach reporting limit.			
LBN-P-03	*551503875-0031*		4/23/2015	<110 ppm
	Site: INTERIOR DOORS & FRAMES Desc: BLUE Insufficient sample to reach reporting limit.			
LBN-P-04	*551503875-0032*		4/23/2015	<90 ppm
	Site: EXTERIOR CINDERBLOCK SHOWER WALLS Desc: WHITE			
LBN-P-05	*551503875-0033*		4/23/2015	130 ppm
	Site: EXTERIOR SIDING Desc: GREY			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:25:46

APPENDIX AA
FINDINGS AND RECOMMENDATIONS
LONG BEACH SOUTH WASHROOM

AA-4.0 FINDINGS—LONG BEACH SOUTH WASHROOM

The Long Beach South Washroom was reportedly constructed in 1977 and is a one storey structure comprised mainly of masonry block walls.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

AA-4.1 Asbestos

No suspected ACMs were observed through visual assessment and as such, no suspect ACM samples were collected.

AA-4.1.1 Potential for Vermiculite Insulation

Vermiculite, a potential ACM, may be present in masonry block walls as loose-fill insulation. Masonry block walls cavities were assessed at openings on the tops of walls, and were observed to be filled with concrete.

AA-4.2 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, three paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table AA-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table AA-4.2.1 Suspected LCP Sample Collection and Analysis Summary Long Beach South Washroom, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
LBS-P-01	Washroom stalls	Grey	<270	No
LBS-P-02	Interior walls	White	<150	No
LBS-P-03	Exterior siding	Grey	<90	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

AA-4.3 Polychlorinated Biphenyls

Eight fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

AA-4.4 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in eight fluorescent light fixtures.

AA-4.5 Mould

No mould or moisture impacted building materials were observed.

AA-4.6 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

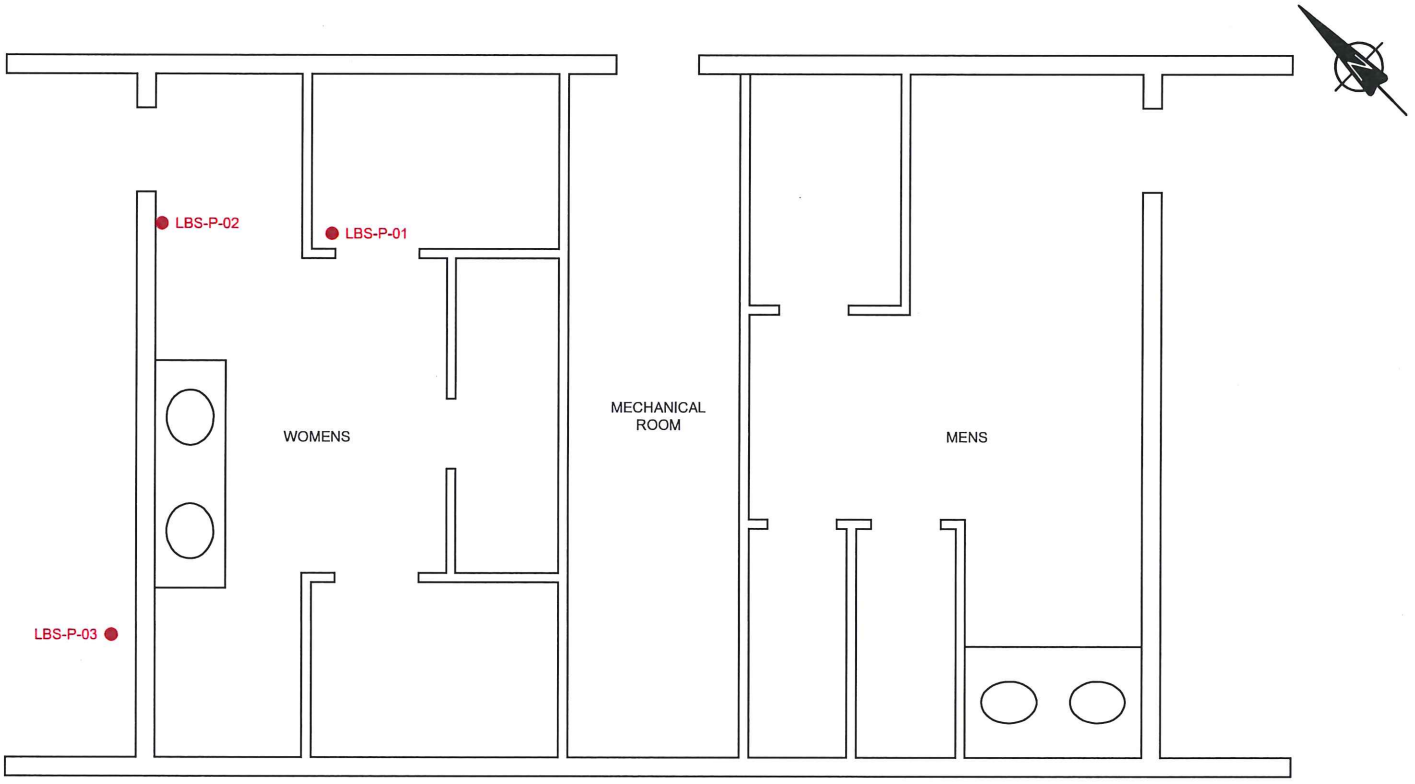
AA-4.1 Silica

Silica is presumed to be present in concrete of the subject building.

AA-5.0 RECOMMENDATIONS—LONG BEACH SOUTH WASHROOM

Identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



LONG BEACH
SOUTH WASHROOM

LEGEND

● PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/08/28
Dwn. By:	CD SL2015080255 PK/DM
App'd By:	TW

Dwg. No.: AA

Stantec

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551503875
CustomerID:	55JACQ30L
CustomerPO:	123220283
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
LBS-P-01	*551503875-0034*		4/23/2015	<270 ppm
	Site: WASHROOM STALLS Desc: GREY Insufficient sample to reach reporting limit.			
LBS-P-02	*551503875-0035*		4/23/2015	<150 ppm
	Site: INTERIOR WALLS Desc: WHITE Insufficient sample to reach reporting limit.			
LBS-P-03	*551503875-0036*		4/23/2015	<90 ppm
	Site: EXTERIOR SIDING Desc: GREY			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:27:04

APPENDIX BB
FINDINGS AND RECOMMENDATIONS
INCINERATOR BEACH WASHROOM

BB-4.0 FINDINGS—INCINERATOR BEACH WASHROOM

The Incinerator Beach Washroom construction date was not provided and is a one storey structure comprised mainly of masonry block walls.

The results of the assessment for each of the considered hazardous materials within the building are provided in the following sub-sections.

Floor plan drawings, which include locations of the samples collected during this assessment and locations of identified hazardous building materials (where practical), are attached to this Appendix.

BB-4.1 Asbestos

Stantec identified and sampled the following suspected ACMs:

- Building paper
- Assorted penetration putties

Nine samples of the above-noted suspected ACM was collected and submitted to EMSL for analysis of asbestos content and nature.

A summary of the sample types, locations and analytical results is presented in Table BB-4.1.1, below. A copy of the certificate of analysis provided by EMSL for the suspected ACM samples submitted is attached at the end of this Appendix.

Table BB-4.1.1 Suspected ACM Sample Collection and Analysis Summary Incinerator Beach Washroom, Tofino, BC

Sample Number	Material Description	Sample Location	Result (%/type asbestos)
IB-BP-01A	Black building paper	Exterior west wall	None Detected
IB-BP-01B	Black building paper	Exterior west wall	None Detected
IB-BP-01C	Black building paper	Exterior west wall	None Detected
IBW-PP-01A	Grey penetration putty	Mechanical room	None Detected
IBW-PP-01B	Grey penetration putty	Mechanical room	None Detected
IBW-PP-01C	Grey penetration putty	Mechanical room	None Detected
IBW-PP-02A	White penetration putty	Mechanical room	None Detected
IBW-PP-02B	White penetration putty	Mechanical room	None Detected
IBW-PP-02C	White penetration putty	Mechanical room	None Detected

Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of suspected ACM sample analytical results, no ACMs were identified.

BB-4.2 Potential for Vermiculite Insulation

Vermiculite, a potential ACM, may be present in masonry block walls as loose-fill insulation. Masonry block walls cavities were assessed at openings on the tops of walls, and were observed to be filled with concrete.

BB-4.3 Lead

Lead is expected to be present in the following:

- Older electrical wiring materials and sheathing
- Solder used in electrical equipment

With respect to paint, four paint chip samples were obtained from the predominant suspected LCP applications within the buildings. A summary of the sample types, locations and analytical results is presented in Table BB-4.2.1, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is attached to this Appendix.

Table BB-4.2.1 Suspected LCP Sample Collection and Analysis Summary Incinerator Beach Washroom, Tofino, BC

Sample No.	Sample Location	Sample Colour	Lab Result (ppm)	Lead Containing (Yes/No)
IB-P-01	Interior walls	White	<210	No
IB-P-02	Interior door and trim	Light blue	<180	No
IB-P-03	Exterior siding	Grey	<90	No
IB-P-04	Exterior cinderblock shower walls on the north side	White	<90	No

Based on our observations and on our interpretations of suspected LCP sample analytical results, no LCPs were identified.

BB-4.4 Polychlorinated Biphenyls

Four fluorescent light fixtures throughout the washroom were observed to have high-efficiency light tubes. The ballasts within such fixtures are not suspected to contain PCBs.

BB-4.5 Mercury

Mercury vapour is expected to be present in fluorescent light bulbs/tubes observed in four fluorescent light fixtures.

BB-4.6 Mould

No mould or moisture impacted building materials were observed.

BB-4.7 Ozone-Depleting Substances

No suspected ODS-containing equipment was observed.

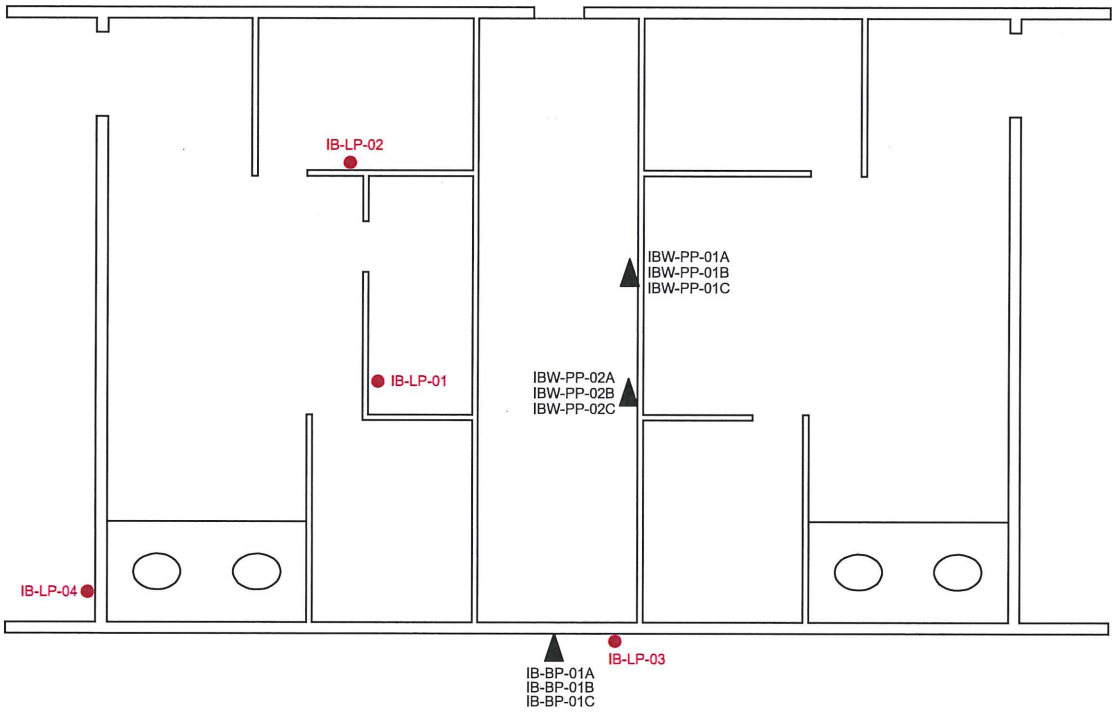
BB-4.1 Silica

Silica is presumed to be present in concrete of the subject building.

BB-5.0 RECOMMENDATIONS—INCINERATOR BEACH WASHROOM

Identified hazardous building materials were observed to be in good condition and do not appear to require specific action to maintain compliance with applicable regulations for continued operations and maintenance. Refer to Section 5.0 of the main body of this report for applicable material-by-material general recommendations.

Stantec Consulting Ltd. © 2015



INCINERATOR BEACH
WASHROOM

LEGEND

- BULK SAMPLE FOR ASBESTOS
- PAINT CHIP SAMPLE FOR LEAD

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS

PACIFIC RIM NATIONAL PARK - TOFINO, BC

Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Project No.:	123220283
Scale:	N.T.S.
Date:	15/08/28
Dwn. By:	CD SL2015080248 VM/DM
App'd By:	TW

Dwg. No.: BB

Stantec

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551503876
Customer ID: 55JACQ30L
Customer PO: 123220283
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 4/17/2015
Analyzed: 4/24/2015

Proj: 123220283

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: IB-BP-01A ***Lab Sample ID:*** **551503876-0191**

Sample Description: EXTERIOR WALLS & ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: IB-BP-01B ***Lab Sample ID:*** **551503876-0192**

Sample Description: EXTERIOR WALLS & ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Client Sample ID: IB-BP-01C ***Lab Sample ID:*** **551503876-0193**

Sample Description: EXTERIOR WALLS & ROOF/BLACK BUILDING PAPER

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	4/24/2015	Brown	0.0%	100%	None Detected	

Analyst(s):

Arabee Sathiaseelan PLM Grav. Reduction (2)
Nicole Yeo PLM Grav. Reduction (1)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 04/24/201518:04:36

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507194
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Attn: Kim Wiese
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Collected:
Received: 7/02/2015
Analyzed: 7/08/2015

Proj: 123220330 - INCINERATOR BEACH WASHROOM

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: IBW-PP-01A ***Lab Sample ID:*** **551507194-0001**
Sample Description: GREY PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: IBW-PP-01B ***Lab Sample ID:*** **551507194-0002**
Sample Description: GREY PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	White	0.0%	100%	None Detected	

Client Sample ID: IBW-PP-01C ***Lab Sample ID:*** **551507194-0003**
Sample Description: GREY PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: IBW-PP-02A ***Lab Sample ID:*** **551507194-0004**
Sample Description: WHITE PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: IBW-PP-02B ***Lab Sample ID:*** **551507194-0005**
Sample Description: WHITE PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

Client Sample ID: IBW-PP-02C ***Lab Sample ID:*** **551507194-0006**
Sample Description: WHITE PENETRATION PUTTY/MECHANICAL ROOM

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	7/08/2015	Gray	0.0%	100%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551507194
Customer ID: 55JACQ30L
Customer PO: 123220330
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s):

Natalie D'Amico	PLM Grav. Reduction (4)
Nicole Dimou	PLM Grav. Reduction (2)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 07/08/201516:29:59

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551503875
CustomerID:	55JACQ30L
CustomerPO:	123220283
ProjectID:	

Attn: **Kim Wiese**
Stantec Consulting, Ltd.
500 - 4730 Kingsway
Burnaby, BC V5H 0C6

Phone: (604) 412-3004
Fax:
Received: 04/17/15 11:30 AM
Collected:

Project: **123220283**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
IB-P-01	*551503875-0037*		4/23/2015	<210 ppm
	Site: INTERIOR WALLS Desc: WHITE Insufficient sample to reach reporting limit.			
IB-P-02	*551503875-0038*		4/23/2015	<180 ppm
	Site: INTERIOR DOOR & TRIM Desc: LIGHT BLUE Insufficient sample to reach reporting limit.			
IB-P-03	*551503875-0039*		4/23/2015	<90 ppm
	Site: EXTERIOR SIDING Desc: GREY			
IB-P-04	*551503875-0040*		4/23/2015	<90 ppm
	Site: EXTERIOR CINDERBLOCK SHOWER WALLS Desc: WHITE			

Lisa Podzyhun
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 04/23/2015 16:28:18

PACIFIC RIM NATIONAL PARK

WASHROOM BUILDINGS

APPENDIX 2

GEOTECHNICAL INVESTIGATION

REPORT

10 June 2016

GEOTECHNICAL INVESTIGATION

Geotechnical Engineering Services for Six Washrooms and Entry Kiosk at Pacific Rim National Park

Submitted to:
Public Works and Government Services Canada
641-800 Burrard St.
Vancouver BC V6Z 2V8

Attention: Mr. Tom Dunphy

Report Number: 1314470497-021-R-Rev0-7000

Distribution:

1 copy - PWGSC
1 copy - Golder Associates Ltd.

Golder Associates

Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT UNDERSTANDING AND SITE DESCRIPTION 2

3.0 SUBSURFACE INVESTIGATION METHODOLOGY AND PROCEDURES 3

4.0 SUBSURFACE INVESTIGATION RESULTS 4

4.1 Stratigraphy 4

4.1.1 Incinerator Rock 4

4.1.2 Long Beach 5

4.1.3 Green Point Campground 6

4.1.4 Wickaninnish Beach 7

4.2 Groundwater 9

4.3 Shear Vane Testing – Silty Clay 9

4.4 Laboratory Testing 10

5.0 GEOTECHNICAL ASSESSMENT 14

5.1 Stripping 14

5.2 Structural Fill 14

5.3 Bearing Capacity 15

5.4 Excavations 15

5.5 Site Drainage 16

5.6 Structure Drainage 16

5.7 Frost Protection 16

5.8 Settlement Assessment and Mitigation Considerations 17

5.8.1 Incinerator Rock 17

5.8.2 Long Beach 17

5.8.3 Green Point Campground 18

5.8.4 Wickaninnish Beach 18

5.9 Seismic Design Considerations 19

5.9.1 Liquefaction Potential 19

5.9.2 Site Specific Foundation Factors 19

5.9.3 Tsunami Impact 20

5.10 Lateral Earth Pressure 20

6.0 CLOSURE 21

TABLES

Table 1: Structure Location Summary 2

Table 2: Monitoring Well Groundwater Levels 9

Table 3: Shear Vane Testing Results of Silty Clay 10

Table 4: Natural Water Content of Silty Clay Samples 11

Table 5: Atterberg Limit Test Results of Silty Clay Samples 12

Table 6: Specific Gravity Test Results of Silty Clay Samples 13

Table 7: Consolidation Test Results of Silty Clay Samples 13

Table 8: Modulus of Subgrade Reaction 15

Table 9: Recommended Bearing Resistances 15

Table 10: Soil Parameters Used in Settlement Analysis (Long Beach) 18

Table 11: Soil parameters used in settlement analysis (Green Point Campground) 18

Table 12: Peak Ground Accelerations and Spectral Accelerations for 1-2475-Year Earthquake (Site Class C). 19

Table 13: Site Specific Foundation Factors 20

Table 14: Lateral Earth Pressure 20

FIGURES

Figure 1: Key Plan

Figure 2: Site 1 – Incineration Rock Washroom Investigation Augerhole Locations

Figure 3: Site 2 – Long Beach North Parking Lot Washroom Investigation Augerhole Locations

Figure 4: Site 3 – Long Beach South Parking Lot Washroom Investigation Augerhole Locations

Figure 5: Site 4 – Green Point Campground North Washroom (#1) Investigation Augerhole Locations

Figure 6: Site 5 – Green Point Campground South Washroom (#4) Investigation Augerhole Locations

Figure 7: Site 6 – Green Point Campground Kiosk Investigation Augerhole Locations

Figure 8: Site 7 – Wickaninnish Beach Washroom Investigation Augerhole Locations

APPENDICES

APPENDIX A
Important Information and Limitations of This Report

APPENDIX B
Photographic Summary

APPENDIX C
Record of Augerholes

APPENDIX D
Geotechnical Laboratory Testing

APPENDIX E
2010 National Building Code Seismic Hazard Calculation

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Public Works and Government Services Canada (PWGSC) to carry out a geotechnical investigation and assessment for the proposed upgrading of park infrastructure at Pacific Rim National Park (PRNP). PWGSC is managing the infrastructure upgrade program on behalf of Parks Canada (Parks) who operates the site. The infrastructure upgrades include the replacement of six existing washrooms and one existing campground entry kiosk in Pacific Rim National Park, near Tofino, BC.

The investigation and assessment were carried out in accordance with the scope of work outlined in Golder's "*Revised Work Plan and Cost Estimate For Geotechnical Engineering Services Six Washroom Facilities and Entry Kiosk Pacific Rim National Park, BC"* dated 2 November 2015 and provided to PWGSC (Golder file reference 1314470497-011-WP-Rev2-7000). The scope of work was identified based on the specific requirements stated in the Terms of Reference (TOR) document dated 1 September 2015. The approved scope of work included the following:

- review existing information for the Site and conduct a visual reconnaissance of the six existing washrooms and entry kiosk;
- prepare a detailed investigation plan for the geotechnical investigation;
- prepare a site-specific health, safety and environment plan for the proposed geotechnical investigation;
- carry out a geotechnical field investigation including augerhole drilling and piezometer installation for groundwater level monitoring; and
- prepare a report summarizing the factual findings of the investigation and recommendations for foundation design with provision of input parameters for structural design.

This report should be read in conjunction with the "*Important Information and Limitations of This Report*" provided in Appendix A. We specifically draw the reader's attention to this information, as it is essential for the proper use and interpretation of this report. Investigation and analytical testing of site soils and groundwater for possible contamination, archaeological assessments, or bio-environmental assessment, were outside our scope of work, but can be provided by Golder if requested.

2.0 PROJECT UNDERSTANDING AND SITE DESCRIPTION

Pacific Rim National Park (PRNP) is located on the central west coast of Vancouver Island, near Tofino, BC. The seven building sites are situated west of Highway 4 between the road and the coastal shoreline. They are located along a 12 kilometre (km) section of the highway stretching southeast from the Tofino Airport. The elevation of this area varies from a few metres above sea level up to 40 metres (m) above sea level at the Green Point Campground.

The seven building sites are located on the perimeter of four public vehicle parking areas and campgrounds within PRNP. There are existing structures at each site which are planned to be removed and replaced with new structures at the same location. At most of the sites, the footprint of the new structure will be larger than the existing structure footprint. The locations of the seven structures are shown in Figure 1. Representative site photographs are provided in Appendix B.

For ease of discussion the seven sites have been grouped into four areas based on location as summarized in the table below.

Table 1: Structure Location Summary

Area	Location	Building Type	Site Name (as shown in Figure 1)
Incinerator Rock	Incinerator Rock Parking Lot	Washroom	Site 1
Long Beach	Long Beach North (north portion of parking lot)	Washroom	Site 2
	Long Beach South (south portion of parking lot)	Washroom	Site 3
Green Point Campground	Green Point Campground #1 (north portion of campground)	Washroom	Site 4
	Green Point Campground #4 (south portion of campground)	Washroom	Site 5
	Green Point Campground Entry Kiosk	Kiosk	Site 6
Wickaninnish Beach	Wickaninnish Beach Parking Lot	Washroom	Site 7

Golder understands that the intent is to use a single design for the six washroom facilities, although possibly varying in size based on the number of stalls.

3.0 SUBSURFACE INVESTIGATION METHODOLOGY AND PROCEDURES

The subsurface investigation was carried out in two phases: (1) 8 to 14 December 2015, and (2) 26 January 2016. The investigation comprised advancing 14 augerholes; two at each building site, to classify the subsurface soils and collect samples for laboratory analysis. The augerhole locations were selected to obtain representative geotechnical information about the subsurface conditions in the vicinity of the existing buildings. One shallow hole and one deeper hole were advanced at each of the building sites to the planned excavation depth or to practical refusal. The augerholes ranged in depth from 1.07 to 16.31 metres below ground surface (m bgs). The augerholes were advanced using a B-37 solid stem auger track drill rig supplied and operated by Drillwell Enterprises Ltd. of Duncan, BC. The augerhole locations were measured by Golder personnel using a handheld GPS (accuracy +/-3 m) and using a tape measure relative to key site features. The approximate augerhole locations are shown in Figures 2 to 8.

The investigation was conducted under the full-time supervision of Golder's geotechnical staff who visually examined and logged the subsurface conditions encountered. Subsurface conditions were assessed based on auger runs, split spoon samples used in Standard Penetration Testing (SPT), and Shelby tube samples. SPT methods were also used to assess in situ relative density and consistency of the soils. Standard Penetration Testing was conducted using a 63.5 kilogram (kg) automatic hammer dropped 760 millimetres (mm). A split barrel corer was driven 600 mm (24 inches) and the SPT "N" value was determined based on the blow count between 150 and 450 mm of driving. Where cohesive soils were encountered, Shelby tubes were advanced 600 mm (24 inches) into the soil to obtain undisturbed samples.

Disturbed samples were placed in plastic sampling bags and the Shelby Tube samples were stored to remain upright during transport. The samples were transported by vehicle to Golder's geotechnical laboratories in Victoria and Burnaby.

Standpipe piezometers made of 25 mm (1 inch) PVC pipe, were installed in six of the augerholes to measure groundwater levels. The remaining augerholes were backfilled with bentonite and drill cuttings consistent with the requirements under the *BC Groundwater Protection Regulation.* Details of the backfilling and piezometer installation are provided on the Record of Augerholes in Appendix C.

4.0 SUBSURFACE INVESTIGATION RESULTS

The subsurface investigation included a drilling investigation to determine the subsurface stratigraphy, measuring groundwater levels in monitoring wells and carrying out laboratory tests on collected samples as summarized below.

4.1 Stratigraphy

The subsurface stratigraphy is discussed below based on the four areas: Incinerator Rock, Long Beach, Green Point Campground and Wickaninnish Beach.

The soil and groundwater descriptions provided in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and the inferred accuracy of soil descriptions is considered to be consistent with current geotechnical practice. The depths to stratigraphic changes are approximate, given the typically gradual nature of the transition between different soil types.

Depths within augerholes are referenced as m bgs. Detailed soil descriptions, SPT blow counts, in situ shear strengths, and groundwater conditions are presented in the Record of Augerholes (Appendix C).

4.1.1 Incinerator Rock

The existing washroom at Incinerator Rock is located at the west end of the parking lot, south of Highway 4. Two augerholes (AH15-01 and AH15-02) were advanced adjacent to the existing building as shown in Figure 2.

For geotechnical analysis and discussion purposes, the subsurface soils encountered during the field investigation were grouped into the following stratigraphic units (in order of increasing depth below ground surface) based on observed physical properties and inferred geological origin:

- sand with silt and gravel; and
- inferred bedrock.

The physical characteristics of each of these materials are described in detail in the following sections.

Sand with Silt and Gravel

Sand with silt and gravel was encountered from surface to termination of both augerholes at practical refusal (1.1 and 3.3 m bgs). The fines content of the sand decreased from silty near surface to trace to some silt with depth; and the gravel content increasing from trace gravel near surface to gravelly with depth. The material was described as grey to brown, non-cohesive, wet, and loose to dense.

SPT “N” values between 3 and 63 blows per 300 mm (average 23) were recorded within this material. Two SPTs were discontinued in this material as refusal of the sampler was reached on the inferred bedrock as described below.

Inferred Bedrock

Both augerholes in this area terminated at refusal at 3.3 and 1.1 m bgs (AH15-01 and AH15-02, respectively). Based on the drill reaction the refusal was interpreted as bedrock.

4.1.2 Long Beach

Two existing washroom facilities at the Long Beach parking lot are planned to be replaced. One of the washrooms is located on the north side of the parking lot (see Figure 3) and the other at the south end of the parking lot (see Figure 4). The investigation included four augerholes (AH15-03, AH15-04, AH15-05 and AH15-06).

For geotechnical analysis and discussion purposes, the subsurface soils encountered during the field investigation were grouped into the following stratigraphic units (in order of increasing depth below ground surface) based on observed physical properties and inferred geological origin:

- loose silty sand;
- compact to dense sand with silt and gravel; and
- clay to silty clay.

The physical characteristics of each of these materials are described in more detail in the following sections.

Loose Silty Sand

Loose silty sand was encountered from surface to a depth between 0.6 and 1.4 m bgs in the four augerholes. The gravel content varied from no gravel observed to over 35 percent gravel by mass within the silty sand. The silty sand was described as brown to grey-brown, non-cohesive, moist to wet, and generally very loose to loose, except in AH15-05 where the upper 0.8 m was described as compact with very loose material below. Organics were observed within this material in augerholes AH15-04, AH15-05 and AH15-06.

SPT “N” values between 0 and 21 blows per 300 mm (average 7) were recorded within this material.

Compact to Dense Sand with Silt and Gravel

Compact to dense sand with silt and gravel was encountered for a thickness between 3.3 to 3.7 m. The sand had a silt content ranging from trace silt to silty, and a gravel content ranging from no gravel observed in the upper portion of the unit to gravelly with depth. The material was described as grey-brown transitioning to grey with depth, non-cohesive, moist to wet, and compact to dense, generally increasing in density with depth.

SPT “N” values between 12 and 24 blows per 300 mm (average 18) were recorded within this material.

Clay to Silty Clay

Clay to silty clay was encountered underlying the compact to dense sand with silt and gravel to a maximum observed thickness of 12 m (maximum depth of investigation of 16.3 m bgs). The material was observed to contain trace sand and was generally described as grey, cohesive, very soft, and with a water content above the plastic limit. Below 15 m bgs, the consistency of the soil increased from very soft to between stiff and very stiff.

SPT “N” values between 0 and 4 blows per 300 mm (average 2) were recorded within this material.

Field shear vane and laboratory index testing of this material is summarized in sections 4.3 and 4.4.

4.1.3 Green Point Campground

The Green Point Campground has three structures, which are planned to be replaced; Washroom #1 located in the north portion of the campground, Washroom #4 located in the south portion of the campground and a kiosk on the entry road into the campground. Six augerholes (two at each building location) were advanced adjacent to the existing structures as shown in Figures 5, 6 and 7.

For geotechnical analysis and discussion purposes, the subsurface soils encountered during the field investigation at the Green Point campground were grouped into the following stratigraphic units (in order of increasing depth below ground surface) based on observed physical properties and inferred geological origin:

- surficial sand;
- clayey silt and sand;
- silty clay; and
- inferred cobbles, boulders or bedrock.

The physical characteristics of each of these units are described in more detail in the following sections.

Surficial Sand

Surficial sand was encountered from surface to between 0.6 and 1.1 m bgs in the six augerholes advanced in the Green Point Campground area. The composition of the sand encountered ranged from organic silt and sand, to silty sand and gravel. The material was described as brown, non-cohesive, wet and, loose to dense, or cohesive, with water content above the plastic limit and soft to firm. The sand was inferred to be fill material.

SPT “N” values between 0 and 32 blows per 300 mm (average 12) were recorded within this material. The “N” value of 0 indicates that the sampler penetrated 300 mm into the material solely from the weight of the hammer. The natural water content measured in one sample of this material was 9.4 percent.

Clayey Silt and Sand

Clayey silt and sand was encountered underlying the surficial sand for a thickness of 2.1 m in augerhole AH15-07, adjacent to Washroom #1. The clayey silt and sand was observed to contain trace to some gravel, and described as firm, with a water content above the plastic limit.

SPT "N" values between 5 and 7 blows per 300 mm (average 6) were recorded within this material.

Silty Clay

Silty clay was encountered underlying either the surficial sand or the clayey silt and sand for an observed maximum thickness of 2.5 to 15.2 m (maximum depth of investigation 16.3 m bgs). The silty clay was generally observed to contain trace sand and trace to no gravel. The material was described as grey, with a water content above the plastic limit. Based on shear vane testing, the material consistency was generally soft increasing to between stiff and very stiff with depth. The exception to this consistency description was adjacent to Washroom #4 in AH15-10, where below 7.6 m bgs the material was described as hard brown silty clay. The hard brown silty clay was encountered for a thickness of 1.7 m, prior to the augerhole being terminated due to refusal.

In the augerholes located near the entry kiosk, the upper 0.7 m of the silty clay was described as mottled orange brown in colour. This type of mottling is typically inferred to be the result of seasonally fluctuating groundwater levels and oxidation of shallow soils during periods when groundwater levels are low, such as during the summer and early fall.

SPT "N" values between 0 and 6 blows per 300 mm (average 2) were recorded within the silty clay material.

Field shear vane and laboratory index testing of this material is summarized in sections 4.3 and 4.4.

Inferred Cobbles, Boulders or Bedrock

Adjacent to Washroom #4 augerhole AH15-10 was terminated at 9.3 m bgs due to refusal of the drill. The refusal was encountered after 0.1 m of difficult drilling conditions. The refusal is inferred to indicate the presence of cobbles, boulders or bedrock.

4.1.4 Wickaninnish Beach

A replacement structure is currently proposed for one washroom building located at the Wickaninnish Beach parking lot. Two augerholes (AH15-13 and 14) were advanced adjacent to the existing building as shown in Figure 8.

For geotechnical analysis and discussion purposes, the subsurface soils encountered during the field investigation were grouped into the following stratigraphic units (in order of increasing depth below ground surface) based on observed physical properties and inferred geological origin:

- sand and gravel (inferred fill);
- loose sand;
- sand and gravel; and
- silty clay.

The physical characteristics of each of these materials are described in more detail in the following sections.

Sand and Gravel (Inferred Fill)

Sand and gravel was encountered in augerhole AH15-13 from surface to 0.8 m bgs. The material was described as brown, wet and compact. This material is inferred to represent fill, likely placed during construction of the existing building.

An SPT “N” value of 27 blows per 300 m was recorded within this material.

Loose Sand

Loose sand was encountered for a thickness of 4.3 to 6.0 m in both augerholes, either from surface or underlying the sand and gravel (inferred fill). Augerhole AH15-13 terminated within this material at 6.7 m bgs. The composition of the sand was generally described as containing trace to some gravel and trace to some fines. The material encountered was further described as brown, loose to compact, and wet. A 0.6 m thick layer of cobbles was inferred within this material below 0.8 m bgs in both augerholes.

SPT “N” values between 7 and 16 blows per 300 mm (average 11) were recorded within this material.

Sand and Gravel

Sand and gravel was encountered underlying the loose sand in augerhole AH15-14 for a thickness of 5.0 m. The material varied in composition from sand and gravel with trace fines, to a silty sand with some gravel. The material was described as brown, wet, and very loose to dense. A layer of cobbles was inferred based on the drill reaction at 5.5 m bgs.

SPT “N” values between 3 and 33 blows per 300 mm (average 17) were recorded within this material.

Silty Clay

Silty clay was encountered underlying the sand and gravel in augerhole AH15-14 for an observed thickness of 9.3 m (to the maximum depth of drilling of 17.8 m bgs). The material composition varied with depth, containing some sand and gravel at 8.5 m bgs, decreasing to trace sand and no gravel below 13.7 m bgs.

The material was described as grey, with a consistency that ranged from firm to very stiff, and with a water content above the plastic limit.

SPT “N” values between 7 and 28 blows per 300 mm (average 18) were recorded within this material.

Field shear vane and laboratory index testing of this material is summarized in sections 4.3 and 4.4.

4.2 Groundwater

Six standpipe piezometer monitoring wells were installed to monitor groundwater levels at the proposed building sites. The monitoring wells were generally installed in the shallower augerhole at each building location. After completion of a shallow augerhole, a 25 mm (1-inch) PVC pipe was installed in the augerhole and the remaining void was backfilled with sand, drill cuttings and a surface seal of bentonite. Typically the wells were screened between 3.0 and 4.5 m bgs. Detailed descriptions of the well locations, screen depths and backfilling are provided in the Record of Augerholes (Appendix C).

Water levels were measured in the monitoring wells using an electronic dip tape. The measurements were collected approximately one week, and again five weeks after well installation. The table below summarizes the groundwater level results.

Table 2: Monitoring Well Groundwater Levels

Location	Augerhole	Depth to Water Surface (m bgs)	
		15 December 2015	26 or 27 January 2016
Long Beach	AH15-04	0.80	0.73
	AH15-05	1.87	0.46
Green Point Campground	AH15-07	0.86	0.00
	AH15-09	1.50	0.63
	AH15-11	1.09	0.74
Wickaninnish Beach	AH15-13	monitoring well not yet installed at this time	2.17*

*Measured immediately following well installation.

A monitoring well was not installed at the Incinerator Rock site because practical refusal was encountered at relatively shallow depths (1.1 and 3.3 m bgs). The soils encountered in both of the Incinerator Rock augerholes were described as wet from surface, indicating that the groundwater level was near surface in this area.

4.3 Shear Vane Testing – Silty Clay

Field shear vane testing was carried out to estimate the in situ shear strength of the silty clay encountered at the Long Beach, Green Point Campground and Wickaninnish Beach sites. Upon encountering the silty clay, shear vane testing was carried out at intervals of 1.5 to 3 m, alternating with collecting undisturbed Shelby tube samples. The shear vane test was completed by inserting a double taper shear vane into the undisturbed material below the bottom of the augerhole. The vane was rotated until failure of the silty clay occurred, providing a measurement of the peak shear strength of the silty clay. After the peak shear strength was recorded, the vane was rotated multiple times to further disturb the silty clay, and then rotated slowly to measure the remoulded strength.

The measured peak and remoulded shear strengths as well as the calculated sensitivity of the silty clay are summarized in the table below.

Table 3: Shear Vane Testing Results of Silty Clay

Location	Augerhole	Vane Tip Depth (m bgs)	Peak Natural Shear Strength (kPa)	Remoulded Shear Strength (kPa)	Sensitivity
Long Beach	AH15-04	6.40	53	15	3.5
		7.92	46	23	2.0
		10.21	30	28	1.1
		13.26	27	25	1.1
		16.31	76	61	1.3
	AH15-06	5.64	91	43	2.1
		7.16	76	10	7.5
		10.21	63	25	2.5
		13.26	56	30	1.8
		16.31	111	46	2.4
Green Point Campground	AH15-08	4.11	56	25	2.2
		7.16	91	25	3.6
		10.21	51	25	2.0
		13.26	81	30	2.7
		16.31	96	46	2.1
	AH15-10	2.59	56	20	2.8
		5.94	101	61	1.7
		8.69	223	58	3.8
	AH15-12	2.38	193	132	1.5
		5.64	33	23	1.4
		8.69	91	Test not completed	Test not completed
		11.28	71	35	2.0
		14.78	66	46	1.4
		16.31	76	61	1.3
Wickaninnish Beach	AH15-14	14.8	122	41	3
		16.3	71	61	1
		17.8	122	91	1

4.4 Laboratory Testing

Geotechnical laboratory testing of the collected samples was carried out in Golder's materials testing laboratories in Victoria and Burnaby. Tests completed included the following:

- Particle-Size Analysis of Soils (ASTM D422);
- Determination of Water Content of Soil and Rock by Mass (ASTM D2216);

- Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318);
- One-Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435/D2435M; and
- Specific Gravity (ASTM D854).

Full detailed results of the testing are provided in Appendix D. Testing results of the silty clay material encountered at the Long Beach, Green Point Campground and Wickaninnish sites are summarized below.

The natural water contents of the silty clay samples are summarized in the table below.

Table 4: Natural Water Content of Silty Clay Samples

Location	Augerhole	Sample	Sample Depth (m bgs)	Natural Water Content (%)
Long Beach	AH15-04	SA 4	4.57 to 5.18	72.2
		SA 6A	7.42 to 7.47	44.6
		SA 7A	9.70 to 9.75	39.5
		SA 8A	12.75 to 12.80	34.0
	AH15-06	SA 5	4.57 to 5.18	67.3
		SA 6A	6.64 to 6.71	36.5
		SA 7A	9.69 to 9.75	53.8
		SA 8A	12.74 to 12.80	37.4
		SA 9	15.24 to 15.85	28.3
	Average			**39.2**
Green Point Campground	AH15-08	SA 2	0.76 to 1.37	38.3
		SA 4A	3.60 to 3.66	25.0
		SA 6A	9.69 to 9.75	22.0
		SA 7	12.19 to 12.80	24.6
		SA 8A	15.79 to 15.85	22.1
	AH15-10	SA 3A	2.07 to 2.13	40.9
		SA 4	4.57 to 5.18	19.0
		SA 5A	8.17 to 8.23	22.9
	AH15-12	SA 3	1.07 to 1.37	32.1
		SA 4A	2.07 to 2.13	28.4
		SA 5A	5.12 to 5.18	25.3
		SA 6A	8.17 to 8.23	24.1
		SA 7	10.21 to 10.82	22.1
		SA 8	13.72 to 14.33	23.2
		SA 9B	15.85 to 15.91	23.3
	Average			**26.2**

Location	Augerhole	Sample	Sample Depth (m bgs)	Natural Water Content (%)
Wickaninnish Beach	AH15-14	SA 5B	9.30 to 9.75	13.8
		SA 6	10.67 to 11.28	11.9
		SA 7	12.19 to 12.80	28.0
		SA 8A	13.72 to 13.78	24.0
		SA 9A	15.24 to 15.30	28.8
		SA 10A	16.76 to 16.83	34.3
	Average			**23.5**

The measured liquid and plastic limits as well as the calculated plasticity and liquidity indices of the silty clay are summarized in the table below.

Table 5: Atterberg Limit Test Results of Silty Clay Samples

Location	Augerhole	Sample	Sample Depth (m bgs)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index
Long Beach	AH15-04	SA 7A	9.70 to 9.75	53	20	33	0.6
	AH15-04	SA 8A	12.75 to 12.80	48	20	28	0.5
	AH15-06	SA 7A	9.69 to 9.75	54	20	34	1.0
	AH15-06	SA 8A	12.74 to 12.80	54	19	35	0.5
	Average			**52**	**20**	**33**	**0.7**
Green Point Campground	AH15-08	SA 6A	9.69 to 9.75	33	17	16	0.3
		SA 8A	15.79 to 15.85	34	16	18	0.3
	AH15-10	SA 4	4.57 to 5.18	22	14	8	0.6
	AH15-12	SA 4A	2.07 to 2.13	43	21	22	0.3
		SA 5A	5.12 to 5.18	32	16	16	0.6
		SA 6A	8.17 to 8.23	34	16	18	0.4
	Average			**33**	**17**	**16**	**0.4**
Wickaninnish Beach	AH15-14	SA 6	10.67 to 11.28	18	14	4.0	-0.5
		SA 9A	15.24 to 15.30	41	17	24.0	0.5
		SA 10A	15.30 to 15.80	41	19	22.0	0.7
	Average			**33**	**17**	**17**	**0.2**

The specific gravity of samples of the silty clay was measured and is summarized in the table below.

Table 6: Specific Gravity Test Results of Silty Clay Samples

Location	Augerhole	Sample	Sample Depth (m bgs)	Specific Gravity
Long Beach	AH15-04	SA 7	9.1 – 9.7	2.72
		SA 8	12.2 – 12.7	2.70
	AH15-06	SA 7	9.1 – 9.7	2.73
		SA 8	12.2 – 12.7	2.70
	Average			**2.71**
Green Point Campground	AH15-08	SA 6	9.1 – 9.7	2.72
		SA 8	15.2 – 15.8	2.72
	AH15-12	SA 4	1.5 – 2.1	2.66
		SA 6	7.6 – 8.2	2.71
	Average			**2.70**
Wickaninnish Beach	AH15-14	SA 9	15.3 – 15.8	2.69
		SA 10	16.8 – 17.3	2.72
	Average			**5.4**

Consolidation tests were conducted in general conformance with Method B of ASTM D 2435 on undisturbed Shelby tube samples of the silty clay material. Consolidation test results produce graphs of void ratio (e_o) versus applied load (σ') at the natural water content of the sample. The consolidation testing results are provided in Appendix D. Variables of pre-consolidation pressure (σ'_p), compression index (C_c), and recompression index (C_r) can be determined from the graphs and test data. The average coefficient of consolidation (c_v), and the calculated coefficient of volume compressibility (m_v) for each test is also provided. These variables contribute to the estimation of possible settlement at depth due to increased surface loads. The table below provides the estimated consolidation parameters for the four samples tested.

Table 7: Consolidation Test Results of Silty Clay Samples

Location	Augerhole	Sample	Sample Depth (m bgs)	σ'_p (kPa)	Overconsolidation Ratio (OCR)	C_c	C_r	Average c_v (cm^2/s)	m_v (m^2/MN)
Long Beach	AH15-04	SA 7	9.14 - 9.69	77	2.85	0.32	0.08	0.0058	0.110
		SA 8	12.19 - 12.74	109	2.74	0.29	0.07	0.0017	0.090
	AH15-06	SA 7	9.14 - 9.69	70	2.97	0.47	0.09	0.0075	0.144
		SA 8	12.19 - 12.74	100	2.62	0.44	0.07	0.0046	0.124
Green Point Campground	AH15-08	SA 6	9.14 - 9.69	95	2.52	0.18	0.05	0.0040	0.077
		SA 8	15.24 - 15.79	160	1.72	0.17	0.04	0.0021	0.070
	AH15-12	SA 4	1.52 - 2.07	17	5.9	0.16	0.05	0.0039	0.063
		SA 6	7.62 - 8.17	76	1.80	0.17	0.03	0.0028	0.081
Wickaninnish Beach	AH15-14	SA 9	15.30 - 15.79	192	1.22	0.10	0.04	0.0043	0.052
		SA 10	16.82 - 17.31	191	1.23	0.20	0.06	0.0040	0.060

5.0 GEOTECHNICAL ASSESSMENT

This section of the report addresses the geotechnical design aspects of the project based on our interpretation of the geotechnical investigation results and project requirements. The information in this portion of the report is provided solely as input to the project designers and is intended for this project only.

5.1 Stripping

Site preparation of the sites should include removal of existing building footings and associated structures, fill, surficial topsoil, organics, and other geotechnically unsuitable materials from within the proposed development area. Based on the results of the field investigation, the depth of stripping of the sites is anticipated to be up to 1.5 m bgs. Local areas not investigated at each of the sites may be underlain by thicker deposits of fill or other unsuitable materials.

Site preparation and foundation construction should be carried out during dry weather conditions to avoid wetting and softening the underlying silty clay.

It is recommended that the exposed subgrade be inspected by experienced geotechnical personnel prior to placement of grade fill. The exposed subgrade is anticipated to comprise natural deposits and caution will be required to avoid disturbance and softening of those undisturbed natural deposits when exposed to wet weather, construction traffic and fill placement operation. Where soft or disturbed soils are encountered following stripping, these materials should be sub-excavated and replaced with well-compacted fill, subject to the review and approval of a qualified geotechnical engineer.

5.2 Structural Fill

Structural fill required to establish foundation subgrade elevations should generally consist of granular base course comprising well-graded, 25 mm minus crushed gravel meeting the specifications for Granular Base in Section 31 05 17 of the Master Municipal Construction Documents (MMCD) Specifications.

Structural fill should be placed in horizontal lifts not exceeding 300 mm in loose lift thickness. Each lift should be uniformly compacted to at least 95 percent of the modified Proctor maximum dry density (ASTM D1556 MPMDD). Moisture conditioning, such as wetting or drying, may be required to achieve the specified compaction. Field density testing to verify the compaction achieved and visual review of structural fill placement by the geotechnical engineer are required where structural fill is placed below important or permanent structures.

Based on the conditions encountered at Incinerator Rock, Wickaninnish Beach and Long Beach, it is recommended that a minimum thickness of 600 mm of structural fill be placed under the proposed footings. It is anticipated that the first lift of this fill will be placed over loose, wet sand. This lift should be compacted using static compaction methods to avoid inducing liquefaction of the underlying sands. For the Green Point site, a single 150 mm lift of structural fill is recommended; vibratory compaction of the first lift of fill is considered suitable for this site.

The calculated modulus of subgrade reaction for the structural fill placed over the subgrade is provided in the table below. It is important to note, however, that the modulus of subgrade reaction is not a fundamental soil property. In addition to the deformation characteristics of the subgrade, it is dependent on the geometry and stiffness of the structural member in contact with the subgrade material. The value provided represents a typical value for the soil type expected at foundation level, and does not consider the contribution of the stiffness of the foundation elements.

Table 8: Modulus of Subgrade Reaction

Location	Anticipated Soil	Modulus of Subgrade Reaction (MPa/m)
Incinerator Rock	Loose Sand	25
Long Beach		
Wickaninnish Beach		
Green Point Campground	Silty Clay	0.8

5.3 Bearing Capacity

As indicated above, all of the sites will require foundations to be constructed over structural fill. Assuming that the recommendations given in section 5.2 for structural fill to be placed on site are followed, the bearing resistances provided in the table below are recommended.

Table 9: Recommended Bearing Resistances

Location	Assumed Foundation Type	Anticipated Soil Types	Bearing Resistance (kPa)	
			Serviceability Limited States (SLS)	Ultimate Limit States (ULS)*
Incinerator Rock	Strip footing width 0.6 m or pad footing 0.75 m x 0.75 m, at depth of 0.5 m	Loose Sand	100	150
Long Beach				
Wickaninnish				
Green Point Campground	Cellular Raft Foundation at 1.2 m depth	Silty Clay	40	100

*Based on an ultimate bearing resistance modification factor of 0.5.

5.4 Excavations

Excavations should be developed with side slopes of 2H:1V or less. If excavating below the groundwater table or where considerable seepage is encountered, reduced side slope angles may be required, and the excavations should be assessed by a qualified geotechnical engineer. Steeper excavation side slopes may be possible, but should be assessed by a qualified geotechnical engineer.

The excavations should be backfilled using structural fill as outlined in section 5.2. Structural fill placed adjacent to slopes should be keyed into the existing slope in a series of steps approximately 300 mm high and penetrating 500 mm into the slope to reduce the risk of soft or loose zones at the interface of the existing soil slope to structural fill.

5.5 Site Drainage

Shallow groundwater should be anticipated at the seven sites. During construction, provisions should be made to intercept and direct surface and groundwater away from the sites. Depending on the magnitude and extent of the shallow groundwater, it may be desirable or necessary to incorporate interceptor ditches and drainage systems as part of the permanent drainage control measures. Temporary and permanent cut slopes and structural fill should be shaped and graded to direct water away from exposed subgrades, buildings, infrastructure and other areas that may be sensitive to softening upon wetting or that could be damaged by flooding.

Shallow groundwater (less than 1 m bgs) was observed in piezometers installed at the Long Beach, Green Point Campground and Wickaninnish sites. Piezometers were not installed at Incinerator Rock; however, the soil was described as wet, indicating shallow groundwater. The groundwater level at the Wickaninnish site was measured as approximately 2 m bgs immediately after piezometer installation; however this level may have since risen as it is possible that the groundwater level in the area had not yet stabilized at the time of the reading.

It is Golder's understanding that the existing wastewater holding tanks at the Incinerator Rock and Long Beach sites will be removed and will not be reused for the new buildings. If the holding tanks are empty when the existing building is removed, the shallow groundwater at the sites may cause the tanks to uplift due to buoyancy. Prior to removing the existing building, consideration should be given to filling the tanks with water to prevent uplift.

The Incinerator Rock, Long Beach and Wickaninnish sites are located at approximately 5 metres above sea level (m asl). Given the near sea level elevations in this area, there is a potential for sea level rise to affect these structures in the future.

5.6 Structure Drainage

It is recommended that an effective subsurface drain system be installed in the vicinity of all proposed building foundations to control groundwater levels at the perimeters of the buildings. The perimeter drain systems should convey groundwater to a suitable storm water management system. The perimeter drain system should consist of suitable rigid perforated PVC pipes surrounded by drain rock, with a geotextile filter fabric surround such as Mirafi P-150 or equivalent. The granular base course materials underlying building slabs should have an effective hydraulic connection to the perimeter drain system.

5.7 Frost Protection

The estimated frost penetration depth for the Tofino area is approximately 500 mm, based on a design freezing index of 162 degree-days Celsius. It is generally recommended that the exterior perimeter footings be founded below this depth unless other frost protection measures (insulation for example) are provided.

5.8 Settlement Assessment and Mitigation Considerations

Golder carried out a preliminary settlement analysis based on loading and foundation information provided by CWMM for the seven proposed structures. The analyses were carried out using the commercially available settlement analysis program Settle3D (Version 3.0 by Rocscience). A numerical model was developed to simulate the one-dimensional settlements resulting from the consolidation of the compressible fine-grained soils (silty clay) when subjected to building loads. The analyses were carried out using the Boussinesq method. The parameters were determined based on the subsurface stratigraphy and on the laboratory one dimensional consolidation testing. The results presented below are preliminary and may be refined after further review and collaboration with the project structural engineers.

The settlement analysis models were created based on drawings provided by CWMM ("*Pacific Rim National Park Washroom Buildings & Entry Kiosk Replacement, A-01 to A-07"* dated 20 January 2016. The drawings were sent to Golder (Sarah Morse) via email from CWMM (Louis Lam) on 10 February 2016.

The following assumptions were made in creating the models:

- The existing washroom buildings have been in place for 20 years and no pre-loading effort was carried out prior to construction of the existing buildings. The existing washrooms were built using a slab foundation applying a uniform pressure of 30 kPa.
- There will be a minimum period of six months between demolition of the existing building and construction of the new building.
- The groundwater table is located 0.5 m bgs.
- The foundation depth for strip and pad footings will be 0.5 m bgs.
- The raft foundations below the structures will apply a uniform un-factored dead load pressure of 18.5 kPa, at a depth of 1.2 m bgs.

5.8.1 Incinerator Rock

At Incinerator Rock, bedrock was encountered at depths of 1.1 and 3.3 m bgs in the two augerholes, therefore, settlement within this area should be within tolerable limits (less than 25 mm of total settlement).

5.8.2 Long Beach

Based on the subsurface investigation and proposed building plans, one model was developed for both the north and south washrooms at the Long Beach parking lot. The specific parameters used for the site are provided in the table below.

Table 10: Soil Parameters Used in Settlement Analysis (Long Beach)

Soil Type	Thickness (m)	Saturated Unit Weight (kN/m³)	Compression Index (Cc)	Recompression Index (Cr)	Initial Void Ratio e_o	OCR	Coefficient of Consolidation (m²/year)
Silty Sand	4.7	22	Not applicable				
Clay	55	18	0.47	0.09	1.07	2.6	15.52

Based on the above parameters and assumptions, our settlement analyses indicated a maximum total settlement in the order of 20 mm with an anticipated differential settlement ratio of 0.0013 (approximately 0.6/500). These settlements are within the tolerances provided of less than 25 mm of total settlement and differential settlement of less than 1/500.

5.8.3 Green Point Campground

For the Green Point Campground, a separate analysis was carried out for each of the three proposed structures (Entry Kiosk, Washroom #1, and Washroom #4). The soil parameters used in the settlement analyses for the Green Point Campground are provided in the table below.

Table 11: Soil parameters used in settlement analysis (Green Point Campground)

Proposed Structure	Soil Type	Thickness (m)	Saturated Unit Weight (kN/m³)	Compression Index (Cc)	Recompression Index (Cr)	Initial Void Ratio e_o	OCR	Coefficient of Consolidation (m²/year)
Entry Kiosk	Sand	0.7	22	Not applicable				
Washroom #1		0.6						
Washroom #4		0.7						
All Green Point Structures	Silty Clay	55	18	0.18	0.05	0.69	2.0	10.11

Based on the above parameters and assumptions, the settlement analyses indicated a maximum total settlement in the order of 30 mm with an anticipated differential settlement ratio of up to 0.003 (approximately 1.5/500) for the two washroom sites. The estimated maximum total settlements at the entry kiosk site are in the order of 20 mm with an anticipated differential settlement ratio of 0.0018 (0.8/500). The estimated total settlements are within the tolerance of 40 mm provided for the proposed cellular raft structures.

5.8.4 Wickaninnish Beach

The subsurface soils encountered during the Wickaninnish Beach investigation comprised approximately 9 m of sand and gravel overlying the silty clay. Based on the proposed loads, settlement within this area should be within reported tolerable limits (less than 25 mm of total settlement and less than 1/500 of differential settlement).

5.9 Seismic Design Considerations

A site-specific seismic hazard calculation was obtained from Natural Resources Canada (NRC) in accordance with the fourth generation seismic hazard maps of Canada, and based on the location of the Site relative to inferred seismic sources and attenuation relationships (see Appendix E). The peak horizontal ground acceleration (PHGA) and the 5% damped spectral response acceleration (Sa) values at periods (T) of 0.2, 0.5, 1.0, and 2.0 seconds corresponding to the seismic event with a 2% probability of exceedance in 50 years (1 in 2,475 year event) are provided in the table below. These accelerations are applicable to "firm-ground" sites classified as Site Class C according to the 2010 National Building Code of Canada (NBCC) and the 2012 BC Building Code (BCBC).

Table 12: Peak Ground Accelerations and Spectral Accelerations for 1-2475-Year Earthquake (Site Class C).

PGA	Sa(0.2s)	Sa(0.5s)	Sa(1.0s)	Sa(2.0s)
0.52 g	1.20 g	0.94 g	0.47 g	0.21 g

Note: In Table 1, PGA refers to peak ground acceleration; Sa refers to spectral acceleration for a given period.

5.9.1 Liquefaction Potential

Based on the observations and data collected during the site investigation in combination with the design earthquake loading for the area, the saturated sand materials encountered near surface at the Long Beach, Incinerator Rock, and Wickaninnish Beach sites are anticipated to be subject to liquefaction under the design earthquake loads. As well, the deeper, clayey materials at the Green Point site are considered to have a moderate susceptibility to liquefaction or cyclic mobility.

The currently available augerhole data is not sufficient to carry out detailed site specific ground response analyses, which would be necessary to provide estimates of potential vertical and horizontal displacements associated with the design earthquake. If this information is required, electric cone penetrometer testing (CPTU) should be carried out at each site to provide detailed soil profile characterization.

5.9.2 Site Specific Foundation Factors

Based on the potential for liquefaction or cyclic mobility under seismic load, all of the sites are designated as Site Class F, per the 2012 BC Building Code (BCBC). Determination of site coefficients F_a and F_v for Site Class F requires site-specific ground response analyses to be carried out. However, the building code also indicates that if a structure has a fundamental period of vibration less than 0.5 seconds, values of F_a and F_v may be determined as described in tables 4.1.8.4.A, 4.1.8.4.B and 4.1.8.4.C, assuming that the soils are not liquefiable. Based on the understanding that the proposed structures have a fundamental period less than 0.5 seconds, the sites have been classified in the table below according to Table 4.1.8.4A of the BCBC. The corresponding site-specific short-period and long-period foundation factors (F_a and F_v, respectively) for each site are provided in the Table below.

Table 13: Site Specific Foundation Factors

Location	2012 BCBC Site Class	F_a	F_v
Incinerator Rock	B – Rock	1.0	0.8
Long Beach	E – Soft Soil	0.9	1.7
Green Point Campground	E – Soft Soil	0.9	1.7
Wickaninnish Beach	D – Stiff Soil	1.1	1.1

The values of F_a and F_v provided conform to Tables 4.1.8.4B and 4.1.8.4C of 2012 BCBC, using linear interpolation for the intermediate values of S_a (0.2) and S_a (1.0).

5.9.3 Tsunami Impact

The seven sites are within a tsunami hazard zone. Assessment of the potential impacts of a tsunami and identification of potential mitigation measures are outside the scope of this work, but can be provided, if requested.

5.10 Lateral Earth Pressure

Lateral earth pressures are based on the soil type, compaction, the type of wall, the inclination of the wall, groundwater levels and surface loading. A preliminary active earth pressure coefficient (K_a) is provided for a shallow basement design. If a deeper basement (deeper than 1.5 m bgs) or a retaining wall structure is required, an additional detailed assessment of the specific area should be carried.

Table 14: Lateral Earth Pressure

Location	Active Earth Pressure
Incinerator Rock	K_a = 0.38
Long Beach	
Wickaninnish	
Green Point Campground	K_a = 0.42

6.0 CLOSURE

We trust that the contents of this report meet your requirements. Should you have questions or require clarification of the contents of this report, please do not hesitate to contact the undersigned.

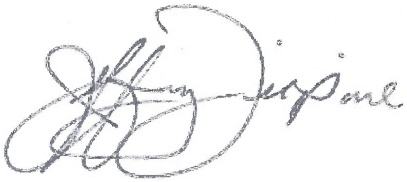
Yours very truly,

GOLDER ASSOCIATES LTD.

Angeleen Ramey, EIT
Junior Geotechnical Engineer

Sarah Morse, PEng, PMP
Senior Geotechnical Engineer

Reviewed by:



Jeff Fillipone, PhD, PGeo
Principal, Senior Geologist

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

n:\final\2013\1447\13-1447-0497 pwgsc wood creek quarry\1314470497-021-r-rev0-7000\1314470497-021-r-rev0-7000-geotechnical investigation-10jun_16.docx

LEGEND

PROJECT LOCATION

REFERENCE

TOPOGRAPHIC MAP 92F/4 © 2000 HER MAJESTY THE QUEEN IN RIGHT OF CANADA. DEPARTMENT OF NATURAL RESOURCES. ALL RIGHTS RESERVED. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD83, COORDINATE SYSTEM: UTM ZONE 10.

0 1,000 2,000

1:60,000 (APPROXIMATE) METRES

CLIENT
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

PROJECT
GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

TITLE
KEY PLAN

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	1

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\pmp_tofino\99_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-01.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 25 mm

LEGEND

EXISTING BUILDING FOOTPRINT

APPROXIMATE AUGER HOLE LOCATION

REFERENCE

BASE IMAGE OBTAINED FROM BING MAPS AERIAL. © 2015 DIGITALGLOBE IMAGE COURTESY OF USGS © 2015 GEOEYE © PROVINCE OF BRITISH COLUMBIA EARTHSTAR GEOGRAPHICS SIO © 2015 MICROSOFT CORPORATION. IMAGE IS NOT TO SCALE.

BUILDING FOOTPRINT OBTAINED FROM CHERNOFF THOMPSON ARCHITECTS ON SEPTEMBER 25, 2015. DRAWING FILE: 31283_Base to Architect.dwg.

0 10 20

1:500 METRES

NOTE

1. BUILDING LOCATIONS ARE APPROXIMATE ONLY.

CLIENT

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

PROJECT

GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

TITLE

SITE 1 - INCINERATOR ROCK WASHROOM INVESTIGATION AUGERHOLE LOCATIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

25 mm

0

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\prmp_tofino\99_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-S1.dwg

LEGEND

EXISTING BUILDING FOOTPRINT

APPROXIMATE AUGER HOLE LOCATION

REFERENCE

BASE IMAGE OBTAINED FROM BING MAPS AERIAL. © 2015 DIGITALGLOBE IMAGE COURTESY OF USGS © 2015 GEOEYE © PROVINCE OF BRITISH COLUMBIA EARTHSTAR GEOGRAPHICS SIO © 2015 MICROSOFT CORPORATION. IMAGE IS NOT TO SCALE.

BUILDING FOOTPRINT OBTAINED FROM CHERNOFF THOMPSON ARCHITECTS ON SEPTEMBER 25, 2015. DRAWING FILE: 31283_Base to Architect.dwg.

0 10 20

1:500 METRES

NOTE

1. BUILDING LOCATIONS ARE APPROXIMATE ONLY.

CLIENT

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

PROJECT

GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

TITLE

SITE 2 - LONG BEACH NORTH PARKING LOT WASHROOM INVESTIGATION AUGERHOLE LOCATIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	3

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\prnp_tofino\99_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-S2.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 25 mm

LEGEND

EXISTING BUILDING FOOTPRINT

APPROXIMATE AUGER HOLE LOCATION

REFERENCE

BASE IMAGE OBTAINED FROM BING MAPS AERIAL. © 2015 DIGITALGLOBE IMAGE COURTESY OF USGS © 2015 GEOEYE © PROVINCE OF BRITISH COLUMBIA EARTHSTAR GEOGRAPHICS SIO © 2015 MICROSOFT CORPORATION. IMAGE IS NOT TO SCALE.

BUILDING FOOTPRINT OBTAINED FROM CHERNOFF THOMPSON ARCHITECTS ON SEPTEMBER 25, 2015. DRAWING FILE: 31283_Base to Architect.dwg.

0 10 20

1:500 METRES

NOTE

1. BUILDING LOCATIONS ARE APPROXIMATE ONLY.

CLIENT

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

PROJECT

GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

TITLE

SITE 3 - LONG BEACH SOUTH PARKING LOT WASHROOM INVESTIGATION AUGERHOLE LOCATIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	4

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\pmp_tofino\09_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-S3.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 25 mm

LEGEND

EXISTING BUILDING FOOTPRINT

APPROXIMATE AUGER HOLE LOCATION

REFERENCE

BASE IMAGE OBTAINED FROM BING MAPS AERIAL. © 2015 DIGITALGLOBE IMAGE COURTESY OF USGS © 2015 GEOEYE © PROVINCE OF BRITISH COLUMBIA EARTHSTAR GEOGRAPHICS SIO © 2015 MICROSOFT CORPORATION. IMAGE IS NOT TO SCALE.

BUILDING FOOTPRINT OBTAINED FROM CHERNOFF THOMPSON ARCHITECTS ON SEPTEMBER 25, 2015. DRAWING FILE: 31283_Base to Architect.dwg.

0 10 20

1:500 METRES

NOTE

1. BUILDING LOCATIONS ARE APPROXIMATE ONLY.

CLIENT

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

PROJECT

GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

TITLE

SITE 4 - GREEN POINT CAMPGROUND NORTH WASHROOM (#1) INVESTIGATION AUGERHOLE LOCATIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	5

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\prmp_tofino\99_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-S4.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 25 mm

LEGEND

EXISTING BUILDING FOOTPRINT

APPROXIMATE AUGER HOLE LOCATION

REFERENCE

BASE IMAGE OBTAINED FROM BING MAPS AERIAL. © 2015 DIGITALGLOBE IMAGE COURTESY OF USGS © 2015 GEOEYE © PROVINCE OF BRITISH COLUMBIA EARTHSTAR GEOGRAPHICS SIO © 2015 MICROSOFT CORPORATION. IMAGE IS NOT TO SCALE.

BUILDING FOOTPRINT OBTAINED FROM CHERNOFF THOMPSON ARCHITECTS ON SEPTEMBER 25, 2015. DRAWING FILE: 31283_Base to Architect.dwg.

0 10 20

1:500 METRES

NOTE

1. BUILDING LOCATIONS ARE APPROXIMATE ONLY.

CLIENT

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

PROJECT

GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

TITLE

SITE 5 - GREEN POINT CAMPGROUND SOUTH WASHROOM (#4) INVESTIGATION AUGERHOLE LOCATIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	6

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\pmp_tofino\09_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-S5.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 25 mm

LEGEND

EXISTING BUILDING FOOTPRINT

APPROXIMATE AUGER HOLE LOCATION

REFERENCE

BASE IMAGE OBTAINED FROM BING MAPS AERIAL. © 2015 DIGITALGLOBE IMAGE COURTESY OF USGS © 2015 GEOEYE © PROVINCE OF BRITISH COLUMBIA EARTHSTAR GEOGRAPHICS SIO © 2015 MICROSOFT CORPORATION. IMAGE IS NOT TO SCALE.

BUILDING FOOTPRINT OBTAINED FROM CHERNOFF THOMPSON ARCHITECTS ON SEPTEMBER 25, 2015. DRAWING FILE: 31283_Base to Architect.dwg.

0 10 20

1:500 METRES

NOTE

1. BUILDING LOCATIONS ARE APPROXIMATE ONLY.

CLIENT

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

PROJECT

GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

TITLE

SITE 6 - GREEN POINT CAMPGROUND KIOSK INVESTIGATION AUGERHOLE LOCATIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	7

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\prnp_tofino\99_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-S6.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 25 mm

LEGEND

EXISTING BUILDING FOOTPRINT

APPROXIMATE AUGER HOLE LOCATION

REFERENCE

BASE IMAGE OBTAINED FROM BING MAPS AERIAL. © 2015 DIGITALGLOBE IMAGE COURTESY OF USGS © 2015 GEOEYE © PROVINCE OF BRITISH COLUMBIA EARTHSTAR GEOGRAPHICS SIO © 2015 MICROSOFT CORPORATION. IMAGE IS NOT TO SCALE.

BUILDING FOOTPRINT OBTAINED FROM CHERNOFF THOMPSON ARCHITECTS ON SEPTEMBER 25, 2015. DRAWING FILE: 35030-sk01-site_plan.dwg.

0 10 20

1:500 METRES

NOTE

1. BUILDING LOCATIONS ARE APPROXIMATE ONLY.

CLIENT

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

PROJECT

GEOTECHNICAL SITE INVESTIGATION
PACIFIC RIM NATIONAL PARK
TOFINO, B.C.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-09
DESIGNED	S. MORSE
PREPARED	R. WIGGINS
REVIEWED	S. MORSE
APPROVED	J. FILLIPONE

TITLE

SITE 7 - WICKANINNISH BEACH WASHROOM INVESTIGATION AUGERHOLE LOCATIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
13-1447-0497	7000/7001	0	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

0 25 mm

Path: \\golder.gds\gal\Victoria\CAD-GIS\Client\PWGSC\prmp_tofino\99_projects\13-1447-0497_geotechnical_site_investigation\02_PRODUCTION\Phase 7000\Task 7001\DWG\ | File Name: 13-1447-0497-7000-7001-GSI-S7.dwg

APPENDIX A

Important Information and Limitations of This Report

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

APPENDIX B

Photographic Summary

Photograph 1: Existing washroom location at the Incinerator Rock parking lot

Photograph 2: Existing washroom at the Long Beach north parking lot

Photograph 3: Existing washroom at the Long Beach south parking lot

Photograph 4: Existing Washroom #1 at Green Point Campground, located in the north portion of the campground

Photograph 5: Existing Washroom #4 at Green Point Campground, located in the south portion of the campground

Photograph 6: Entry Kiosk at Green Point Campground

Photograph 7: Existing washroom at the Wickaninnish Beach parking lot

Photograph 8: Example of sand with silt and gravel material in a split spoon from AH15-01 at the Incinerator Rock washroom

Photograph 9: Example of compact to dense sand with silt and gravel material in a split spoon from AH15-03 at the Long Beach north washroom

Photograph 10: Example of compact to dense sand with silt and gravel material in a split spoon from AH15-04 at the Long Beach north washroom

Photograph 11: Example of silty clay material in a split spoon from AH15-06 at the Long Beach south washroom

Photograph 12: Example of surficial sand material in a split spoon from AH15-07 at Washroom #1 located in the north portion of Green Point Campground

Photograph 13: Example of surficial sand material in a split spoon from AH15-12 at the entry kiosk of Green Point Campground

Photograph 14: Example of surficial sand material in split spoon from AH15-08 at Washroom #1 located in the north portion of Green Point Campground

Photograph 15: Example of clayey silt and sand material in a split spoon from AH15-10 at Washroom #4 located in the south portion of Green Point Campground

Photograph 16: Example of silty clay material in a split spoon from AH15-09 at Washroom #4 located in the south portion of Green Point Campground

APPENDIX C

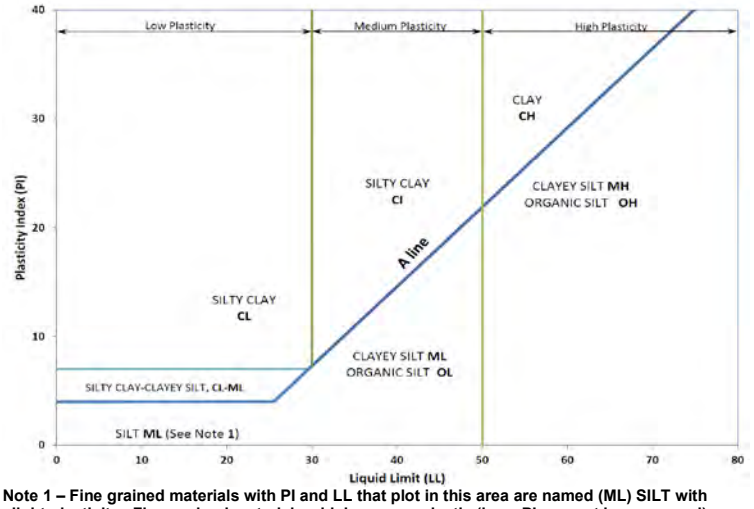
Record of Augerholes

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil		Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
					Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)		Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
					Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
					Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
				Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
					None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)		Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% (see Note 2)	CL	SILTY CLAY
				Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
				Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures								30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat								75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to ~~or~~ indicate~~s~~ a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL, SAND and CLAY)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.).

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
FS	Foil sample
GS	Grab Sample
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size
TP	Thin-walled, piston – note size
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 - 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects.
2. Definition of compactness descriptions based on SPT 'N' ranges from Terzaghi and Peck (1967) and correspond to typical average N_{60} values.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
σ_1, σ_2, σ_3	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c′	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-01

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Incinerator Rock Washroom
N: ~5439200 E: ~297887
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 8, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface							
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm.)	**(SM)** SILTY SAND, trace to some gravel; brown; non-cohesive, wet, loose to compact.		0.00	1	SS	38	3	
1					2	SS	42	13	
2		**(SP-SM)** SAND, trace fines, trace gravel; brown, with shell fragments; non-cohesive, wet, compact.		1.37	3	SS	75	15	Cuttings
		(SP) SAND, trace silt, trace gravel; grey; non-cohesive, wet, loose to compact.		2.29	4	SS	42	4	
3		**(SP-SM)** gravelly SAND, some silt; grey; non-cohesive, wet, dense.		2.90	5	SS	80	>42	
		End of Augerhole. (Refusal)		3.28					
4									
5									
6									
7									
8									
9									
10									

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■ (40 80 120 160)

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl (10 20 30 40) NP - Non-Plastic

ADDITIONAL LAB. TESTING

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-02

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Incinerator Rock Washroom
N: ~5439191 E: ~297881
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 9, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY %	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ●; rem V. ⊕ U - ○; Pocket Pen - ■) (40 80 120 160)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface												
0	Track Mounted Auger Drill (Casing:203 mm;)	**(SM)** gravelly SILTY SAND; brown; non-cohesive, wet, compact to very dense.		0.00	1	SS	67	19						Cuttings
1					2	SS	0	>63						
	Hollow Stem Auger	End of Augerhole. (Refusal)		1.07										
2														
3														
4														
5														
6														
7														
8														
9														
10														

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-03

SHEET 1 OF 1

DATUM: Local Project Datum

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Long Beach North Parking Lot Washroom
N: ~5439114 E: ~298478
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 9, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○, Pocket Pen - ■) (40 80 120 160)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp, W, Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(SM/GM)** gravelly SILTY SAND to SILTY SAND and GRAVEL; brown; non-cohesive, wet, loose.		0.00	1	SS	42	8				Cuttings
		(SP) SAND, trace fines; grey-brown; non-cohesive, wet, loose to compact.		0.69	2	SS	67	10				Bentonite
1												
					3	SS	58	20				
2												Cuttings
					4A	SS	50	16				
3					4B							
		(SM) gravelly SILTY SAND; grey; non-cohesive, wet, compact.		3.51								
4												Bentonite
		(Cl) SILTY CLAY, trace sand, trace gravel; grey; cohesive, w>PL, soft.		4.42	5	SS	33	4				
5												
		(Cl) SILTY CLAY, trace sand; grey; cohesive, w>PL, very soft.		5.33								Cuttings
6					6	SS	79	1				
		End of Augerhole.		6.71								
7												
8												
9												
10												

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-04

SHEET 1 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Long Beach North Parking Lot Washroom
N: ~5439093 E: ~298472
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 10, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■) (40 80 120 160)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(SM)** SILTY SAND, some gravel; brown, with organics; non-cohesive, wet, very loose.		0.00								Concrete and Road Base
				0.30	1	SS	63	4				Bentonite
		(SM) SILTY SAND, trace gravel; brown; non-cohesive, wet, very loose.										
1		**(SP-SM)** SAND, some silt to silty; grey; non-cohesive, moist, compact.		0.91								
					2	SS	75	17				Cuttings
2												
		(SM) SILTY SAND, some gravel; grey; non-cohesive, wet, compact.		2.74								Sand
3					3A	SS	54	24				
		(GM) sandy SILTY GRAVEL; grey; non-cohesive, wet, compact to dense.		3.51	3B							Slotted PVC Pipe
4												
		(CH-CI) CLAY to SILTY CLAY, trace sand; grey; cohesive, w>PL, very soft to firm.		4.27								
					4	SS	58	2		72		
5												
					5	TO	100		⊕ +			
6												
					6	TO	100			○		Bentonite and Cuttings
7					6A							
									⊕ +			
8												
9					7	TO	100				GS C	
					7A					53		
10		*CONTINUED NEXT PAGE*										

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-04

SHEET 2 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Long Beach North Parking Lot Washroom
N: ~5439093 E: ~298472
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 10, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY %	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
10	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(CH-CI)** CLAY to SILTY CLAY, trace sand; grey; cohesive, w>PL, very soft to firm. *(continued)*										
11												
12					8	TO	100				GS C	
13					8A							Bentonite and Cuttings
14												
15												
16		- firm to stiff below 16.0 m depth			9	SS	100	WH				
		End of Augerhole.		16.31								
17												
18												
19												
20												

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-05

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Long Beach South Parking Lot Washroom
N: ~5439005 E: ~298689
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 10, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■) (40 80 120 160)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(SM)** SILTY SAND, trace gravel; brown, with organics; non-cohesive, wet, compact.		0.00		SS	67	21				Concrete and Road Base
		(SP-SM) SAND, some silt to silty, trace to some gravel; grey-brown; non-cohesive, wet, compact. - soil becomes very loose at 0.76 m depth		0.30	2	SS	29	1				Bentonite
1												
		(SM) SILTY SAND; grey; non-cohesive, wet, compact.		1.37	3	SS	50	15				Cuttings
2												
		(SM) SILTY SAND, some gravel; grey; non-cohesive, wet, compact.		2.74	4	SS	42	14				Sand
3												
												Slotted PVC Pipe
4												
		(CI) SILTY CLAY, trace sand; grey; cohesive, w>PL, very soft.		4.72	5	SS	71	1				
5												
		End of Augerhole.		5.18								
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-06

SHEET 1 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Long Beach South Parking Lot Washroom
N: ~5439000 E: ~298680
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 11, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■) (40 80 120 160)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(SM)** SILTY SAND, some gravel; brown, with organics; non-cohesive, wet, very loose.		0.00	1	SS	17	WH				Bentonite
		(SP-SM) SAND, some silt to silty; brown; non-cohesive, wet, compact.		0.61	2	SS	83	12				
1												
					3	SS	71	16				
2		- transitioning to grey at 1.83 m depth										
		(SP-SM) SAND, some silt to silty, some gravel; grey; non-cohesive, wet, compact.		2.44								Cuttings
3												
					4	SS	42	24				
4												
		(CH) CLAY, trace sand; grey; cohesive, w>PL, very soft.		4.42								
					5	SS	71	1		67		Bentonite
5									⊕ +			
6					6	TO	100			○		
					6A							
7									⊕ +			Cuttings
8												
9					7	TO	100				GS	
					7A					54 ⊕	C	
10		*CONTINUED NEXT PAGE*										

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-06

SHEET 2 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Long Beach South Parking Lot Washroom
N: ~5439000 E: ~298680
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 11, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
10	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm:)	**(CH)** CLAY, trace sand; grey; cohesive, w>PL, very soft. *(continued)*							⊕ +			
11												
12					8	TO	100				GS C	
					8A					54		
13									⊕ +			Cuttings
14												
15		- soil becomes soft to firm at 15.24 m depth			9	SS	100	4		○		
16		- stiff to very stiff below 16.0 m depth							⊕ +			
				16.31								
		End of Augerhole.										
17												
18												
19												
20												

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-07

SHEET 1 OF 1

DATUM: Local Project Datum

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Washroom #1
N: ~5437386 E: ~301116
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 12, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface								
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(OL)** ORGANIC SILT and SAND, some gravel; brown; non-cohesive, wet, loose.		0.00	1	SS	75	4		Concrete and Road Base
1		**(MH)** CLAYEY SILT and SAND, trace to some gravel; brown; cohesive, w>PL, firm.		0.61	2	SS	71	5		Bentonite
2					3	SS	100	7		Cuttings
3		**(CI)** SILTY CLAY, trace sand, trace gravel; grey; cohesive, w>PL, very soft.		2.74	4	SS	100	1		Sand
4										Slotted PVC Pipe
5					5	SS	100	WH		
		End of Augerhole.		5.18						
6										
7										
8										
9										
10										

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; Pocket Pen - ■; 40 80 120 160
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp — W — Wl; NP - Non-Plastic; 10 20 30 40

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-08

SHEET 1 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Washroom #1
N: ~5437382 E: ~301110
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 12, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(ML)** gravelly SILT and SAND; brown; non-cohesive, wet, loose.		0.00	1	SS	38	4				Bentonite
1		**(CL)** SILTY CLAY, trace sand, trace gravel; brown; cohesive, w>PL, soft to firm.		0.69	2	SS	75	3		W ○		
2												
		(Cl) SILTY CLAY, trace sand, trace gravel; grey; cohesive, w>PL, soft to stiff.		2.44	3	SS	92	4				Cuttings
3					4	TO	100			W ○		
					4A							
4									⊕ +			
5												Bentonite
6					5	SS	0	1				
7									⊕ +			Cuttings
8												
9												
					6	TO	100			W ○	GS C	Bentonite
					6A							
10		*CONTINUED NEXT PAGE*										

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-08

SHEET 2 OF 2

DATUM: Local Project Datum

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Washroom #1
N: ~5437382 E: ~301110
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 12, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY %	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
10	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(Cl)** SILTY CLAY, trace sand, trace gravel; grey; cohesive, w>PL, soft to stiff. *(continued)*										
11												
12					7	SS	100	WH		W		
13												Cuttings
14												
15												
16					8	TO	100			W	GS C	
					BA							
		End of Augerhole.		16.31								
17												
18												
19												
20												

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-09

SHEET 1 OF 1

DATUM: Local Project Datum

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Washroom #4
N: ~5437019 E: ~301329
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 13, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(SM/GM)** SILTY SAND and GRAVEL; brown; non-cohesive, wet, loose.		0.00	1	SS	21	7				Concrete and Road Base
1		**(ML)** CLAYEY SILT, trace sand; brown; cohesive, w>PL, very soft.		0.76	2	SS	100	WH				Bentonite
		(CI) SILTY CLAY, trace sand; grey; cohesive, w>PL, very soft.		1.12	3							
2		**(CI)** SILTY CLAY, trace sand, trace gravel; grey; cohesive, w>PL, firm.		1.52	4	SS	83	5				Cuttings
3		- soil becomes soft at 3.05 m depth			5	SS	33	3				Sand
4		- soil becomes very soft at 4.57 m depth										Slotted PVC Pipe
5					6	SS	100	WH				
		End of Augerhole.		5.18								
6												
7												
8												
9												
10												

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-10

SHEET 1 OF 1

DATUM: Local Project Datum

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Washroom #4
N: ~5437007 E: ~301330
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 13, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○ / Pocket Pen - ■) (40 80 120 160)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl; NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface												
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(ML)** CLAYEY SILT and SAND, some gravel; brown, with organics; cohesive, w>PL, firm.		0.00	1	SS	50	4						Bentonite
1		**(Cl)** SILTY CLAY, trace sand; grey; cohesive, w>PL, very soft. - increasing to stiff with depth		1.07	2	SS	67	WH						
2					3 / 3A	TO	92							Cuttings
3														
4		**(Cl)** sandy SILTY CLAY; grey; cohesive, w>PL, firm to very stiff.		3.96										Bentonite
5					4	TO	75	4						
6														
7														Cuttings
8		**(Cl)** SILTY CLAY, trace sand; brown; cohesive, w>PL, firm to hard.		7.62	5 / 5A	TO	83							
9										223				
		End of Augerhole. (Refusal)		9.30										
10														

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-11

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Entry Kiosk
N: ~5437076 E: ~301332
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 14, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG	DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
			Ground Surface							
0	Track Mounted Auger Drill	Hollow Stem Auger (Casing:203 mm;)	**(SM/GM)** SILTY SAND and GRAVEL; brown; non-cohesive, wet, compact. - cobbles at 0.46 m depth		0.00	1	SS	21	20	Concrete and Road Base Bentonite
1			**(CL)** SILTY CLAY, trace sand; mottled orange-grey; cohesive, w>PL, firm.		0.76	2	SS	75	6	Cuttings
2			**(CI)** SILTY CLAY, trace sand; grey; cohesive, w>PL, firm.		1.52	3	SS	92	5	Bentonite
3			- soil becomes very soft at 3.05 m depth			4	SS	100	WH	Sand
4			**(CI)** SILTY CLAY, trace to some sand; grey; cohesive, w>PL, soft.		4.27					Slotted PVC Pipe
5						5	SS	92	2	
			End of Augerhole.		5.18					
6										
7										
8										
9										
10										

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; Pocket Pen - ■; 40 80 120 160

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; NP - Non-Plastic; 10 20 30 40

ADDITIONAL LAB. TESTING

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-12

SHEET 1 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Entry Kiosk
N: ~5437094 E: ~301347
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 14, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl, NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing 203 mm;)	**(SM/GM)** SILTY SAND and GRAVEL; brown, with organics; non-cohesive, moist to wet, dense.		0.00	1	SS	88	32				Bentonite
		- soil becomes loose at 0.76 m depth			2							
1		**(CL)** SILTY CLAY, trace sand; mottled orange-grey; cohesive, w>PL, soft to firm.		1.07	2 3	SS	75	6				
2		**(CI)** SILTY CLAY, trace sand; grey; cohesive, w>PL, soft. - increasing to stiff with depth		1.83	4 4A	TO	83		⊕ +		GS C	
3												Cuttings
4												
5					5 5A	TO	96		⊕ +			
6												Bentonite
7												
8					6 6A	TO	25		+		GS C	
9												Cuttings
10		*CONTINUED NEXT PAGE*										

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-12

SHEET 2 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Green Point Campground Entry Kiosk
N: ~5437094 E: ~301347
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: December 14, 2015
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
10	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(Cl)** SILTY CLAY, trace sand, trace gravel; grey; cohesive, w>PL, very soft.		10.21	7	SS	100	WH				Cuttings
11												
12												Bentonite
13												
14					8	SS	100	4				
15												Cuttings
16					9	TO	100					
					9H							
		End of Augerhole.		16.31								
17												
18												
19												
20												

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-13

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Wickaninnish Beach Washroom
N: ~5432950 E: ~304566
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DATUM: Local Project Datum

DRILLING DATE: January 26, 2016
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (40 80 120 160) nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp W Wl NP - Non-Plastic (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		Ground Surface										Flushmount Road Box
0	Track Mounted Auger Drill / Hollow Stem Auger (Casing:203 mm;)	**(SP)** SILTY SAND and GRAVEL; brown; non-cohesive, wet, compact.		0.00	1	SS	63	27				Concrete
												Bentonite
1		**(SP)** SAND, trace to some silt; brown; non-cohesive, wet, loose to compact. - possible cobbles or coarse gravel from 0.76 m to 1.37 m depth.		0.76								
2					2	SS	88	9				Cuttings
3					3	SS	100	16				
4												Bentonite
												Filter Sand
5		**(SP)** SAND, some gravel, trace silt; brown; non-cohesive, wet, compact.		4.72	4	SS	100	13				Slotted PVC Pipe
6		**(SP)** SAND, trace gravel, trace silt; brown; non-cohesive, wet, loose.		5.94	5	SS	75	7				
7		End of Augerhole.		6.71								
8												
9												
10												

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-14

SHEET 1 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Wickaninnish Beach Washroom
N: ~5432932 E: ~304570
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: January 26, 2016
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG	DRILLING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○ Pocket Pen - ■) (40 80 120 160)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl, NP - Non-Plastic) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
			Ground Surface										
0	Track Mounted Auger Drill	Hollow Stem Auger (Casing:203 mm.)	**(SP)** SAND, trace to some silt; brown; non-cohesive, wet, loose. - possible cobbles or gravel from 0.76 m to 1.37 m depth.		0.00								Sand
1													Bentonite
2						1	SS	79	8				
3													
4													
			(SP-GP) SAND and GRAVEL, trace silt; brown; non-cohesive, wet, dense.		4.27								
5						2	SS	67	33				Cuttings
			- possible cobbles or gravel at 5.49 m depth.										
			(SP) SAND, some gravel to gravelly, trace silt; brown; non-cohesive, wet, very loose.		5.79								
6						3	SS	25	3				
7													
			(SP-GP) SAND and GRAVEL, some silt; grey; non-cohesive, wet, compact to dense.		7.16								
8						4	SS	42	>15				
			(SM) SILTY SAND, some gravel to gravelly; grey; non-cohesive, wet, compact.		8.53								
9						5A	SS	63	18				Bentonite
			(CL) SILTY CLAY, some sand, trace to some gravel; grey; cohesive, w>PL, very stiff.		9.30	5B					○		Cuttings
10			*CONTINUED NEXT PAGE*										

DEPTH SCALE
1 : 50

Golder Associates

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

PROJECT No.: 13-1447-0497 / 7000 / 7001

RECORD OF AUGERHOLE: AH15-14

SHEET 2 OF 2

CLIENT: Public Works and Government Services Canada
PROJECT: Pacific Rim National Park
LOCATION: Wickaninnish Beach Washroom
N: ~5432932 E: ~304570
Note: Coordinates and Elevation have not been surveyed and are considered to be approximate only.

DRILLING DATE: January 26, 2016
DRILLING CONTRACTOR: Drillwell Enterprises Ltd.

DATUM: Local Project Datum

SAMPLER HAMMER, 140lbs.; DROP, 30in.

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY %	BLOWS/0.3m
		(CL) sandy SILTY CLAY, trace to some gravel; grey; cohesive, w>PL, very stiff.		10.36				
					6	SS	29	28
		(CL) SILTY CLAY, trace to some sand, trace gravel; grey; cohesive, w>PL, firm.		11.89				
					7	SS	100	7
					8A			
		(CL) SILTY CLAY, trace sand; grey; cohesive, w>PL, firm to very stiff.		13.79	8	TO	112	
					8B			
					9A			
					9	TO	122	
		(CI) SILTY CLAY, trace sand, trace gravel; grey; cohesive, w>PL, stiff to very stiff.		15.70	9B			
					10A			
					10	TO	122	
					10B			
		End of Augerhole.		17.83				

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; Pocket Pen - ■; 40 80 120 160

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp W Wl; NP - Non-Plastic; 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION: Cuttings

DEPTH SCALE
1 : 50

SOIL CLASSIFICATION SYSTEM: GACS
LOGGED: DGM
CHECKED: SEM

Golder Associates

National IM Server:GINT_GAL_NATIONALIM Unique Project ID: Output Form:BC_BOREHOLE (AUTO) rwiggins 9/6/16

APPENDIX D

Geotechnical Laboratory Testing

WATER CONTENT DETERMINATION

ASTM D 2216

Client: Public Works and Government Services Canada
Project: Pacific Rim National Park
Location: Tofino, B.C.
Project No.: 13-1447-0497 **Phase:** 7000 **Task:** 7001

Project No.: 13-1447-0497 **Phase:** 7000 **Task:** 7001
Lab Schedule No.:

Sample Location	Sample No.	Specimen No.	Depth Interval		Water Content (%)
			Depth (m)	Bottom (m)	
AH15-04	**4**		4.57	5.18	**72.2**
AH15-04	**6A**		7.42	7.47	**44.6**
AH15-04	**7A**		9.70	9.75	**39.5**
AH15-04	**8A**		12.75	12.80	**34.0**
AH15-06	**5**		4.57	5.18	**67.3**
AH15-06	**9**		15.24	15.85	**28.3**
AH15-06	**6A**		6.64	6.71	**36.5**
AH15-06	**7A**		9.69	9.75	**53.8**
AH15-06	**8A**		12.74	12.80	**37.4**
AH15-08	**2**		0.76	1.37	**38.3**
AH15-08	**7**		12.19	12.80	**24.6**
AH15-08	**4A**		3.60	3.66	**25.0**
AH15-08	**6A**		9.69	9.75	**22.0**
AH15-08	**8A**		15.79	15.85	**22.1**
AH15-10	**4**		4.57	5.18	**19.0**
AH15-10	**3A**		2.07	2.13	**40.9**
AH15-10	**5A**		8.17	8.23	**22.9**
AH15-12	**2**		0.76	1.37	**9.4**
AH15-12	**3**		1.07	1.37	**32.1**
AH15-12	**7**		10.21	10.82	**22.1**
AH15-12	**8**		13.72	14.33	**23.2**
AH15-12	**4A**		2.07	2.13	**28.4**
AH15-12	**5A**		5.12	5.18	**25.3**
AH15-12	**6A**		8.17	8.23	**24.1**
AH15-12	**9B**		15.85	15.91	**23.3**
AH15-14	**6**		10.67	11.28	**11.9**
AH15-14	**7**		12.19	12.80	**28.0**
AH15-14	**10A**		16.76	16.83	**34.3**
AH15-14	**5B**		9.30	9.75	**13.8**
AH15-14	**8A**		13.72	13.78	**24.0**
AH15-14	**9A**		15.24	15.30	**28.8**

DGM 1/12/2016
Checked Date

National IM Server\GINT_GAL_NATIONALIM Unique Project ID: Output Form: _LAB_WATER CONTENT (REPORT) 2015 samarilli 19/2/16

Golder Associates Ltd.
2nd Floor - 3795 Carey Road Victoria, BC, V8Z 6T8 CANADA
Tel: +1 (250) 881 7372 Fax: +1 (250) 881 7470 www.golder.com

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

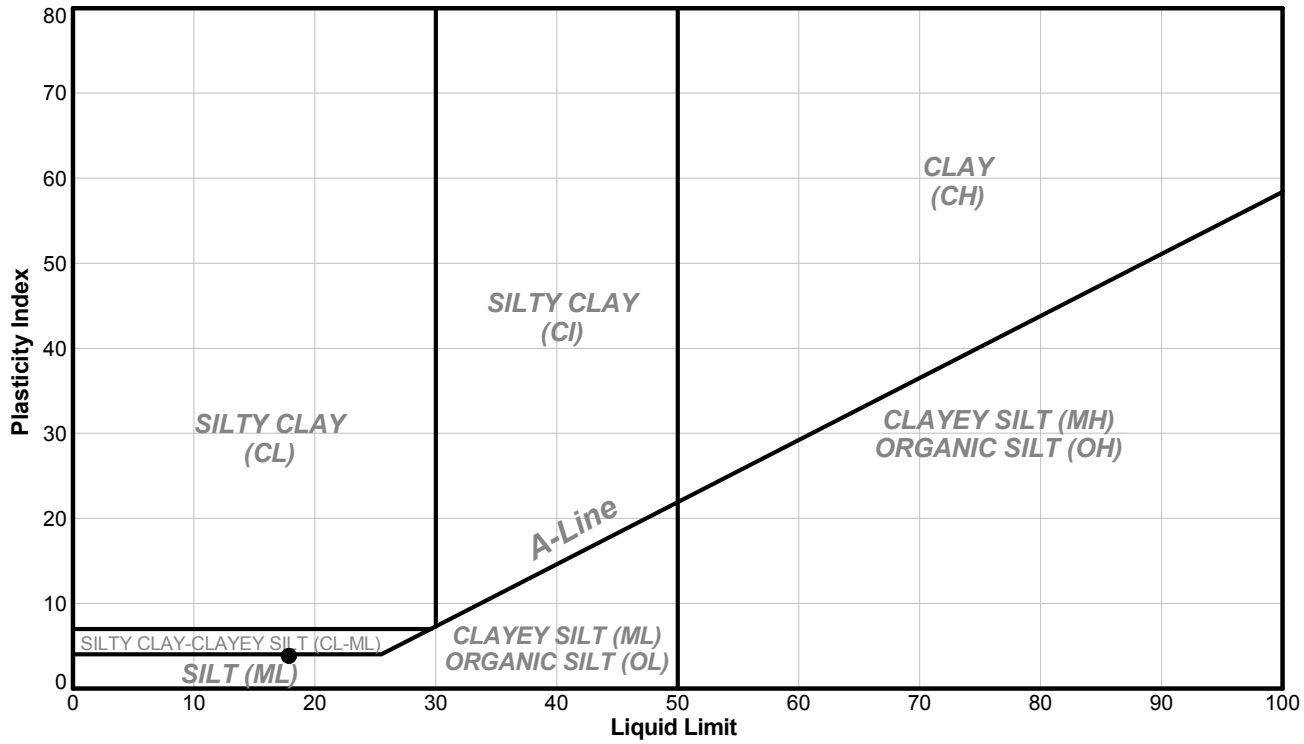
ASTM D 4318-10

Client:	Public Works and Government Services Canada	**Augerhole ID:**	**AH15-14**
Project:	Pacific Rim National Park	**Sample No.:**	**6**
Location:	Tofino, B.C.	**Depth Interval (m):**	10.67 to 11.28
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7001	**Lab Schedule No.:**	

Other Remarks: **N/A**

Test Method: A-Multi Point	**Preparation Method: Wet**

PLASTICITY CHART



Sym.	Sample Location	Sample / Specimen Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	AH15-14	6	10.67	11.28	ND	18	14	4.0	11.9	-0.5

NP - NON-PLASTIC RESULT ND - NOT DETERMINED

AA	2/7/2016	DGM	2/18/2016
Tech	Date	Checked	Date

National IM Server\GINT_GAL_NATIONALIM Unique Project ID: Output Form: _LAB ATTERBERG CASAGRANDE (SINGLE) 2015 aamarilli 2/22/16

Golder Associates Ltd.
2nd Floor - 3795 Carey Road Victoria, BC, V8Z 6T8 CANADA
Tel: +1 (250) 881 7372 Fax: +1 (250) 881 7470 www.golder.com

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

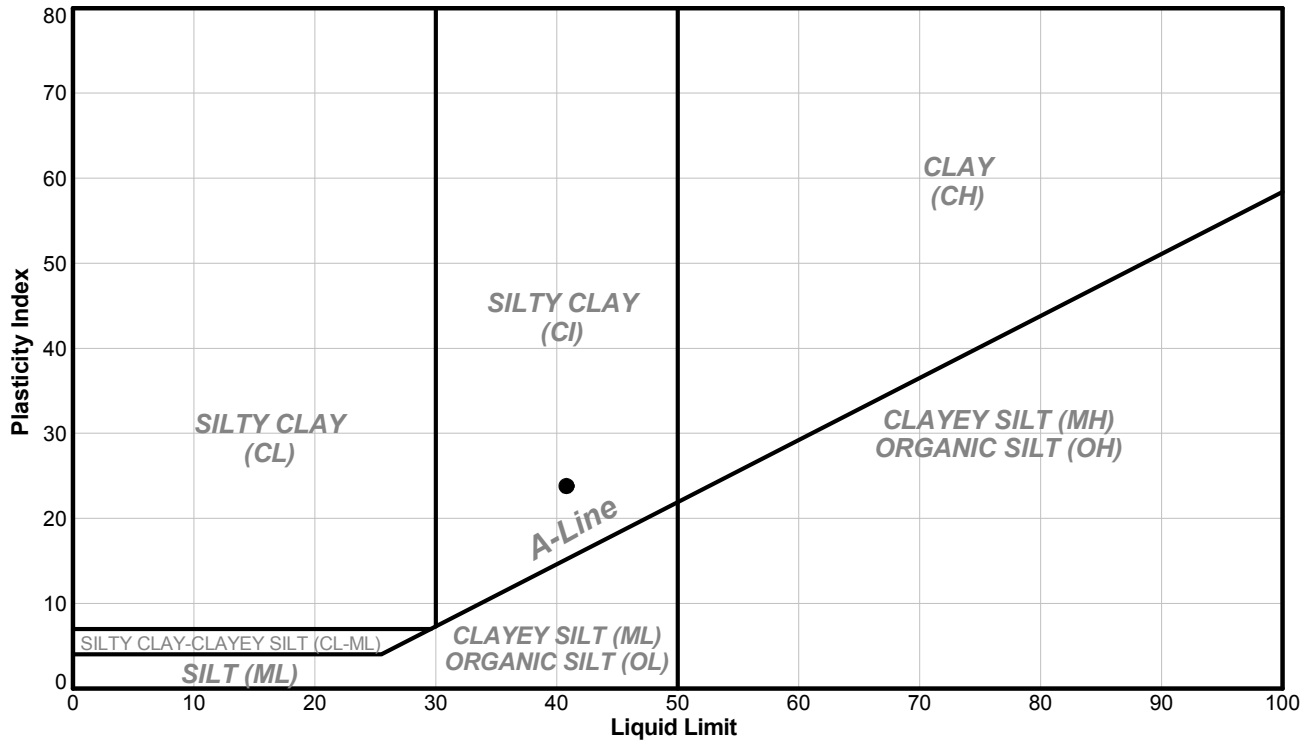
ASTM D 4318-10

Client:	Public Works and Government Services Canada	**Augerhole ID:**	**AH15-14**
Project:	Pacific Rim National Park	**Sample No.:**	**9A**
Location:	Tofino, B.C.	**Depth Interval (m):**	15.24 to 15.30
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7001	**Lab Schedule No.:**	

Other Remarks: **N/A**

Test Method: A-Multi Point	**Preparation Method: Wet**

PLASTICITY CHART



Sym.	Sample Location	Sample / Specimen Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	AH15-14	9A	15.24	15.30	ND	41	17	24.0	28.8	0.5

NP - NON-PLASTIC RESULT ND - NOT DETERMINED

AA	**2/15/2016**	**DGM**	**2/18/2016**
Tech	Date	Checked	Date

National IM Server\GINT_GAL_NATIONALIM Unique Project ID: Output Form: _LAB ATTERBERG CASAGRANDE (SINGLE) 2015 aamarilli 2/22/16

Golder Associates Ltd.
2nd Floor - 3795 Carey Road Victoria, BC, V8Z 6T8 CANADA
Tel: +1 (250) 881 7372 Fax: +1 (250) 881 7470 www.golder.com

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

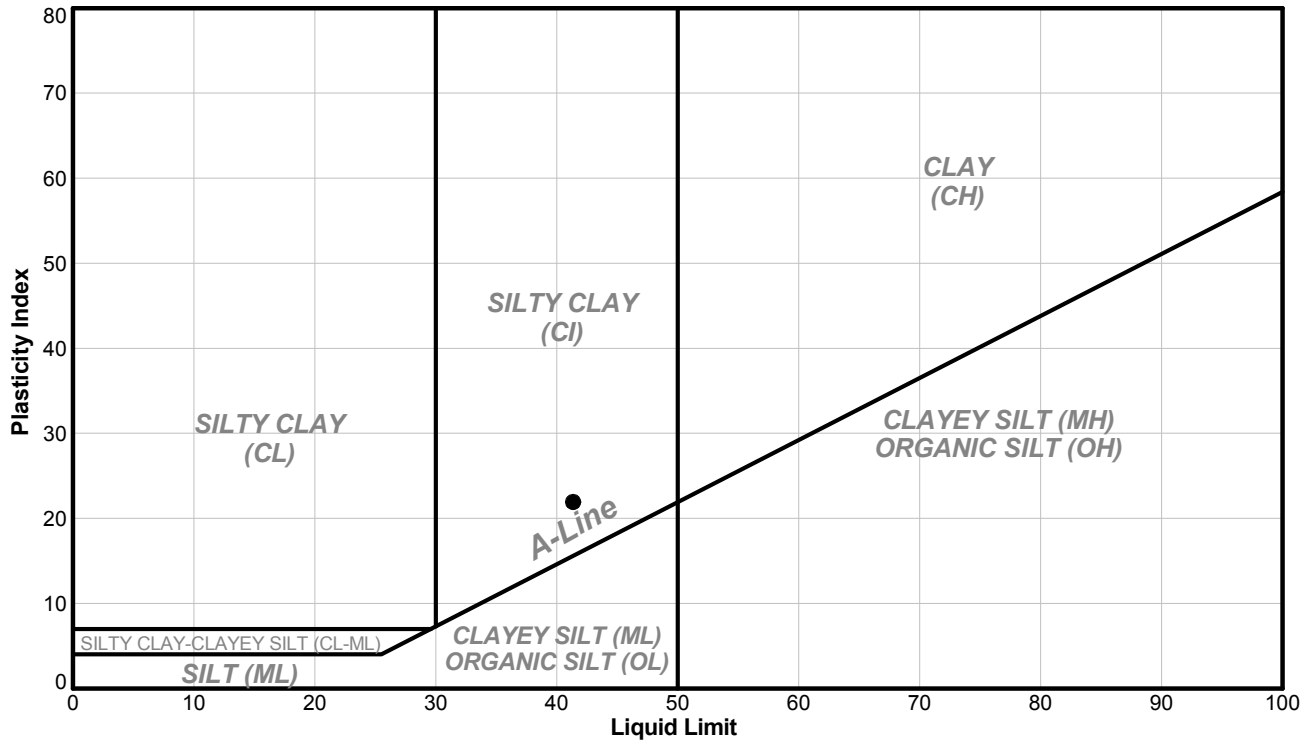
ASTM D 4318-10

Client:	Public Works and Government Services Canada	**Augerhole ID:**	**AH15-14**
Project:	Pacific Rim National Park	**Sample No.:**	**10A**
Location:	Tofino, B.C.	**Depth Interval (m):**	16.76 to 16.92
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7001	**Lab Schedule No.:**	

Other Remarks: **N/A**

Test Method: A-Multi Point	**Preparation Method: Wet**

PLASTICITY CHART



Sym.	Sample Location	Sample / Specimen Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	AH15-14	10A	16.76	16.92	ND	41	19	22.0	34.3	0.7

NP - NON-PLASTIC RESULT ND - NOT DETERMINED

AA	**2/15/2016**	**DGM**	**2/18/2016**
Tech	Date	Checked	Date

National IM Server\GINT_GAL_NATIONALIM Unique Project ID: Output Form: _LAB ATTERBERG CASAGRANDE (SINGLE) 2015 aamarilli 2/22/16

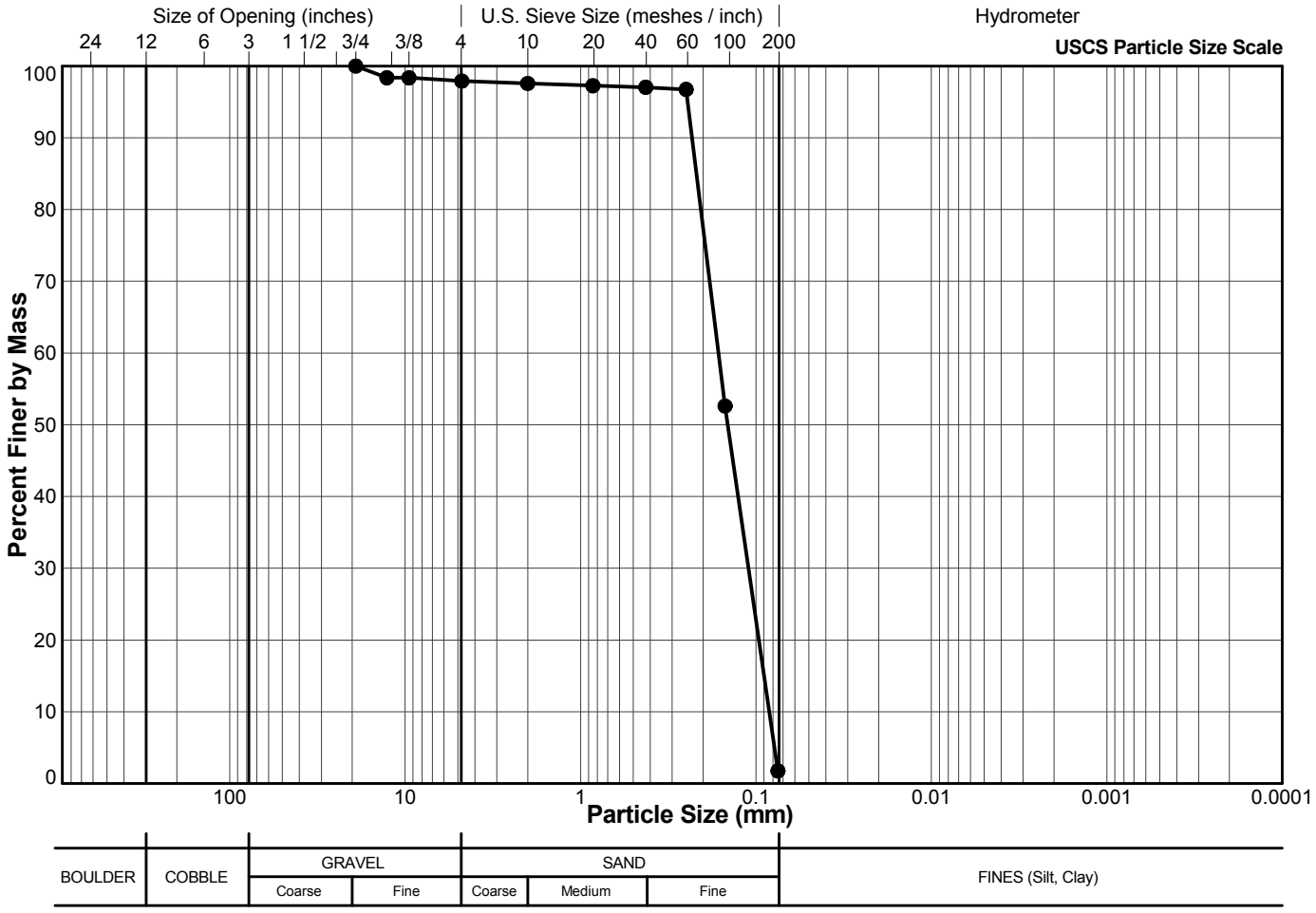
Golder Associates Ltd.
2nd Floor - 3795 Carey Road Victoria, BC, V8Z 6T8 CANADA
Tel: +1 (250) 881 7372 Fax: +1 (250) 881 7470 www.golder.com

SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM C136

Client: Public Works and Government Services Canada
Project: Pacific Rim National Park
Location: Tofino, B.C.
Project No.: 13-1447-0497 **Phase:** 7000 **Task:** 7001

Sample Location: AH15-01
Sample No.: 3
Depth Interval (m): 1.52 to 2.13
Lab Schedule No.:



Legend

Sieve Size (USS)	(mm)	Particle Size (mm)	Percent Passing
3/4"	19.1		100.0
1/2"	12.7		98.4
3/8"	9.5		98.4
#4 US MESH	4.75		97.9
#10 US MESH	2		97.6
#20 US MESH	0.85		97.3
#40 US MESH	0.425		97.0
#60 US MESH	0.25		96.7
#100 US MESH	0.15		52.6
#200 US MESH	0.075		1.8

AA	1/8/2016	DGM	2/25/2016
Tech	Date	Checked	Date

National IM Server:GINT_GAL_NATIONALIM Unique Project ID:1159 Output Form:_LAB_PARTICLE SIZE (W/ GRADATIONS) 2015 dmackie 25/2/16

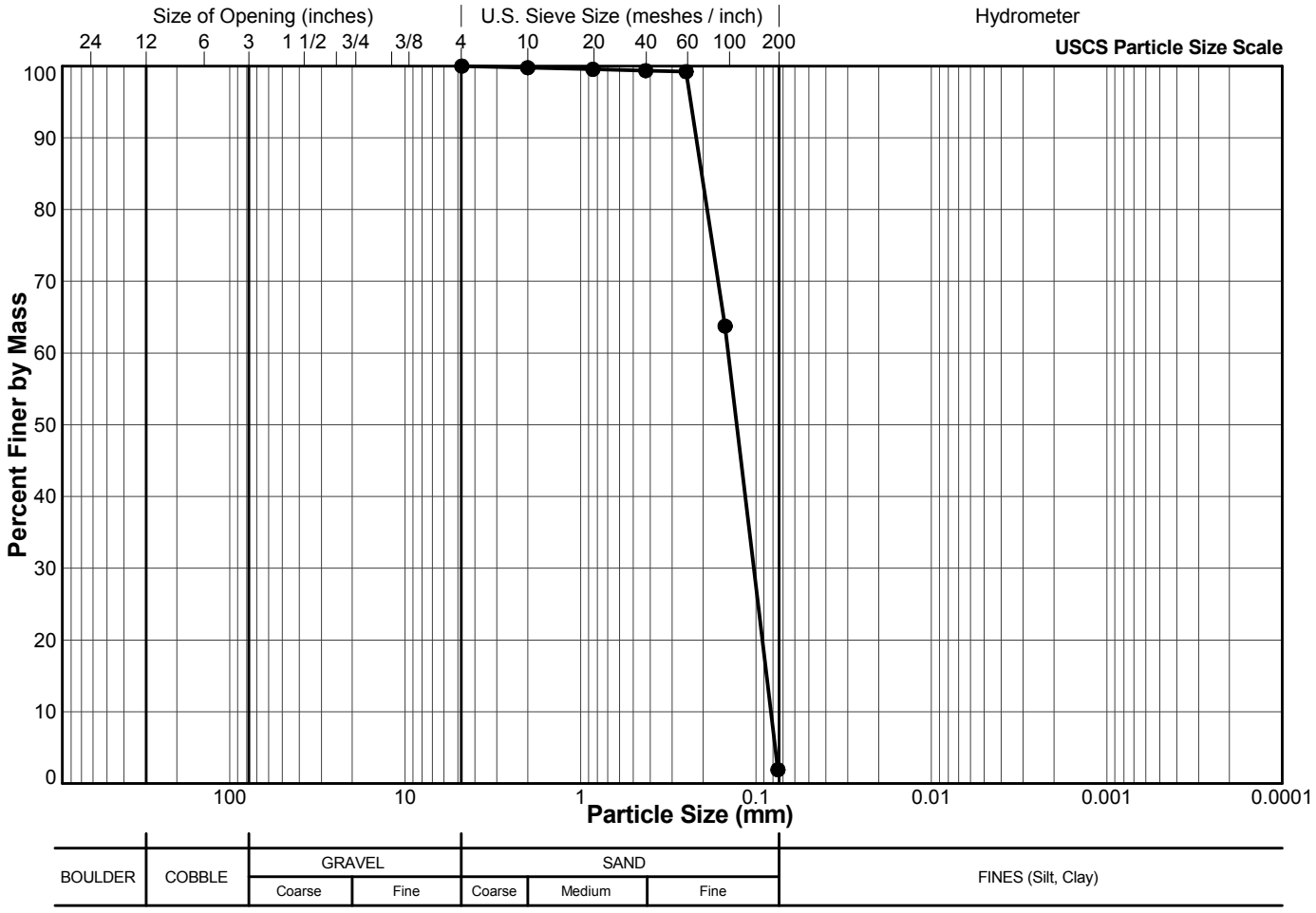
Golder Associates Ltd.
2nd floor, 3795 Carey Road Victoria, British Columbia, Canada V8Z 6T8
Tel: +1 (250) 881-7372 Fax: +1 (250) 881 7470 www.golder.com

SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM C136

Client: Public Works and Government Services Canada
Project: Pacific Rim National Park
Location: Tofino, B.C.
Project No.: 13-1447-0497 **Phase:** 7000 **Task:** 7001

Sample Location: AH15-03
Sample No.: 2
Depth Interval (m): 0.76 to 1.37
Lab Schedule No.:



Legend

Sieve Size (USS)	(mm)	Particle Size (mm)	Percent Passing
#4 US MESH	4.75		100.0
#10 US MESH	2		99.8
#20 US MESH	0.85		99.6
#40 US MESH	0.425		99.4
#60 US MESH	0.25		99.2
#100 US MESH	0.15		63.8
#200 US MESH	0.075		1.9

AA	1/8/2016	DGM	2/25/2016
Tech	Date	Checked	Date

National IM Server:GINT_GAL_NATIONALIM Unique Project ID:1159 Output Form:_LAB_PARTICLE SIZE (W/ GRADATIONS) 2015 dmackie 25/2/16

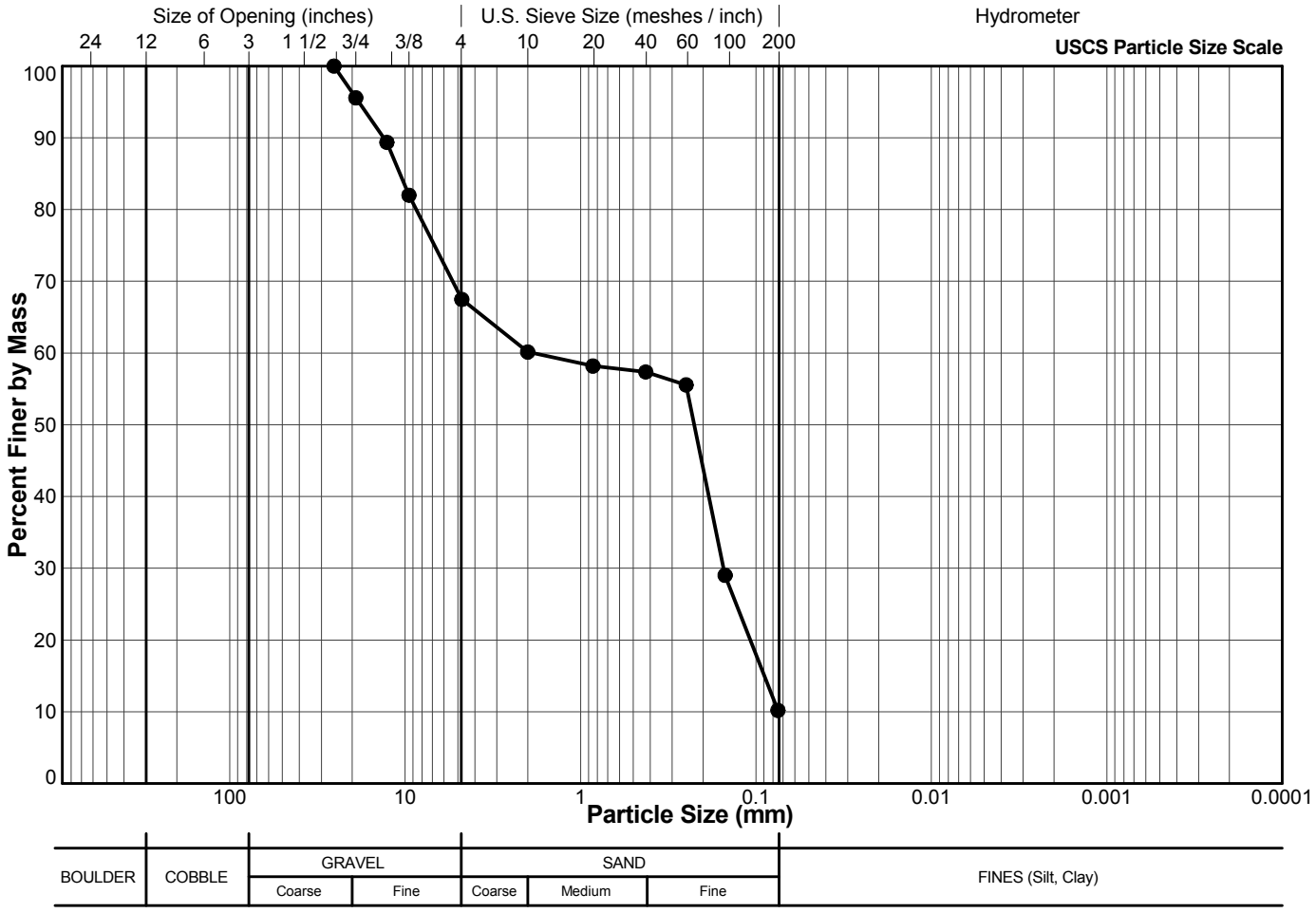
Golder Associates Ltd.
2nd floor, 3795 Carey Road Victoria, British Columbia, Canada V8Z 6T8
Tel: +1 (250) 881-7372 Fax: +1 (250) 881 7470 www.golder.com

SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM C136

Client: Public Works and Government Services Canada
Project: Pacific Rim National Park
Location: Tofino, B.C.
Project No.: 13-1447-0497 **Phase:** 7000 **Task:** 7001

Sample Location: AH15-06
Sample No.: 4
Depth Interval (m): 3.05 to 3.66
Lab Schedule No.:



Legend

Sieve Size (USS)	(mm)	Particle Size (mm)	Percent Passing
1"	25.4		100.0
3/4"	19.1		95.6
1/2"	12.7		89.4
3/8"	9.5		82.0
#4 US MESH	4.75		67.5
#10 US MESH	2		60.1
#20 US MESH	0.85		58.2
#40 US MESH	0.425		57.4
#60 US MESH	0.25		55.6
#100 US MESH	0.15		29.0
#200 US MESH	0.075		10.2

AA	1/8/2016	DGM	2/25/2016
Tech	Date	Checked	Date

National IM Server:GINT_GAL_NATIONALIM Unique Project ID:1159 Output Form:_LAB_PARTICLE SIZE (W/ GRADATIONS) 2015 dmackie 25/2/16

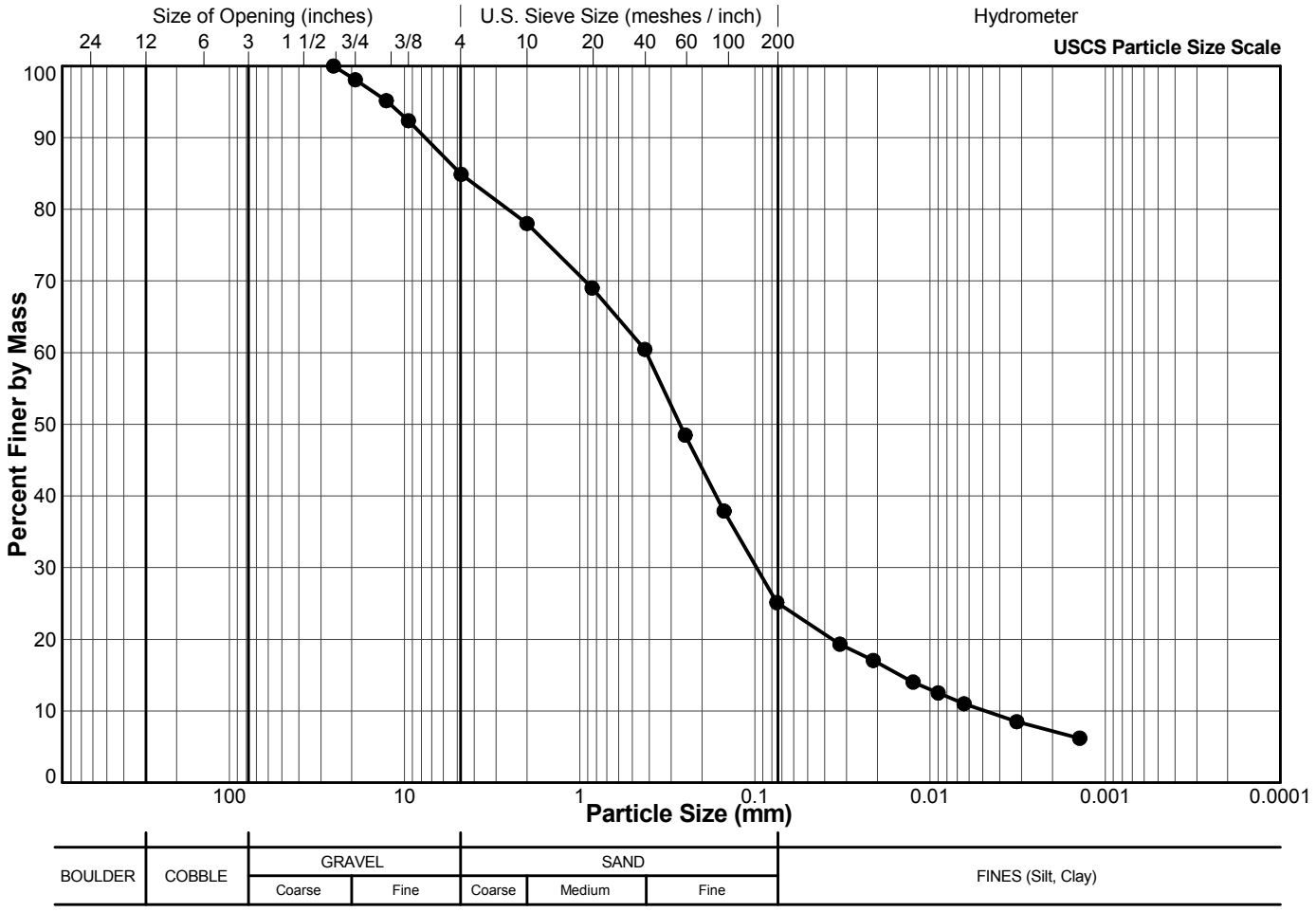
Golder Associates Ltd.
2nd floor, 3795 Carey Road Victoria, British Columbia, Canada V8Z 6T8
Tel: +1 (250) 881-7372 Fax: +1 (250) 881 7470 www.golder.com

SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM D 422

Client: Public Works and Government Services Canada
Project: Pacific Rim National Park
Location: Tofino, B.C.
Project No.: 13-1447-0497 **Phase:** 7000 **Task:** 7001

Sample Location: AH15-07
Sample No.: 2
Depth Interval (m): 0.76 to 1.37
Lab Schedule No.:



Legend

Sieve Size (USS)	(mm)	Particle Size (mm)	Percent Passing
1"	25.4		100.0
3/4"	19.1		98.1
1/2"	12.7		95.2
3/8"	9.5		92.4
#4 US MESH	4.75		84.9
#10 US MESH	2		78.0
#20 US MESH	0.85		69.0
#40 US MESH	0.425		60.5
#60 US MESH	0.25		48.5
#100 US MESH	0.15		37.9
#200 US MESH	0.075		25.1
		0.0327	19.3
		0.0211	17.1
		0.0125	14.0
		0.0090	12.5
		0.0064	11.0
		0.0032	8.5
		0.0014	6.2

AA	1/7/2016	DGM	2/25/2016
Tech	Date	Checked	Date

National IM Server:GINT_GAL_NATIONALIM Unique Project ID:1159 Output Form:_LAB_PARTICLE SIZE (W/ GRADATIONS) 2015 dmackie 25/2/16

Golder Associates Ltd.
2nd floor, 3795 Carey Road Victoria, British Columbia, Canada V8Z 6T8
Tel: +1 (250) 881-7372 Fax: +1 (250) 881 7470 www.golder.com

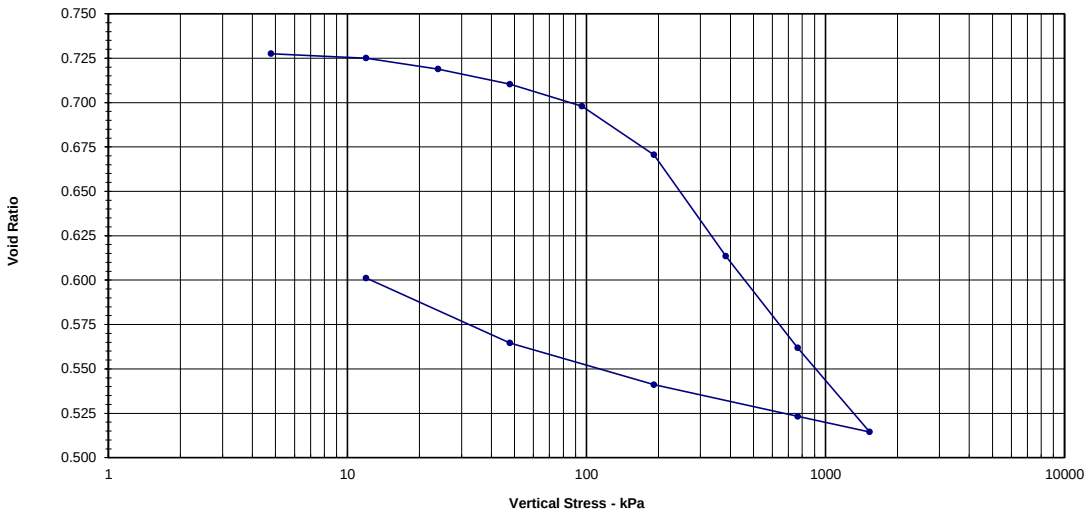
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

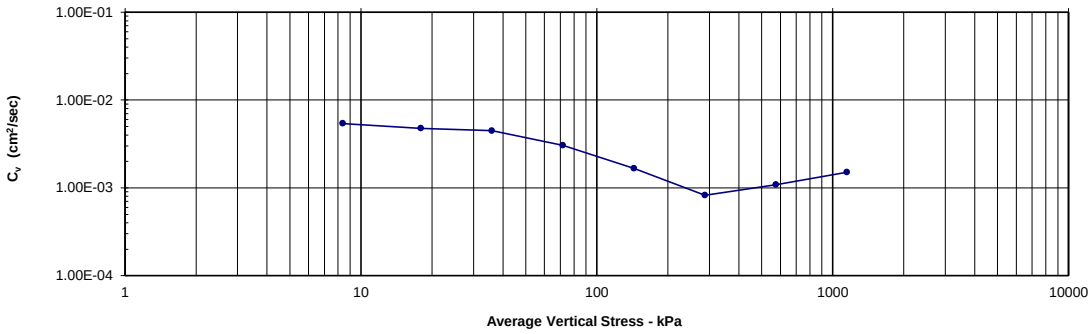
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-12
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	6
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	7.62 - 8.17

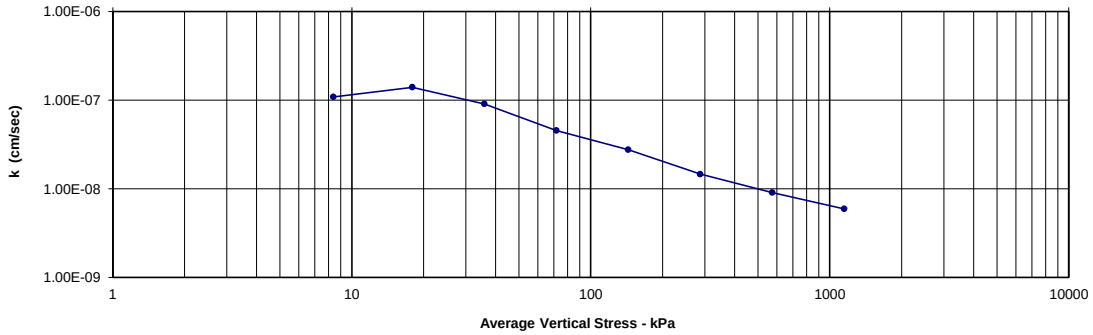
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



TM/MM	28/12/2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-12
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	6
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	7.62 - 8.17

Equipment

Machine:	Sigma-1
Mach No.	4
Ring No.	C2
Drainage:	Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.92	19.52
Diameter (mm) =	63.53	63.53
Area (cm^2) =	31.70	31.70
Volume (cm^3) =	69.48	61.88

Phase Relationships

	Initial	Final
Wet Wt (g) =	137.48	130.59
Dry Wt (g) =	108.90	108.90
w (%) =	26.24	19.92
e =	0.729	0.540
ρ_{wet} (kg/m^3) =	1979	2110
ρ_{drv} (kg/m^3) =	1567	1760
S (%) =	98	100

Remarks

ASTM Method:	B - Constant Time Increment @ EOP
Method for Cv :	Taylor
H_{avg} **:**	Half the specimen height
Time Increment:	360 min

Sample Properties

G_s = 2.71 Calculated

H_s (mm) = 12.68

Atterberg Limits

Liquid Limit:	N/A
Plastic Limit:	N/A
Plasticity Index:	N/A
Soil Classification:	N/A

Estimated Preconsolidation Stress: 138 kPa

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	H-H_s (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.03	21.90	0.09	9.22	0.728						
2	12	0.10	21.87	0.24	9.19	0.725	8	0.73	10.94	3.13	5.4E-03	1.1E-07
3	24	0.11	21.79	0.60	9.11	0.719	18	0.72	10.91	3.54	4.8E-03	1.4E-07
4	48	0.14	21.68	1.09	9.00	0.710	36	0.71	10.87	3.74	4.5E-03	9.1E-08
5	96	0.20	21.52	1.81	8.85	0.698	72	0.70	10.80	5.41	3.0E-03	4.5E-08
6	192	0.41	21.18	3.39	8.50	0.671	144	0.68	10.68	9.67	1.7E-03	2.8E-08
7	383	0.80	20.45	6.69	7.78	0.613	287	0.64	10.41	18.58	8.2E-04	1.5E-08
8	766	0.77	19.80	9.68	7.12	0.562	575	0.59	10.06	13.14	1.1E-03	9.1E-09
9	1532	0.72	19.20	12.41	6.52	0.515	1149	0.54	9.75	8.92	1.5E-03	5.9E-09
10	766	-0.19	19.31	11.91	6.63	0.523						
11	192	-0.35	19.54	10.88	6.86	0.541						
12	48	-0.39	19.83	9.52	7.16	0.565						
13	12	-0.48	20.30	7.41	7.62	0.601						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.
Sample patched due to gravel.

Description: SILTY CLAY; some sand; trace gravel, brown to grey, moist.

TM/MM	28/12/2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

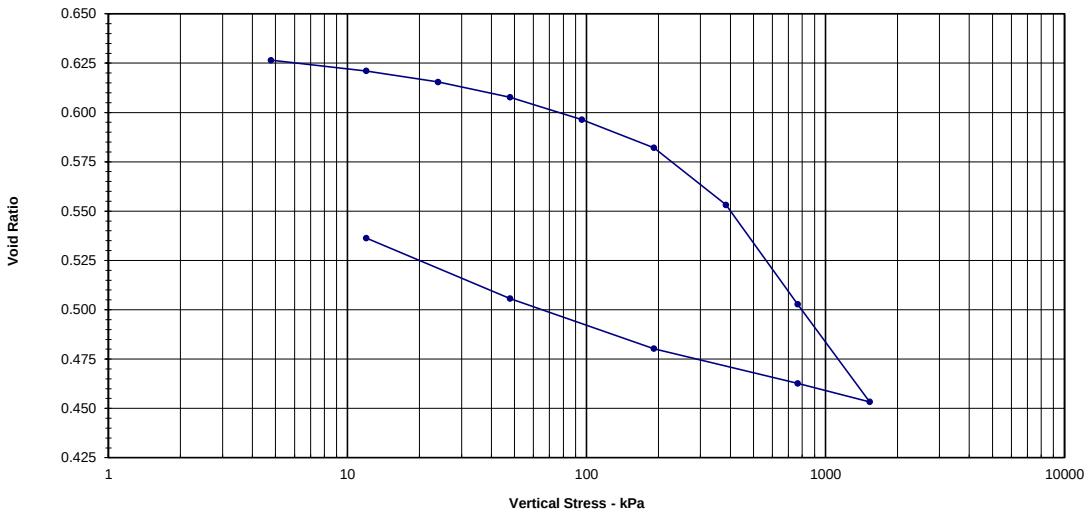
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

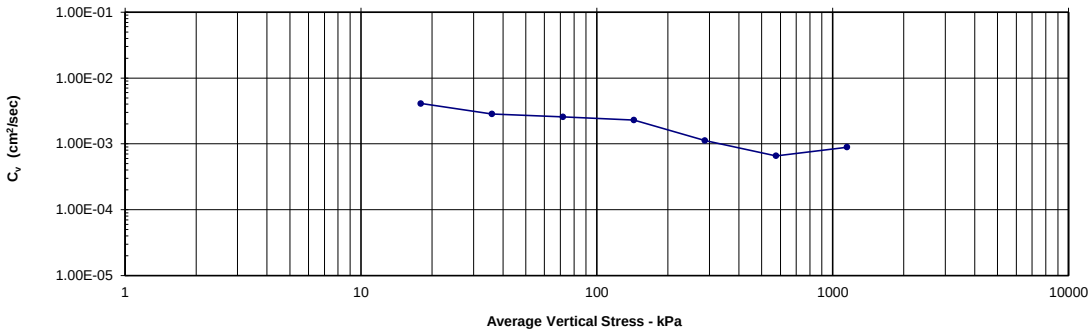
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-08
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	8
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	15.24 - 15.79

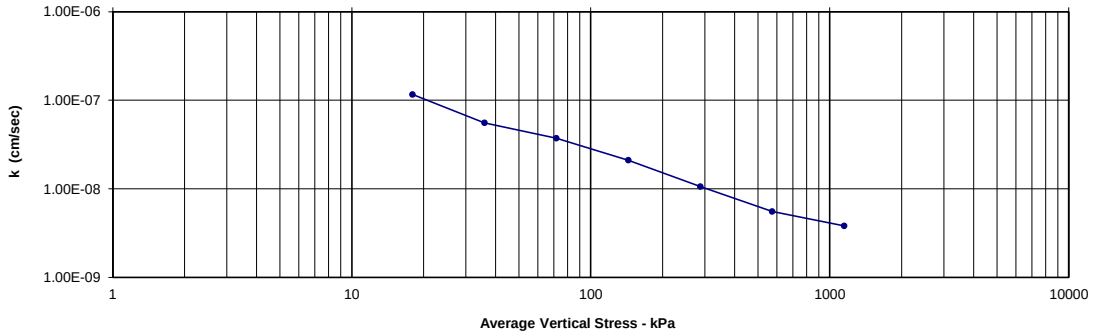
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



TM/MM	December 29, 2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-08
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	8
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	15.24 - 15.79

Equipment

Machine: Sigma-1
Mach No. 2
Ring No. Stn1
Drainage: Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.83	20.25
Diameter (mm) =	63.53	63.53
Area (cm^2) =	31.70	31.70
Volume (cm^3) =	69.19	64.21

Phase Relationships

	Initial	Final
Wet Wt (g) =	141.40	137.34
Dry Wt (g) =	115.65	115.65
w (%) =	22.27	18.75
e =	0.627	0.510
ρ_{wet} (kg/m^3) =	2044	2139
ρ_{drv} (kg/m^3) =	1672	1801
S (%) =	97	100

Remarks

ASTM Method: B - Constant Time Increment @ EOP
Method for Cv : Taylor
H_{avg} **:** Half the specimen height
Time Increment: 360 min

Sample Properties

G_s = 2.72 Calculated
H_s (mm) = 13.41

Atterberg Limits

Liquid Limit: N/A
Plastic Limit: N/A
Plasticity Index: N/A
Soil Classification: N/A

Estimated Preconsolidation Stress: 276 kPa

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε Σ ΔH / Ho (%)	H-H_s (mm)	e (H-H_s)/H_s	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.01	21.81	0.02	8.40	0.626						
2	12	0.09	21.74	0.35	8.33	0.621						
3	24	0.10	21.67	0.70	8.25	0.615	18	0.62	10.85	4.07	4.1E-03	1.2E-07
4	48	0.14	21.56	1.17	8.15	0.608	36	0.61	10.81	5.82	2.8E-03	5.6E-08
5	96	0.18	21.41	1.87	8.00	0.596	72	0.60	10.74	6.36	2.6E-03	3.7E-08
6	192	0.24	21.22	2.74	7.81	0.582	144	0.59	10.66	6.98	2.3E-03	2.1E-08
7	383	0.44	20.83	4.53	7.42	0.553	287	0.57	10.51	13.90	1.1E-03	1.1E-08
8	766	0.77	20.16	7.62	6.74	0.503	575	0.53	10.25	22.52	6.6E-04	5.6E-09
9	1532	0.78	19.49	10.66	6.08	0.453	1149	0.48	9.91	15.55	8.9E-04	3.8E-09
10	766	-0.20	19.62	10.09	6.20	0.463						
11	192	-0.35	19.85	9.01	6.44	0.480						
12	48	-0.39	20.19	7.45	6.78	0.506						
13	12	-0.44	20.60	5.56	7.19	0.536						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.

Description: SILTY CLAY; some coarse sand, grey, moist.

TM/MM	December 29, 2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

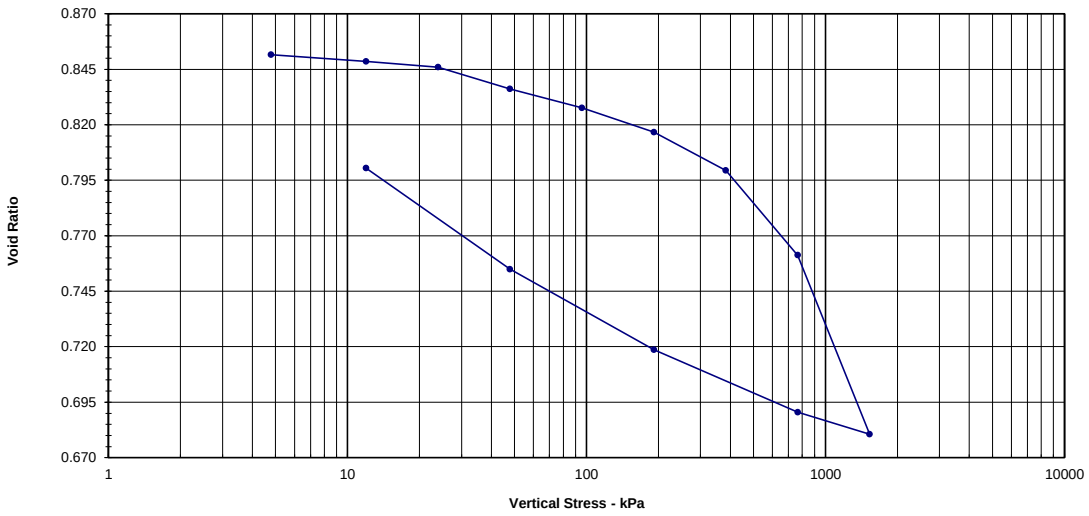
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

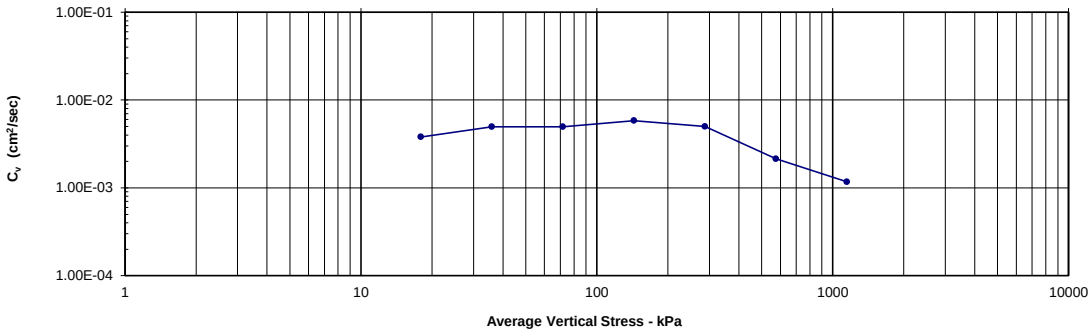
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Borehole:**	AH15-14
Sch No.	56	**Project :**	Pacific Rim	**Sample:**	10
Lab Work:	MM	**Location:**	Tofino, BC	**Depth(m):**	16.82 - 17.31

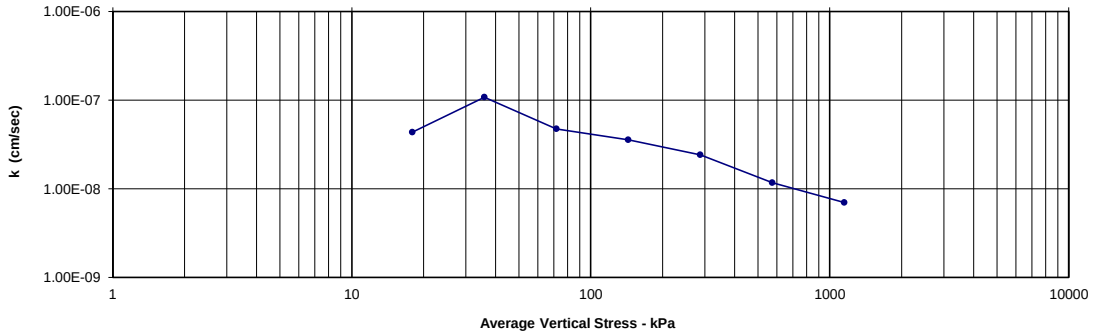
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



MM	February 3, 2016	L.Lee	February 17, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Borehole:**	AH15-14
Sch No.	56	**Project :**	Pacific Rim	**Sample:**	10
Lab Work:	MM	**Location:**	Tofino, BC	**Depth(m):**	16.82 - 17.31

Equipment

Machine: Sigma-1
Mach No. 3
Ring No. B1
Drainage: Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.98	20.71
Diameter (mm) =	63.54	63.54
Area (cm^2) =	31.71	31.71
Volume (cm^3) =	69.70	65.66

Phase Relationships

	Initial	Final
Wet Wt (g) =	133.02	130.41
Dry Wt (g) =	102.39	102.39
w (%) =	29.92	27.37
e =	0.852	0.744
ρ_{wet} (kg/m^3) =	1908	1986
ρ_{drv} (kg/m^3) =	1469	1559
S (%) =	96	100

Remarks

ASTM Method: B - Constant Time Increment @ EOP
Method for Cv : Taylor
H_{avg} **:** Half the specimen height
Time Increment: 360 min

Sample Properties

G_s = 2.72 Calculated
H_s (mm) = 11.87

Atterberg Limits

Liquid Limit: N/A
Plastic Limit: N/A
Plasticity Index: N/A
Soil Classification: N/A

Estimated Preconsolidation Stress: N/A

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	H-H_s (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.00	21.98	0.01	10.11	0.852						
2	12	0.05	21.94	0.17	10.07	0.849						
3	24	0.05	21.91	0.31	10.04	0.846	18	0.85	10.96	4.48	3.8E-03	4.4E-08
4	48	0.14	21.80	0.84	9.93	0.836	36	0.84	10.93	3.40	5.0E-03	1.1E-07
5	96	0.15	21.70	1.30	9.82	0.828	72	0.83	10.87	3.36	5.0E-03	4.8E-08
6	192	0.19	21.57	1.90	9.69	0.817	144	0.82	10.82	2.85	5.8E-03	3.6E-08
7	383	0.27	21.36	2.82	9.49	0.799	287	0.81	10.73	3.27	5.0E-03	2.4E-08
8	766	0.55	20.91	4.89	9.04	0.761	575	0.78	10.57	7.38	2.1E-03	1.2E-08
9	1532	1.13	19.95	9.25	8.08	0.681	1149	0.72	10.21	12.59	1.2E-03	7.0E-09
10	766	-0.28	20.07	8.71	8.20	0.690						
11	192	-0.46	20.40	7.19	8.53	0.719						
12	48	-0.48	20.83	5.23	8.96	0.755						
13	12	-0.55	21.37	2.77	9.50	0.800						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.
Advanced to 12 kPa due to swelling.

Description: SILTY CLAY; trace gravel, grey, w>PL, moist, stiff.

MM	February 3, 2016	L.Lee	February 17, 2016
TESTED BY	DATE	CHECKED BY	DATE

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER				Reference(s) ASTM D854 -14
Client:	PWGSC			**Borehole:** AH15-14
Project:	Pacific Rim			**Sample Number:** 9
Location:	Tofino, BC			**Depth (m):** 15.3-15.8
Project No.:	13-1447-0497	**Phase:** 7000	**Task:** 7002	**Lab ID No:** 56

Visual Description:	% Passing 4.75mm	N/A
CLAYEY SILT, trace gravel, gray, w > PL, stiff	**Excluded Material Description**	

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		A	B
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		89.99	90.72
Mass of Flask + Dry Soil (g)		129.21	130.41
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	364.30	365.08
Test Temperature (°C)	T_t	21.3	21.5
Mass of Flask + Water (g)	$M_{\rho w,t}$	339.52	340.27
Tare Number		1D	2D
Mass of Tare + Dry Soil (g)		221.58	225.20
Mass of Tare (g)		182.27	185.59
Mass of Oven Dry Soil (g)	M_S	39.31	39.61
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.71	2.68
Specific Gravity at 20ºC	$G_{20ºC}$	2.70	2.68

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.69

SJ	February 9, 2016	LH	February 15, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

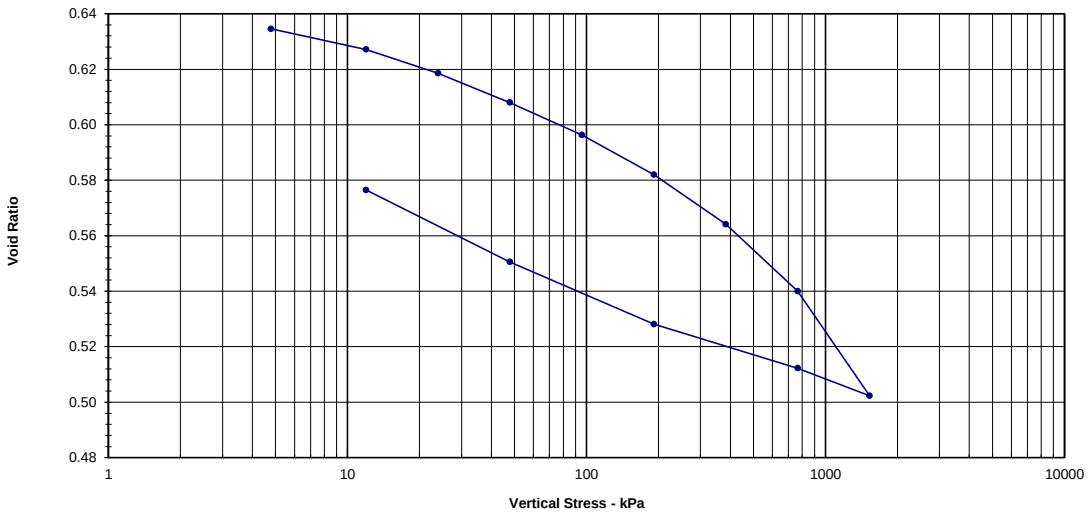
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

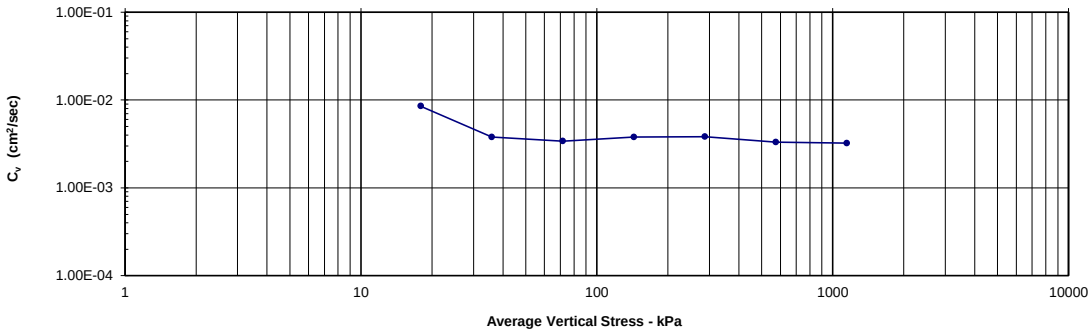
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Borehole:**	AH15-14
Sch No.	56	**Project :**	Pacific Rim	**Sample:**	9
Lab Work:	MM	**Location:**	Tofino, BC	**Depth(m):**	15.30 - 15.79

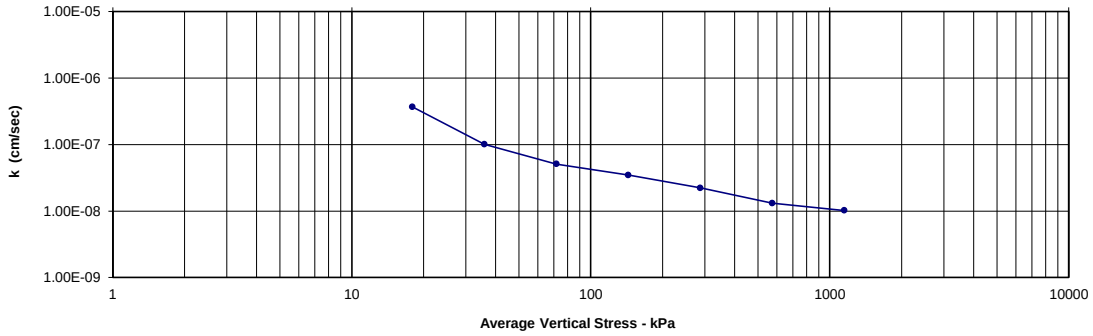
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



MM	February 3, 2016	L.Lee	February 17, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Borehole:**	AH15-14
Sch No.	56	**Project :**	Pacific Rim	**Sample:**	9
Lab Work:	MM	**Location:**	Tofino, BC	**Depth(m):**	15.30 - 15.79

Equipment

Machine: Sigma-1
Mach No. 2
Ring No. Z
Drainage: Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	22.05	21.10
Diameter (mm) =	63.49	63.49
Area (cm^2) =	31.65	31.65
Volume (cm^3) =	69.81	66.80

Phase Relationships

	Initial	Final
Wet Wt (g) =	141.40	138.97
Dry Wt (g) =	114.88	114.88
w (%) =	23.08	20.97
e =	0.635	0.564
ρ_{wet} (kg/m^3) =	2026	2081
ρ_{drv} (kg/m^3) =	1646	1720
S (%) =	98	100

Remarks

ASTM Method: B - Constant Time Increment @ EOP
Method for Cv : Taylor
H_{avg} **:** Half the specimen height
Time Increment: 600 min

Sample Properties

G_s = 2.69 Calculated
H_s (mm) = 13.49

Atterberg Limits

Liquid Limit: N/A
Plastic Limit: N/A
Plasticity Index: N/A
Soil Classification: N/A

Estimated Preconsolidation Stress: N/A

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	H-H_s (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.00	22.05	0.00	8.56	0.635						
2	12	0.12	21.95	0.45	8.46	0.627						
3	24	0.14	21.84	0.98	8.34	0.619	18	0.62	10.95	1.99	8.5E-03	3.7E-07
4	48	0.17	21.69	1.62	8.20	0.608	36	0.61	10.88	4.42	3.8E-03	1.0E-07
5	96	0.18	21.54	2.34	8.04	0.596	72	0.60	10.81	4.85	3.4E-03	5.1E-08
6	192	0.24	21.34	3.21	7.85	0.582	144	0.59	10.72	4.29	3.8E-03	3.5E-08
7	383	0.30	21.10	4.31	7.61	0.564	287	0.57	10.61	4.15	3.8E-03	2.2E-08
8	766	0.42	20.78	5.78	7.29	0.540	575	0.55	10.47	4.69	3.3E-03	1.3E-08
9	1532	0.63	20.27	8.09	6.78	0.502	1149	0.52	10.26	4.62	3.2E-03	1.0E-08
10	766	-0.21	20.40	7.48	6.91	0.512						
11	192	-0.32	20.62	6.51	7.13	0.528						
12	48	-0.35	20.92	5.14	7.43	0.551						
13	12	-0.38	21.27	3.55	7.78	0.576						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.

Description: CLAYEY SILT; trace gravel, grey, w>PL, moist, stiff.

MM	February 3, 2016	L.Lee	February 17, 2016
TESTED BY	DATE	CHECKED BY	DATE

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER				Reference(s) ASTM D854 -14
Client:	PWGSC			**Borehole:** AH15-14
Project:	Pacific Rim			**Sample Number:** 10
Location:	Tofino, BC			**Depth (m):** 16.8-17.3
Project No.:	13-1447-0497	**Phase:** 7000	**Task:** 7002	**Lab ID No:** 56

Visual Description:	% Passing 4.75mm	N/A
SILTY CLAY, trace gravel, gray, w > PL, stiff	**Excluded Material Description**	

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		C	D
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		90.32	90.54
Mass of Flask + Dry Soil (g)		128.99	128.38
Mass of Flask + Soil + Water (g)	$M_{pws,t}$	363.92	363.63
Test Temperature (°C)	T_t	21.9	21.9
Mass of Flask + Water (g)	$M_{pw,t}$	339.66	339.69
Tare Number		1D	2D
Mass of Tare + Dry Soil (g)		220.75	223.29
Mass of Tare (g)		182.28	185.53
Mass of Oven Dry Soil (g)	M_S	38.47	37.76
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.71	2.73
Specific Gravity at 20ºC	$G_{20ºC}$	2.71	2.73

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.72

SJ	February 11, 2016	LH	February 15, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-04
Project:	Pacific Rim	**Sample Number:** 7
Location:	Tofino, BC	**Depth (m):** 9.14-9.69
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
CLAY, some silt, grey, moist, firm to stiff.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		A	B
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		90.13	90.85
Mass of Flask + Dry Soil (g)		125.30	126.29
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	361.85	362.75
Test Temperature (°C)	T_t	19.9	19.9
Mass of Flask + Water (g)	$M_{\rho w,t}$	339.61	340.36
Tare Number		1d	2d
Mass of Tare + Dry Soil (g)		217.54	221.30
Mass of Tare (g)		182.38	185.88
Mass of Oven Dry Soil (g)	M_S	35.16	35.42
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.72	2.72
Specific Gravity at 20ºC	$G_{20ºC}$	2.72	2.72

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.72

OA	December 23, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-04
Project:	Pacific Rim	**Sample Number:** 8
Location:	Tofino, BC	**Depth (m):** 12.19-12.74
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
CLAY; some silt; trace coarse sand, dark grey, moist.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		E	F
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		88.35	90.45
Mass of Flask + Dry Soil (g)		124.01	125.97
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	360.35	362.26
Test Temperature (°C)	T_t	20.3	20.3
Mass of Flask + Water (g)	$M_{\rho w,t}$	337.64	339.73
Tare Number		9d	10d
Mass of Tare + Dry Soil (g)		224.17	219.46
Mass of Tare (g)		188.14	183.58
Mass of Oven Dry Soil (g)	M_S	36.03	35.88
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.70	2.69
Specific Gravity at 20ºC	$G_{20ºC}$	2.70	2.69

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.70

OA	December 23, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-06
Project:	Pacific Rim	**Sample Number:** 7
Location:	Tofino, BC	**Depth (m):** 9.14-9.69
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
CLAY; some silt, dark grey, moist.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		C	D
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		90.37	90.59
Mass of Flask + Dry Soil (g)		126.41	126.35
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	362.42	362.5
Test Temperature (°C)	T_t	19.8	19.8
Mass of Flask + Water (g)	$M_{\rho w,t}$	339.78	339.83
Tare Number		3d	4d
Mass of Tare + Dry Soil (g)		217.05	218.16
Mass of Tare (g)		181.25	182.38
Mass of Oven Dry Soil (g)	M_S	35.80	35.78
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.72	2.73
Specific Gravity at 20ºC	$G_{20°C}$	2.72	2.73

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.73

OA	December 23, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-06
Project:	Pacific Rim	**Sample Number:** 8
Location:	Tofino, BC	**Depth (m):** 12.19-12.74
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
CLAY; some silt, trace sand, trace garvel, grey, moist, stiff.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		G	H
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		89.80	89.48
Mass of Flask + Dry Soil (g)		125.29	125.13
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	361.64	361.42
Test Temperature (°C)	T_t	20.3	20.3
Mass of Flask + Water (g)	$M_{\rho w,t}$	339.00	338.74
Tare Number		11d	12d
Mass of Tare + Dry Soil (g)		221.79	219.83
Mass of Tare (g)		185.86	183.84
Mass of Oven Dry Soil (g)	M_S	35.93	35.99
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.70	2.70
Specific Gravity at 20ºC	$G_{20ºC}$	2.70	2.70

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.70

OA	December 23, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-08
Project:	Pacific Rim	**Sample Number:** 6
Location:	Tofino, BC	**Depth (m):** 9.14-9.69
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
Clay, some silt, trace sand, trace gravel, dark grey, moist.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		A	B
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		90.13	90.85
Mass of Flask + Dry Soil (g)		127.10	127.95
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	363.09	363.94
Test Temperature (°C)	T_t	19.5	19.5
Mass of Flask + Water (g)	$M_{\rho w,t}$	339.63	340.38
Tare Number		1d	2d
Mass of Tare + Dry Soil (g)		219.48	222.80
Mass of Tare (g)		182.32	185.62
Mass of Oven Dry Soil (g)	M_S	37.16	37.18
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.71	2.73
Specific Gravity at 20ºC	$G_{20°C}$	2.71	2.73

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.72

OA	January 4, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-08
Project:	Pacific Rim	**Sample Number:** 8
Location:	Tofino, BC	**Depth (m):** 15.24-15.79
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
Silty clay, some coarse sand, dark grey, moist.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		C	D
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		90.37	90.59
Mass of Flask + Dry Soil (g)		126.37	126.58
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	362.80	362.9
Test Temperature (°C)	T_t	19.5	19.5
Mass of Flask + Water (g)	$M_{\rho w,t}$	339.79	339.85
Tare Number		3d	4d
Mass of Tare + Dry Soil (g)		217.47	218.79
Mass of Tare (g)		181.17	182.24
Mass of Oven Dry Soil (g)	M_S	36.30	36.55
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.73	2.71
Specific Gravity at 20ºC	$G_{20ºC}$	2.73	2.71

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.72

OA	January 4, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-12
Project:	Pacific Rim	**Sample Number:** 4
Location:	Tofino, BC	**Depth (m):** 1.52-2.07
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
Silty clay, some sand, brown/grey, moist.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		E	F
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		88.35	90.45
Mass of Flask + Dry Soil (g)		129.16	131.33
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	363.49	365.67
Test Temperature (°C)	T_t	19.5	19.5
Mass of Flask + Water (g)	$M_{\rho w,t}$	337.70	339.78
Tare Number		5d	6d
Mass of Tare + Dry Soil (g)		225.06	223.04
Mass of Tare (g)		183.67	181.57
Mass of Oven Dry Soil (g)	M_S	41.39	41.47
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.65	2.66
Specific Gravity at 20ºC	$G_{20ºC}$	2.65	2.66

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.66

OA	January 4, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

SPECIFIC GRAVITY OF SOIL SOLIDS BY WATER PYCNOMETER		Reference(s) ASTM D854 -14
Client:	PWGSC	**Borehole:** AH15-12
Project:	Pacific Rim	**Sample Number:** 6
Location:	Tofino, BC	**Depth (m):** 7.62-8.17
Project No.:	13-1447-0497 **Phase:** 7000 **Task:** 7002	**Lab ID No:** 556

Visual Description:	% Passing 4.75mm	100.00
Clay, some silt, trace sand, trace gravel, dark grey, moist.	**Excluded Material Description**	No excluded material

Specific Gravity of Fine Fraction Method B - Oven Dried Samples

		Trial 1	Trial 2
Flask Number		G	H
Air Removal Method	M_p	Hot Plate	Hot Plate
Mass of Flask (g)		89.80	89.48
Mass of Flask + Dry Soil (g)		125.25	125.01
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	361.55	361.31
Test Temperature (°C)	T_t	19.7	19.7
Mass of Flask + Water (g)	$M_{\rho w,t}$	339.04	338.78
Tare Number		7d	8d
Mass of Tare + Dry Soil (g)		218.09	221.05
Mass of Tare (g)		182.47	185.34
Mass of Oven Dry Soil (g)	M_S	35.62	35.71
Temperature Coefficient	K	1.00	1.00
Specific Gravity at Test Temperature	G_t	2.72	2.71
Specific Gravity at 20ºC	$G_{20ºC}$	2.72	2.71

AVERAGE SPECIFIC GRAVITY OF TRIALS	2.71

OA	January 4, 2016	LH	January 8, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd
#300 - 3811 North Fraser Way Burnaby, British Columbia Canada V5J 5J2
Tel: (604) 412 6899 Fax: (604) 412 6812 www.golder.com

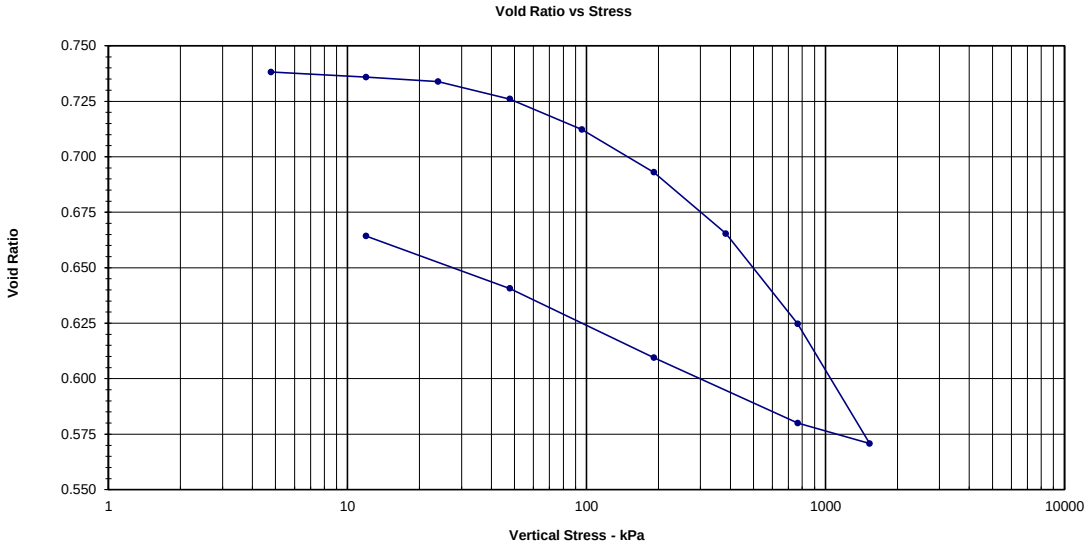
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

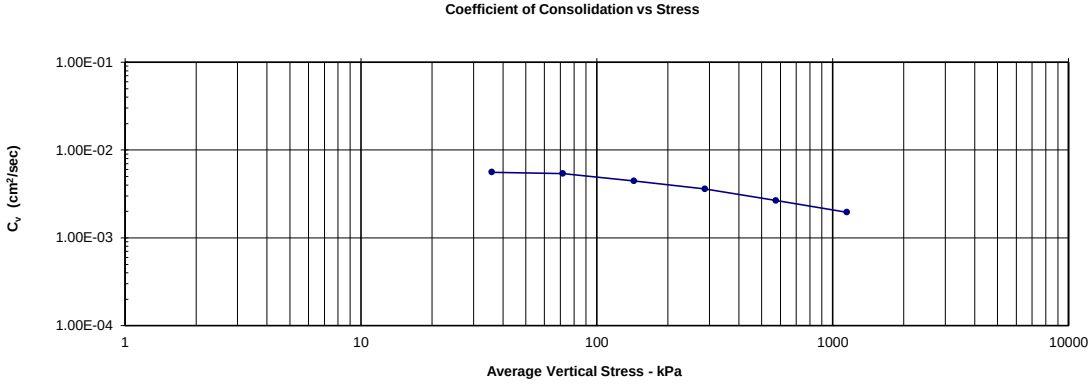
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

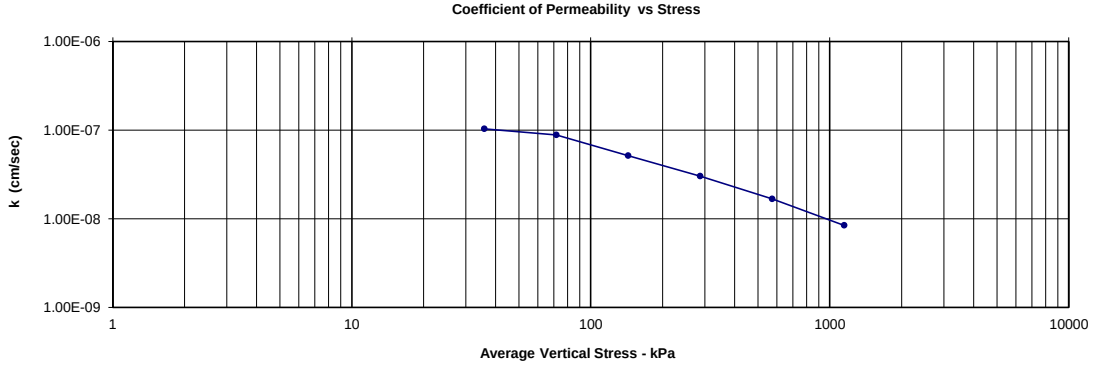
One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-12
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	4
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	1.52 - 2.07







TM/MM	December 28, 2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-12
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	4
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	1.52 - 2.07

Equipment

Machine: Sigma-1
Mach No. 5
Ring No. B1
Drainage: Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.90	21.01
Diameter (mm) =	63.45	63.45
Area (cm^2) =	31.62	31.62
Volume (cm^3) =	69.25	66.44

Phase Relationships

	Initial	Final
Wet Wt (g) =	135.34	132.83
Dry Wt (g) =	106.39	106.39
w (%) =	27.21	24.85
e =	0.732	0.661
ρ_{wet} (kg/m^3) =	1954	1999
ρ_{drv} (kg/m^3) =	1536	1601
S (%) =	99	100

Remarks

ASTM Method: B - Constant Time Increment @ EOP
Method for Cv : Taylor
H_{avg} **:** Half the specimen height
Time Increment: 360 min

Sample Properties

G_s = 2.66 Calculated
H_s (mm) = 12.65

Atterberg Limits

Liquid Limit: N/A
Plastic Limit: N/A
Plasticity Index: N/A
Soil Classification: N/A

Estimated Preconsolidation Stress: N/A

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	H-H_s (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	-0.09	21.99	-0.42	9.34	0.738						
2	12	0.06	21.96	-0.28	9.31	0.736						
3	24	0.06	21.93	-0.17	9.28	0.734						
4	48	0.14	21.83	0.28	9.18	0.726	36	0.73	10.94	3.03	5.6E-03	1.0E-07
5	96	0.21	21.66	1.08	9.01	0.712	72	0.72	10.87	3.10	5.4E-03	8.8E-08
6	192	0.30	21.41	2.19	8.77	0.693	144	0.70	10.77	3.68	4.4E-03	5.2E-08
7	383	0.43	21.07	3.79	8.42	0.665	287	0.68	10.62	4.44	3.6E-03	3.0E-08
8	766	0.62	20.55	6.14	7.90	0.625	575	0.65	10.40	5.76	2.7E-03	1.7E-08
9	1532	0.88	19.87	9.25	7.22	0.571	1149	0.60	10.11	7.38	2.0E-03	8.5E-09
10	766	-0.27	19.99	8.72	7.34	0.580						
11	192	-0.52	20.36	7.02	7.71	0.609						
12	48	-0.47	20.75	5.22	8.10	0.641						
13	12	-0.34	21.05	3.85	8.40	0.664						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.
Sample patched due to sand.

Description: SILTY CLAY; some sand, brown to grey, moist.

TM/MM	December 28, 2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

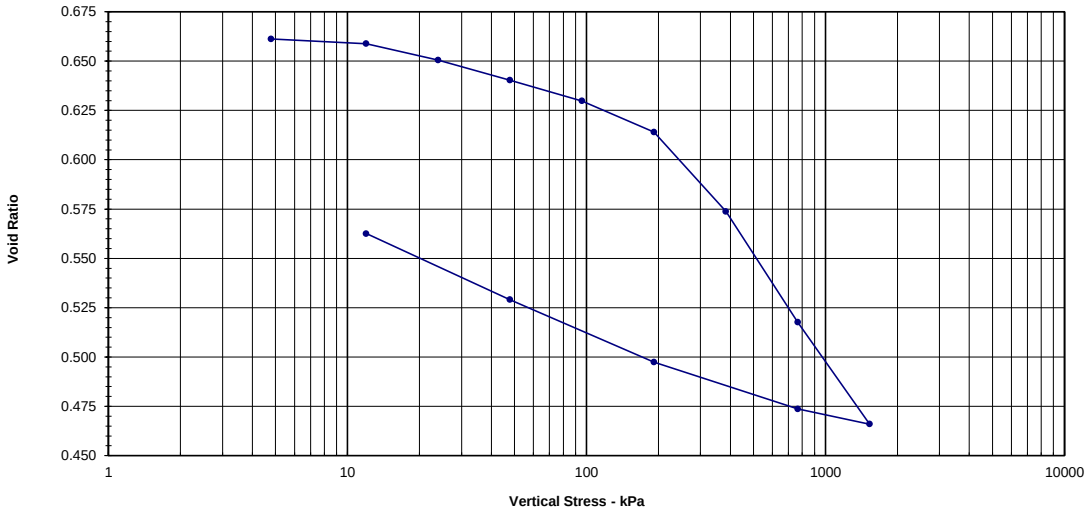
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

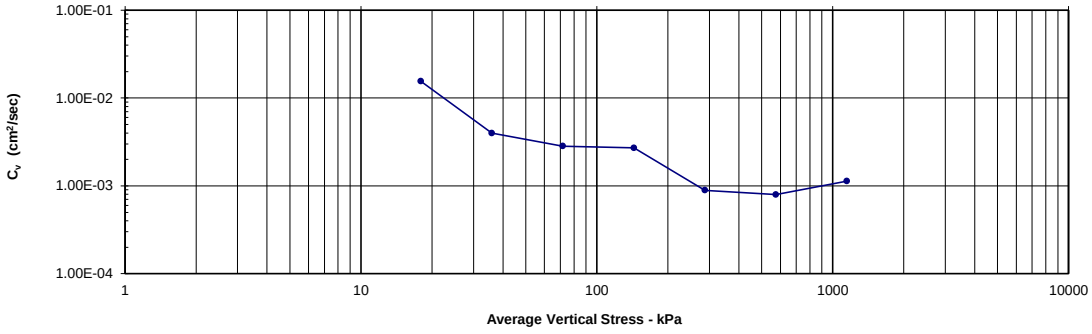
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-08
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	6
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	9.14 - 9.69

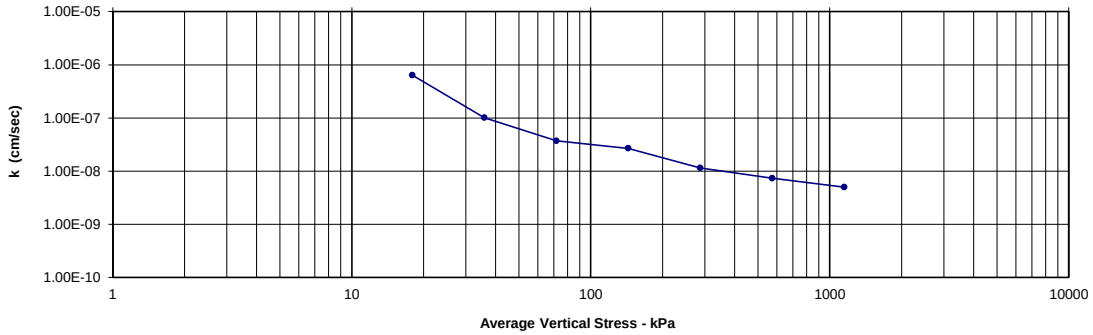
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



TM/MM	December 28, 2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-08
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	6
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	9.14 - 9.69

Equipment

Machine:	Sigma-1
Mach No.	3
Ring No.	C1
Drainage:	Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.83	20.05
Diameter (mm) =	63.52	63.52
Area (cm^2) =	31.69	31.69
Volume (cm^3) =	69.18	63.53

Phase Relationships

	Initial	Final
Wet Wt (g) =	139.69	134.97
Dry Wt (g) =	112.97	112.97
w (%) =	23.65	19.47
e =	0.666	0.530
ρ_{wet} (kg/m^3) =	2019	2124
ρ_{drv} (kg/m^3) =	1633	1778
S (%) =	97	100

Remarks

ASTM Method:	B - Constant Time Increment @ EOP
Method for Cv :	Taylor
H_{avg} **:**	Half the specimen height
Time Increment:	360 min

Sample Properties

G_s = 2.72 Calculated

H_s (mm) = 13.11

Atterberg Limits

Liquid Limit:	N/A
Plastic Limit:	N/A
Plasticity Index:	N/A
Soil Classification:	N/A

Estimated Preconsolidation Stress: 240 kPa

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	$H-H_s$ (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.06	21.77	0.26	8.67	0.661						
2	12	0.05	21.74	0.40	8.64	0.659						
3	24	0.13	21.63	0.90	8.53	0.651	18	0.65	10.84	1.07	1.5E-02	6.4E-07
4	48	0.15	21.50	1.52	8.39	0.640	36	0.65	10.78	4.13	4.0E-03	1.0E-07
5	96	0.19	21.36	2.15	8.25	0.630	72	0.64	10.71	5.72	2.8E-03	3.7E-08
6	192	0.27	21.15	3.10	8.05	0.614	144	0.62	10.63	5.91	2.7E-03	2.7E-08
7	383	0.60	20.63	5.51	7.52	0.574	287	0.59	10.45	17.33	8.9E-04	1.2E-08
8	766	0.84	19.89	8.88	6.79	0.518	575	0.55	10.13	18.25	7.9E-04	7.4E-09
9	1532	0.85	19.21	11.98	6.11	0.466	1149	0.49	9.78	11.97	1.1E-03	5.0E-09
10	766	-0.26	19.31	11.52	6.21	0.474						
11	192	-0.44	19.63	10.10	6.52	0.497						
12	48	-0.47	20.04	8.20	6.93	0.529						
13	12	-0.45	20.48	6.19	7.37	0.563						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.
Sample patched due to gravel.

Description: CLAY; some silt; trace gravel, grey, moist.

TM/MM	December 28, 2015	L.Lee	January 11, 2016
TESTED BY	DATE	CHECKED BY	DATE

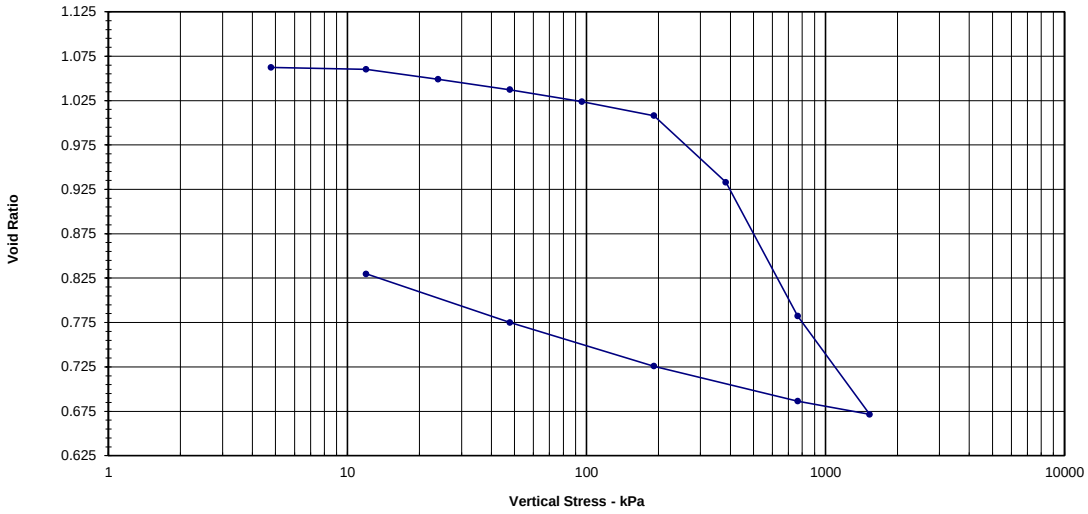
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

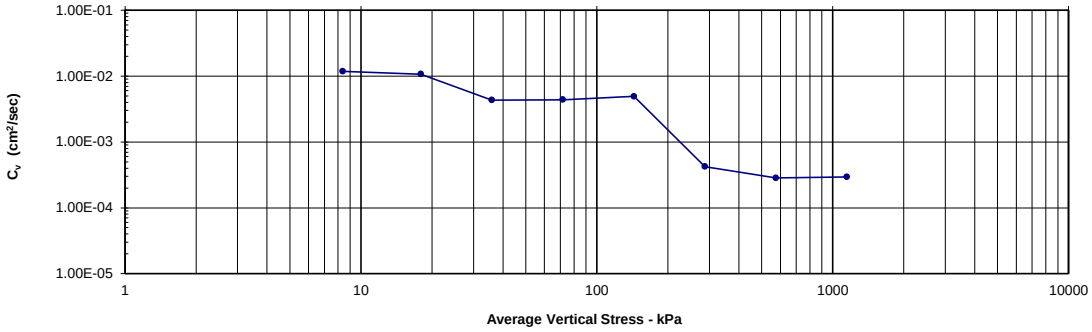
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-06
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	8
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	12.19 - 12.74

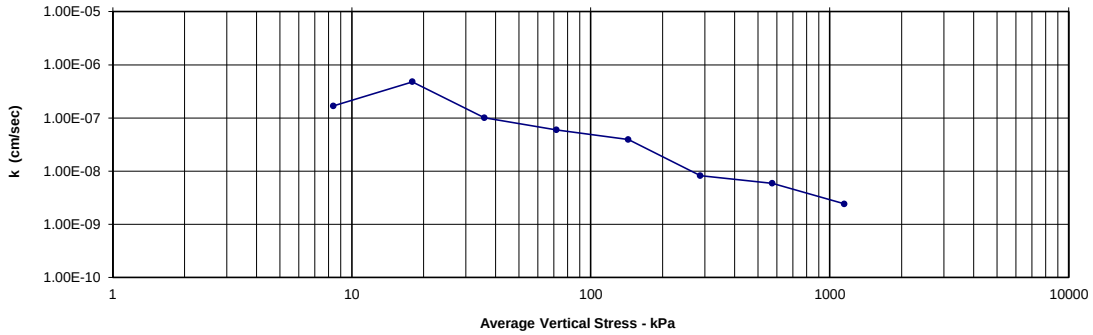
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



TM/MM	December 21, 2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-06
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	8
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	12.19 - 12.74

Equipment

Machine:	Sigma-1
Mach No.	6
Ring No.	B
Drainage:	Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.48	18.68
Diameter (mm) =	63.59	63.59
Area (cm^2) =	31.75	31.75
Volume (cm^3) =	68.19	59.32

Phase Relationships

	Initial	Final
Wet Wt (g) =	123.95	115.38
Dry Wt (g) =	89.04	89.04
w (%) =	39.21	29.58
e =	1.068	0.799
ρ_{wet} (kg/m^3) =	1818	1945
ρ_{drv} (kg/m^3) =	1306	1501
S (%) =	99	100

Remarks

ASTM Method:	B - Constant Time Increment @ EOP
Method for Cv :	Taylor
H_{avg} **:**	Half the specimen height
Time Increment:	360 min

Sample Properties

G_s = 2.70 Calculated

H_s (mm) = 10.39

Atterberg Limits

Liquid Limit:	N/A
Plastic Limit:	N/A
Plasticity Index:	N/A
Soil Classification:	N/A

Estimated Preconsolidation Stress: 263 kPa

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	H-H_s (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.07	21.42	0.33	11.03	1.062						
2	12	0.04	21.40	0.43	11.01	1.060	8	1.06	10.70	1.38	1.2E-02	1.7E-07
3	24	0.14	21.28	0.98	10.89	1.049	18	1.05	10.67	1.50	1.1E-02	4.8E-07
4	48	0.15	21.16	1.54	10.77	1.037	36	1.04	10.61	3.69	4.3E-03	1.0E-07
5	96	0.17	21.02	2.19	10.63	1.024	72	1.03	10.54	3.59	4.4E-03	6.0E-08
6	192	0.21	20.85	2.95	10.47	1.008	144	1.02	10.47	3.16	4.9E-03	3.9E-08
7	383	0.83	20.07	6.58	9.69	0.933	287	0.97	10.23	35.14	4.2E-04	8.2E-09
8	766	1.66	18.51	13.86	8.12	0.782	575	0.86	9.65	46.39	2.8E-04	5.9E-09
9	1532	1.27	17.36	19.22	6.97	0.671	1149	0.73	8.97	38.63	2.9E-04	2.4E-09
10	766	-0.23	17.51	18.50	7.13	0.686						
11	192	-0.52	17.92	16.59	7.54	0.726						
12	48	-0.56	18.43	14.22	8.05	0.775						
13	12	-0.60	19.00	11.57	8.62	0.830						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.

Description: CLAY; some silt; trace sand; trace gravel, grey, moist, stiff.

TM/MM	December 21, 2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

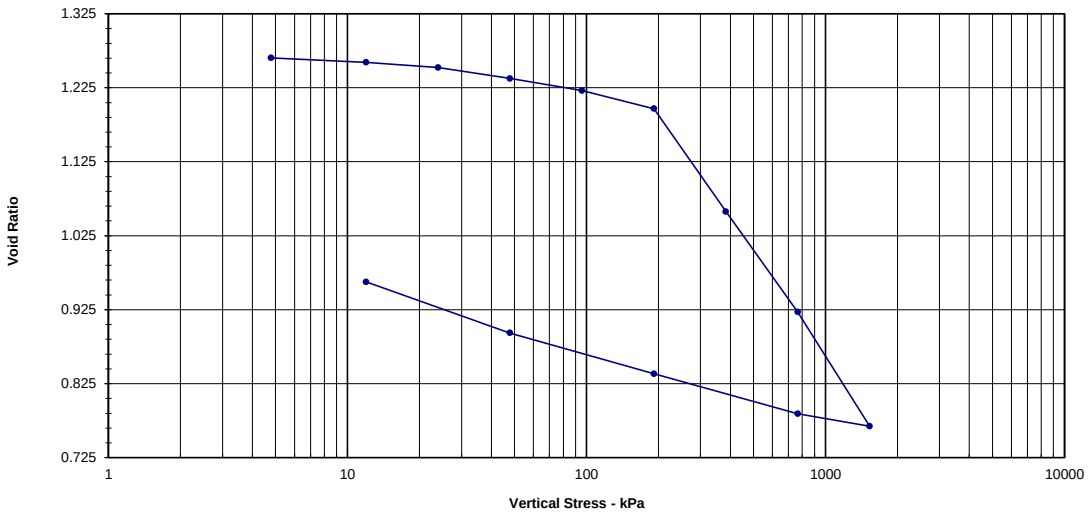
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

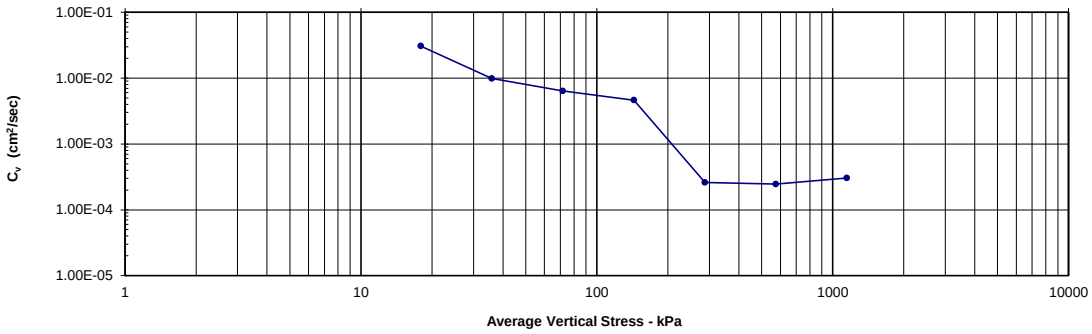
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-06
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	7
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	9.14 - 9.69

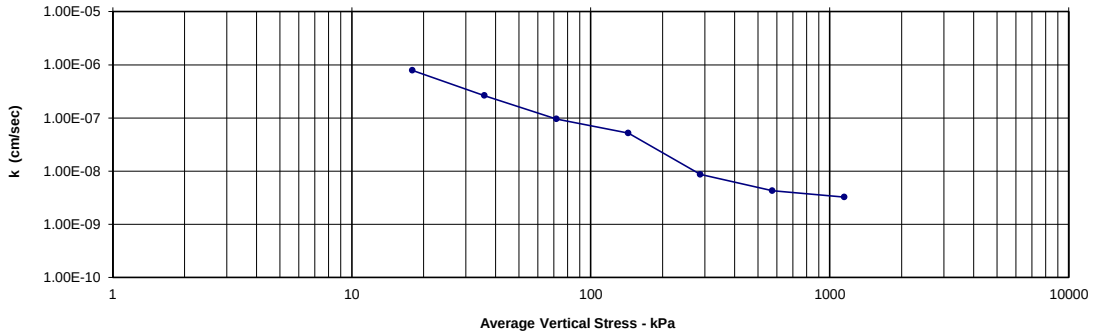
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



TM/MM	December 21, 2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-06
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	7
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	9.14 - 9.69

Equipment

Machine:	Sigma-1
Mach No.	5
Ring No.	AC2
Drainage:	Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.72	18.01
Diameter (mm) =	63.62	63.62
Area (cm^2) =	31.78	31.78
Volume (cm^3) =	69.03	57.23

Phase Relationships

	Initial	Final
Wet Wt (g) =	120.86	109.88
Dry Wt (g) =	83.08	83.08
w (%) =	45.47	32.26
e =	1.268	0.881
ρ_{wet} (kg/m^3) =	1751	1920
ρ_{drv} (kg/m^3) =	1204	1452
S (%) =	98	100

Remarks

ASTM Method:	B - Constant Time Increment @ EOP
Method for Cv :	Taylor
H_{avg} **:**	Half the specimen height
Time Increment:	360 min

Sample Properties

G_s =	2.73	Calculated
H_s (mm) =	9.57	

Atterberg Limits

Liquid Limit:	N/A
Plastic Limit:	N/A
Plasticity Index:	N/A
Soil Classification:	N/A

Estimated Preconsolidation Stress: 209 kPa

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	$H-H_s$ (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.03	21.69	0.13	12.12	1.265						
2	12	0.07	21.63	0.40	12.06	1.259						
3	24	0.08	21.56	0.71	11.99	1.252	18	1.26	10.80	0.54	3.1E-02	7.8E-07
4	48	0.16	21.42	1.35	11.85	1.237	36	1.24	10.75	1.66	9.8E-03	2.6E-07
5	96	0.21	21.27	2.08	11.69	1.221	72	1.23	10.67	2.53	6.4E-03	9.6E-08
6	192	0.29	21.03	3.15	11.46	1.197	144	1.21	10.57	3.42	4.6E-03	5.2E-08
7	383	1.58	19.70	9.28	10.13	1.058	287	1.13	10.18	56.51	2.6E-04	8.7E-09
8	766	1.35	18.40	15.27	8.83	0.922	575	0.99	9.53	52.30	2.5E-04	4.3E-09
9	1532	1.53	16.92	22.07	7.35	0.768	1149	0.84	8.83	36.26	3.0E-04	3.3E-09
10	766	-0.32	17.09	21.33	7.51	0.784						
11	192	-0.64	17.60	18.95	8.03	0.838						
12	48	-0.58	18.13	16.52	8.56	0.894						
13	12	-0.67	18.79	13.48	9.22	0.962						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.

Description: CLAY; some silt, dark grey, moist.

TM/MM	December 21, 2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

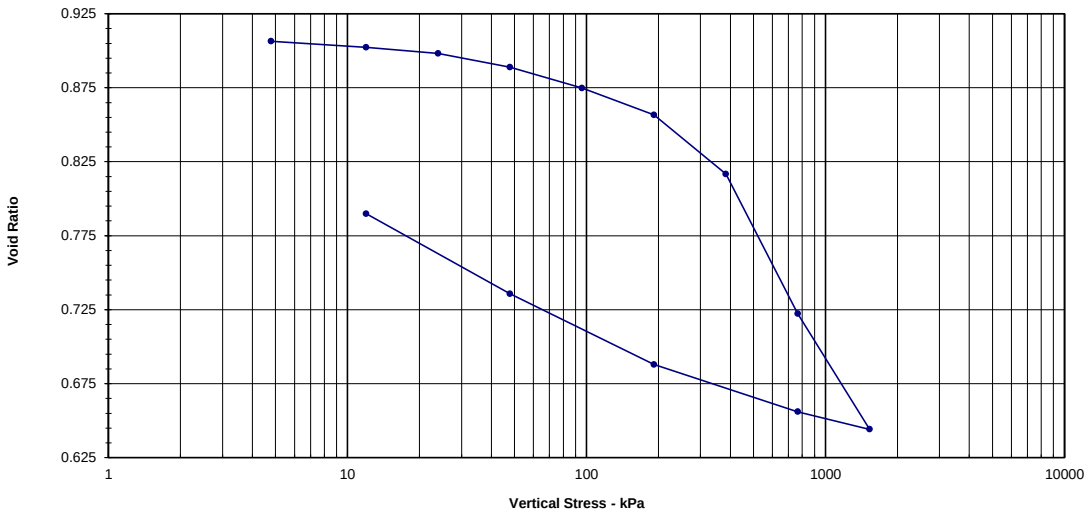
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

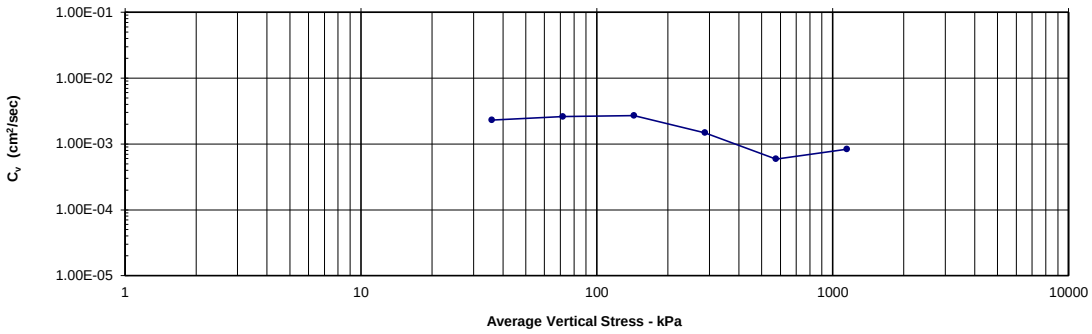
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-04
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	8
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	12.19 - 12.74

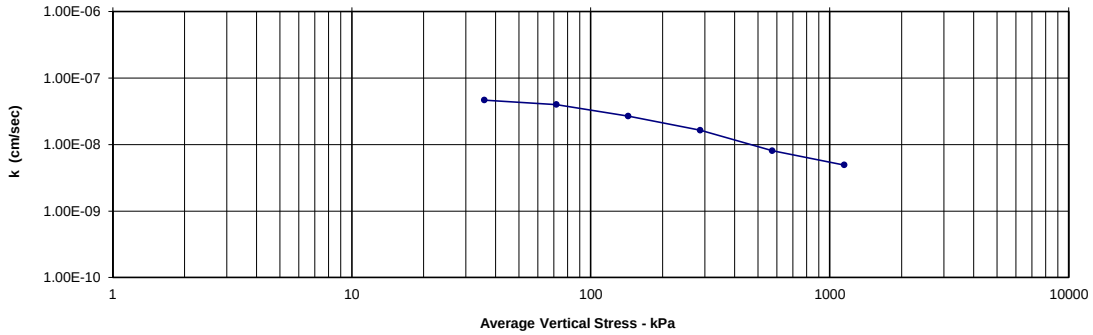
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



TM/MM	21/12/2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-04
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	8
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	12.19 - 12.74

Equipment

Machine: Sigma-1
Mach No. 4
Ring No. Y
Drainage: Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.68	19.83
Diameter (mm) =	63.57	63.57
Area (cm^2) =	31.74	31.74
Volume (cm^3) =	68.80	62.95

Phase Relationships

	Initial	Final
Wet Wt (g) =	129.41	124.60
Dry Wt (g) =	97.91	97.91
w (%) =	32.17	27.26
e =	0.897	0.736
ρ_{wet} (kg/m^3) =	1881	1979
ρ_{drv} (kg/m^3) =	1423	1555
S (%) =	97	100

Remarks

ASTM Method: B - Constant Time Increment @ EOP
Method for Cv : Taylor
H_{avg} **:** Half the specimen height
Time Increment: 360 min

Sample Properties

G_s = 2.70 Calculated
H_s (mm) = 11.43

Atterberg Limits

Liquid Limit: N/A
Plastic Limit: N/A
Plasticity Index: N/A
Soil Classification: N/A

Estimated Preconsolidation Stress: 300 kPa

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	H-H_s (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	-0.09	21.78	-0.48	10.36	0.906						
2	12	0.11	21.73	-0.26	10.31	0.902						
3	24	0.08	21.69	-0.05	10.26	0.898						
4	48	0.14	21.58	0.44	10.16	0.889	36	0.89	10.82	7.18	2.3E-03	4.7E-08
5	96	0.21	21.42	1.19	9.99	0.875	72	0.88	10.75	6.28	2.6E-03	4.0E-08
6	192	0.27	21.21	2.15	9.79	0.857	144	0.87	10.66	5.98	2.7E-03	2.7E-08
7	383	0.53	20.76	4.25	9.33	0.817	287	0.84	10.49	10.53	1.5E-03	1.6E-08
8	766	1.19	19.68	9.23	8.25	0.722	575	0.77	10.11	24.40	5.9E-04	8.1E-09
9	1532	1.02	18.79	13.34	7.36	0.644	1149	0.68	9.62	15.72	8.3E-04	4.9E-09
10	766	-0.21	18.92	12.72	7.50	0.656						
11	192	-0.48	19.28	11.04	7.86	0.688						
12	48	-0.64	19.83	8.51	8.41	0.736						
13	12	-0.63	20.45	5.67	9.02	0.790						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.
Advanced to 12 kPa due to swelling.

Description: CLAY; some silt; trace coarse sand, dark grey, moist.

TM/MM	21/12/2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

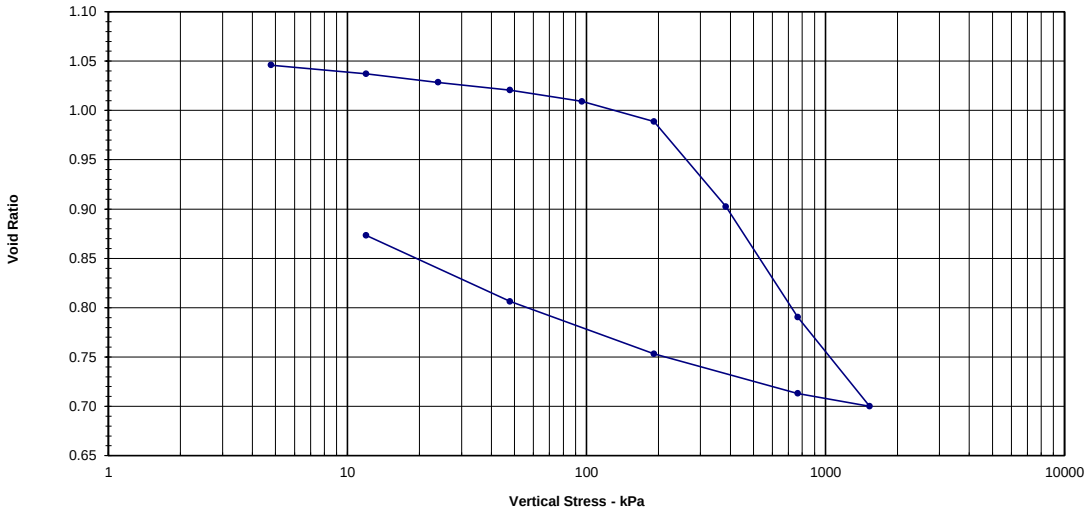
Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

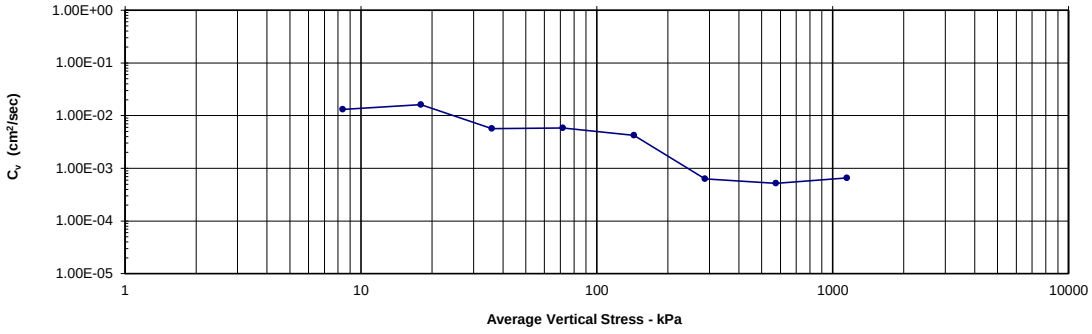
Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-04
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	7
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	9.14 - 9.69

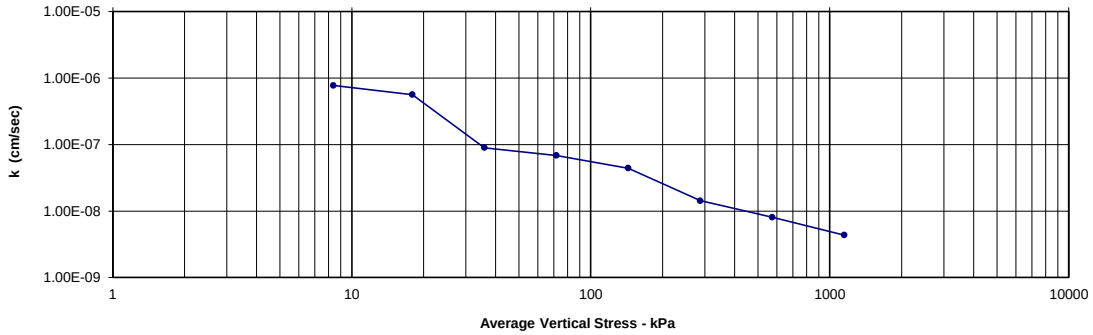
Vold Ratio vs Stress



Coefficient of Consolidation vs Stress



Coefficient of Permeability vs Stress



TM/MM	December 21, 2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
Unit 300 - 3811 North Fraser Way
Burnaby, B.C. Canada V5J 5J2

One-Dimensional Consolidation Properties of Soils

Reference(s)
ASTM D 2435/D 2435M-11

Project No. :	13-1447-0497 Phase: 7000 Task: 7002	**Client :**	PWGSC	**Point ID:**	AH15-04
Sch No.	556	**Project :**	Pacific Rim	**Sample:**	7
Lab Work:	TM/MM	**Location:**	Tofino, BC	**Compaction:**	9.14 - 9.69

Equipment

Machine: Sigma-1
Mach No. 7
Ring No. Z
Drainage: Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	21.82	19.39
Diameter (mm) =	63.48	63.48
Area (cm^2) =	31.64	31.64
Volume (cm^3) =	69.04	61.36

Phase Relationships

	Initial	Final
Wet Wt (g) =	125.65	119.41
Dry Wt (g) =	91.80	91.80
w (%) =	36.87	30.08
e =	1.046	0.818
ρ_{wet} (kg/m^3) =	1820	1946
ρ_{drv} (kg/m^3) =	1330	1496
S (%) =	96	100

Remarks

ASTM Method: B - Constant Time Increment @ EOP
Method for Cv : Taylor
H_{avg} : Half the specimen height
Time Increment: 360 min

Sample Properties

G_s = 2.72 Calculated
H_s (mm) = 10.67

Atterberg Limits

Liquid Limit: N/A
Plastic Limit: N/A
Plasticity Index: N/A
Soil Classification: N/A

Estimated Preconsolidation Stress: 221 kPa

Load #	Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε $\Sigma \Delta H / Ho$ (%)	H-H_s (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 90 (min)	Cv (cm^2/sec)	k (cm/sec)
1	5	0.00	21.82	-0.02	11.16	1.046						
2	12	0.13	21.73	0.41	11.06	1.037	8	1.04	10.89	1.28	1.3E-02	7.8E-07
3	24	0.13	21.63	0.84	10.97	1.028	18	1.03	10.84	1.03	1.6E-02	5.6E-07
4	48	0.14	21.55	1.22	10.89	1.021	36	1.02	10.80	2.91	5.7E-03	9.0E-08
5	96	0.20	21.43	1.79	10.76	1.009	72	1.01	10.74	2.80	5.8E-03	6.9E-08
6	192	0.29	21.21	2.79	10.54	0.989	144	1.00	10.66	3.82	4.2E-03	4.4E-08
7	383	1.00	20.29	7.00	9.62	0.902	287	0.95	10.37	24.15	6.3E-04	1.4E-08
8	766	1.33	19.10	12.47	8.43	0.791	575	0.85	9.85	26.39	5.2E-04	8.1E-09
9	1532	1.13	18.13	16.89	7.47	0.700	1149	0.75	9.31	18.66	6.6E-04	4.4E-09
10	766	-0.23	18.27	16.26	7.61	0.713						
11	192	-0.55	18.70	14.30	8.03	0.753						
12	48	-0.65	19.27	11.70	8.60	0.806						
13	12	-0.77	19.98	8.42	9.32	0.873						

Comments: Void Ratio Vs. Stress computed for end of primary consolidation. Final height calculated to 100% saturation.

Description: CLAY; some silt, grey, moist, firm to stiff.

TM/MM	December 21, 2015	L.Lee	January 6, 2016
TESTED BY	DATE	CHECKED BY	DATE

APPENDIX E

2010 National Building Code Seismic Hazard Calculation

2010 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Requested by: A. Ramey, Golder Associates

February 03, 2016

Site Coordinates: 49.0715 North 125.8085 West

User File Reference: Tofino B.C.

National Building Code ground motions:
2% probability of exceedance in 50 years (0.000404 per annum)

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA (g)
1.201	0.936	0.473	0.206	0.522

Notes. Spectral and peak hazard values are determined for firm ground (NBCC 2010 soil class C - average shear wave velocity 360-750 m/s). Median (50th percentile) values are given in units of g. 5% damped spectral acceleration (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are tabulated. Only 2 significant figures are to be used. ***These values have been interpolated from a 10 km spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the calculated values.*** Warning: You are in a region which considers the hazard from a deterministic Cascadia subduction event for the National Building Code. Values determined for high probabilities (0.01 per annum) in this region do not consider the hazard from this type of earthquake.

Ground motions for other probabilities:

Probability of exceedance per annum	0.010	0.0021	0.001
Probability of exceedance in 50 years	40%	10%	5%
Sa(0.2)	0.158	0.627	0.762
Sa(0.5)	0.109	0.489	0.594
Sa(1.0)	0.060	0.247	0.300
Sa(2.0)	0.034	0.097	0.122
PGA	0.077	0.273	0.331

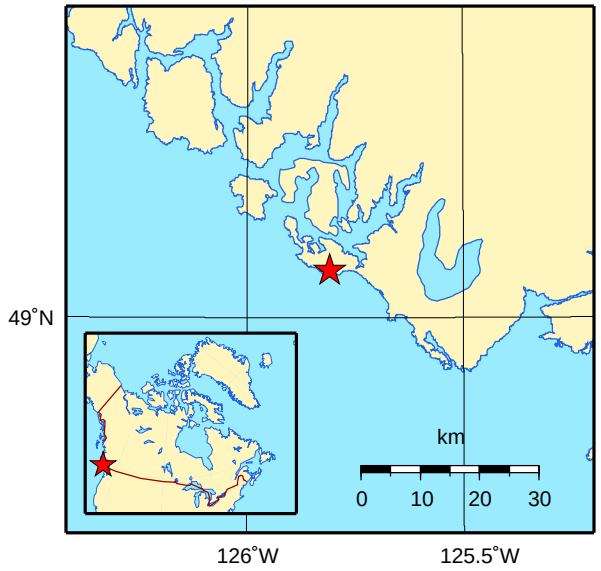
References

National Building Code of Canada 2010 NRCC no. 53301; sections 4.1.8, 9.20.1.2, 9.23.10.2, 9.31.6.2, and 6.2.1.3
Appendix C: Climatic Information for Building Design in Canada - table in Appendix C starting on page C-11 of Division B, volume 2

User's Guide - NBC 2010, Structural Commentaries NRCC no. 53543 (in preparation)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File xxxx
Fourth generation seismic hazard maps of Canada: Maps and grid values to be used with the 2010 National Building Code of Canada (in preparation)

See the websites *www.EarthquakesCanada.ca* and *www.nationalcodes.ca* for more information



Aussi disponible en français

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
2nd floor, 3795 Carey Road
Victoria, British Columbia, V8Z 6T8
Canada
T: +1 (250) 881 7372

Golder Associates

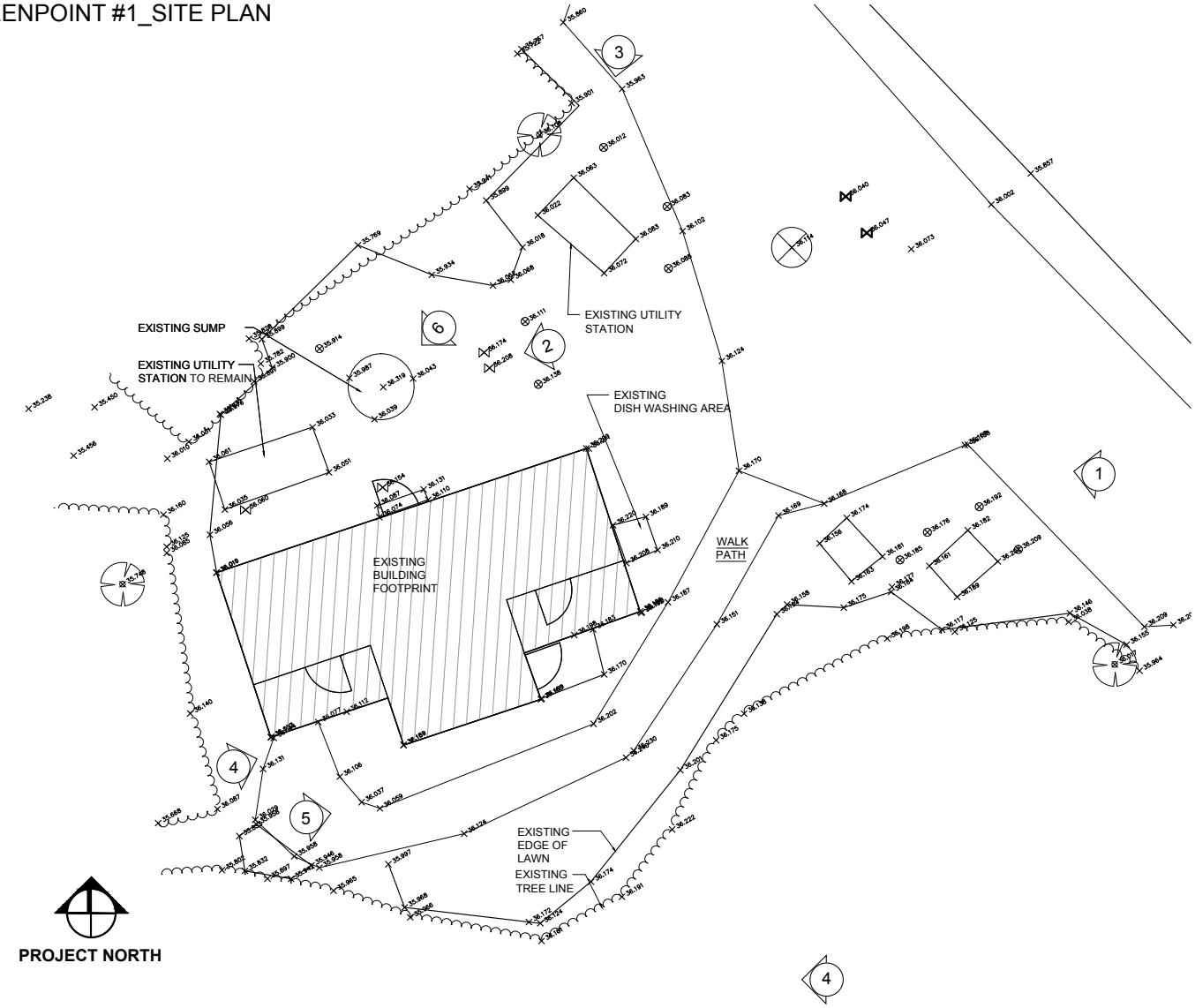
PACIFIC RIM NATIONAL PARK

WASHROOM BUILDINGS

APPENDIX 3

SITE PHOTOS

GREENPOINT #1_SITE PLAN



01. JPG

02. JPG

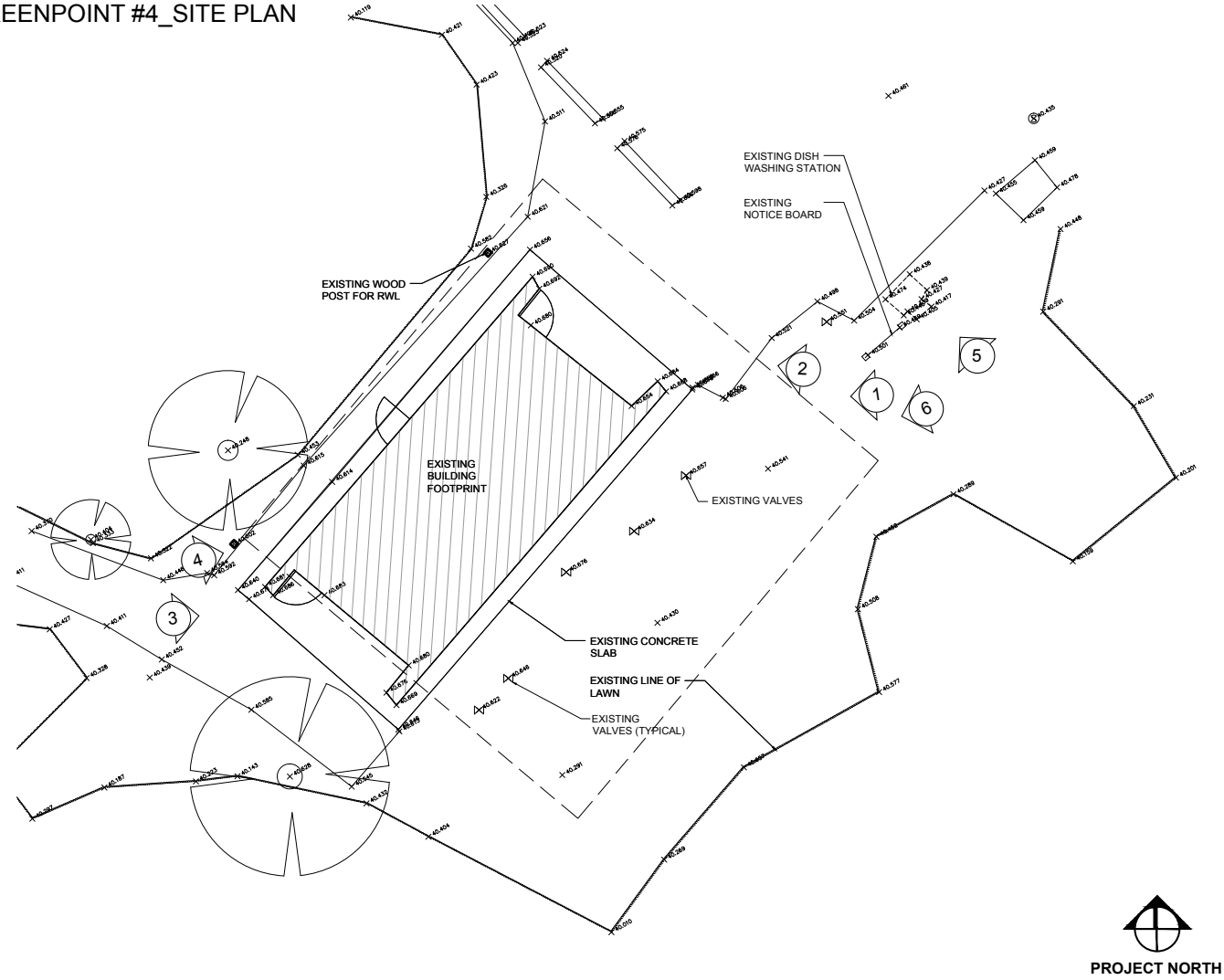
03. JPG

04. JPG

05. JPG

06. JPG

GREENPOINT #4_SITE PLAN



01. JPG

02. JPG

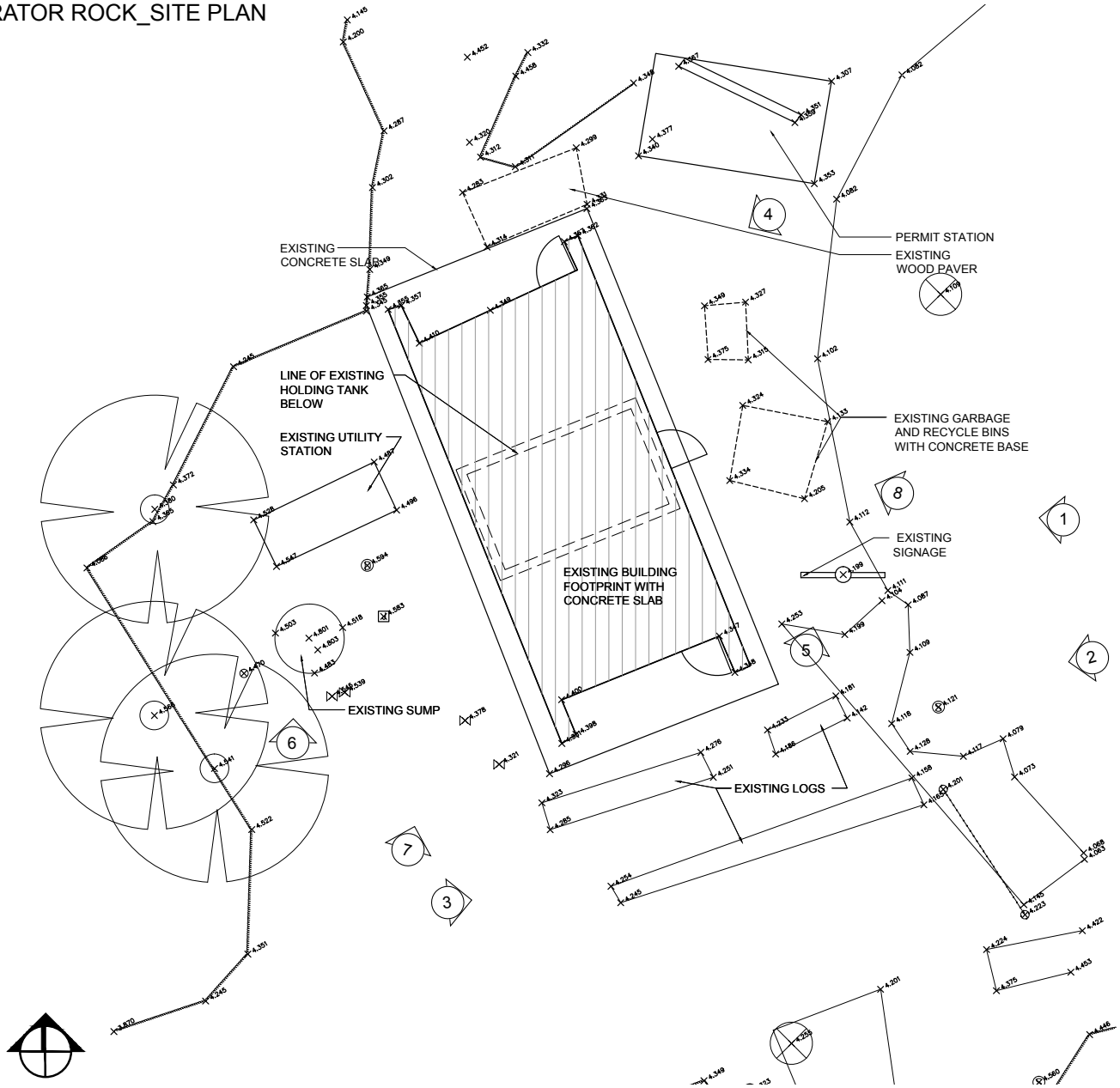
03. JPG

04. JPG

05. JPG

06. JPG

INCINERATOR ROCK_SITE PLAN



01. JPG

02. JPG

03. JPG

04. JPG

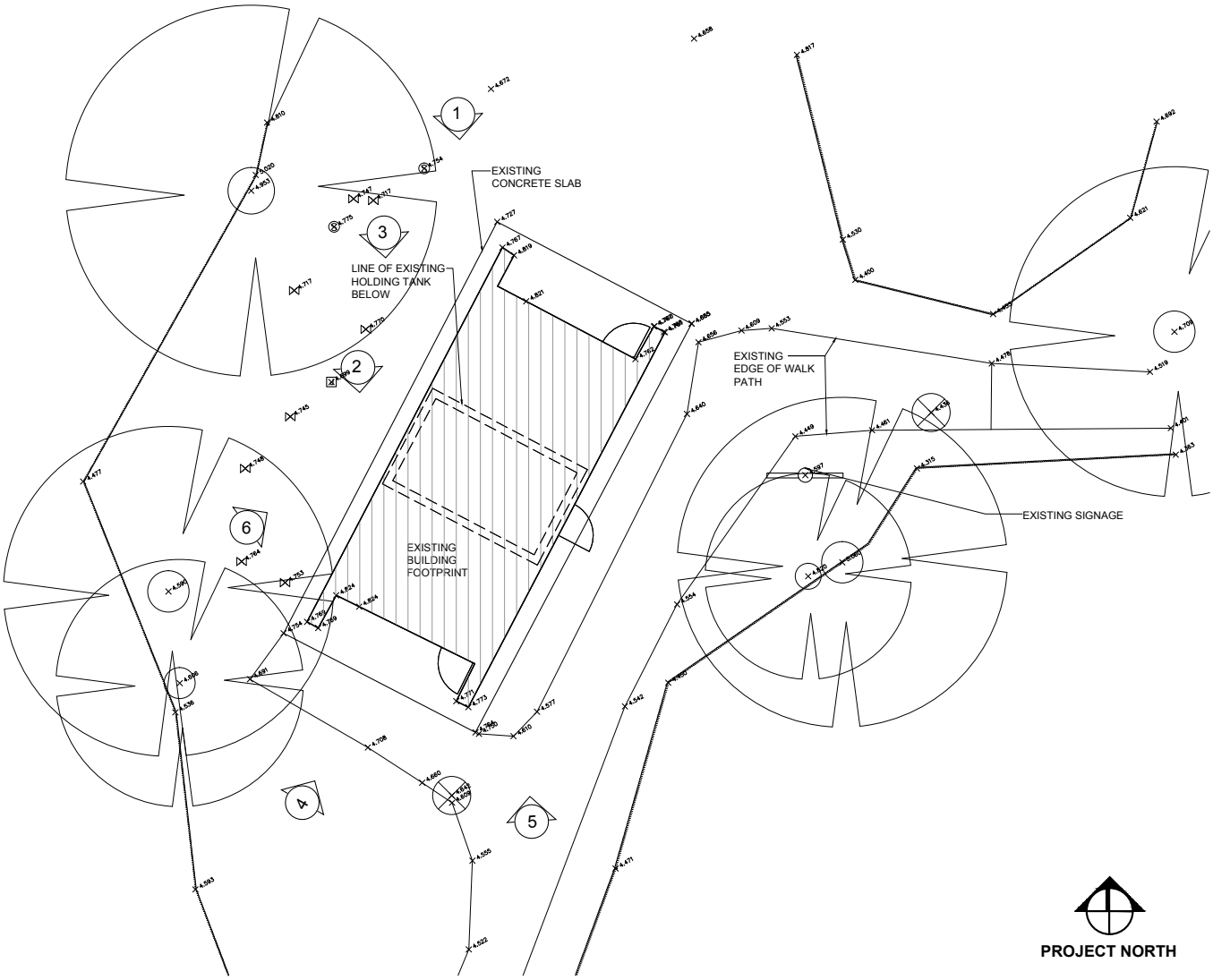
05. JPG

06. JPG

07. JPG

08. JPG

LONG BEACH NORTH_SITE PLAN



01. JPG

02. JPG

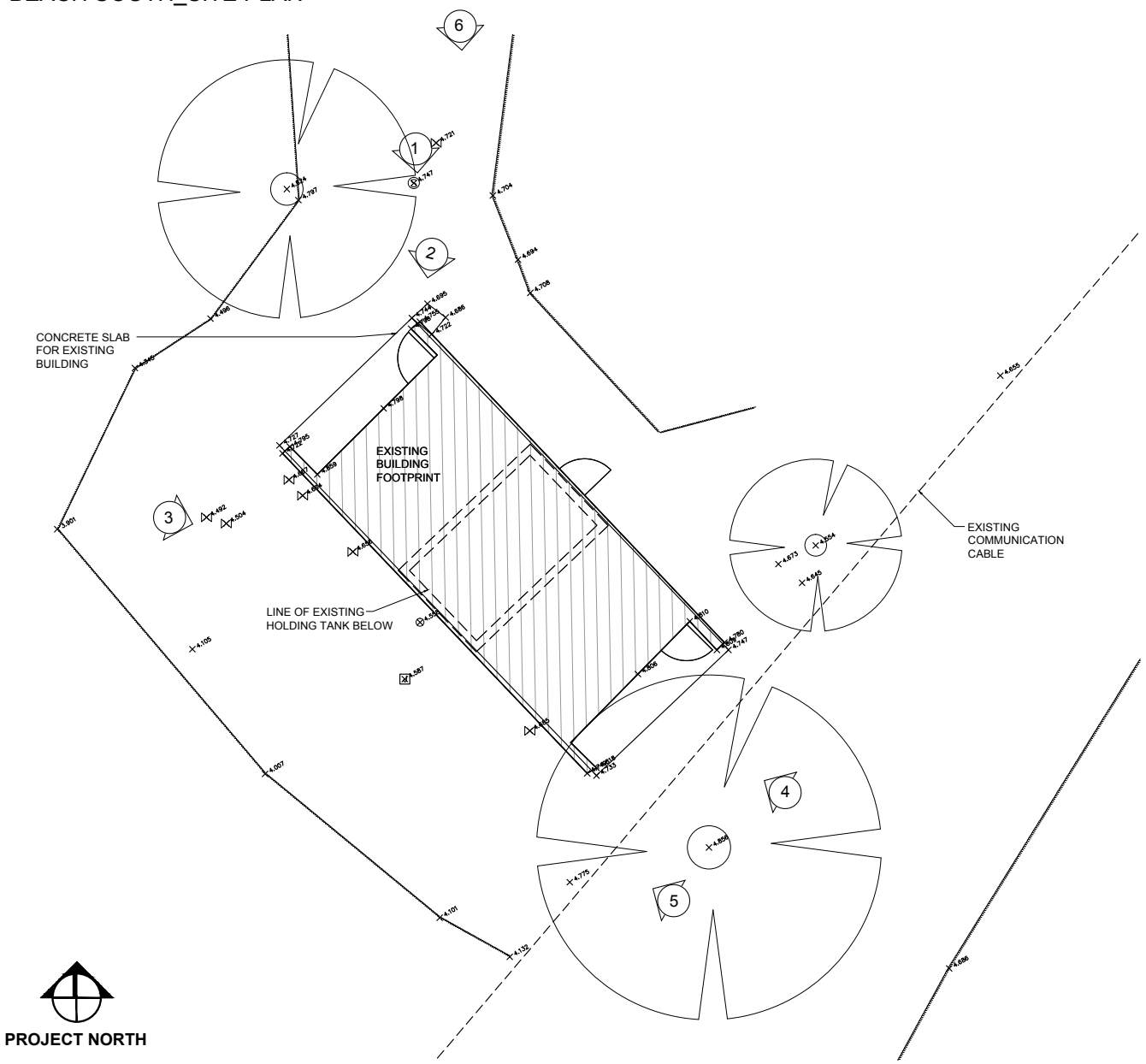
03. JPG

04. JPG

05. JPG

06. JPG

LONG BEACH SOUTH_SITE PLAN



01. JPG

02. JPG

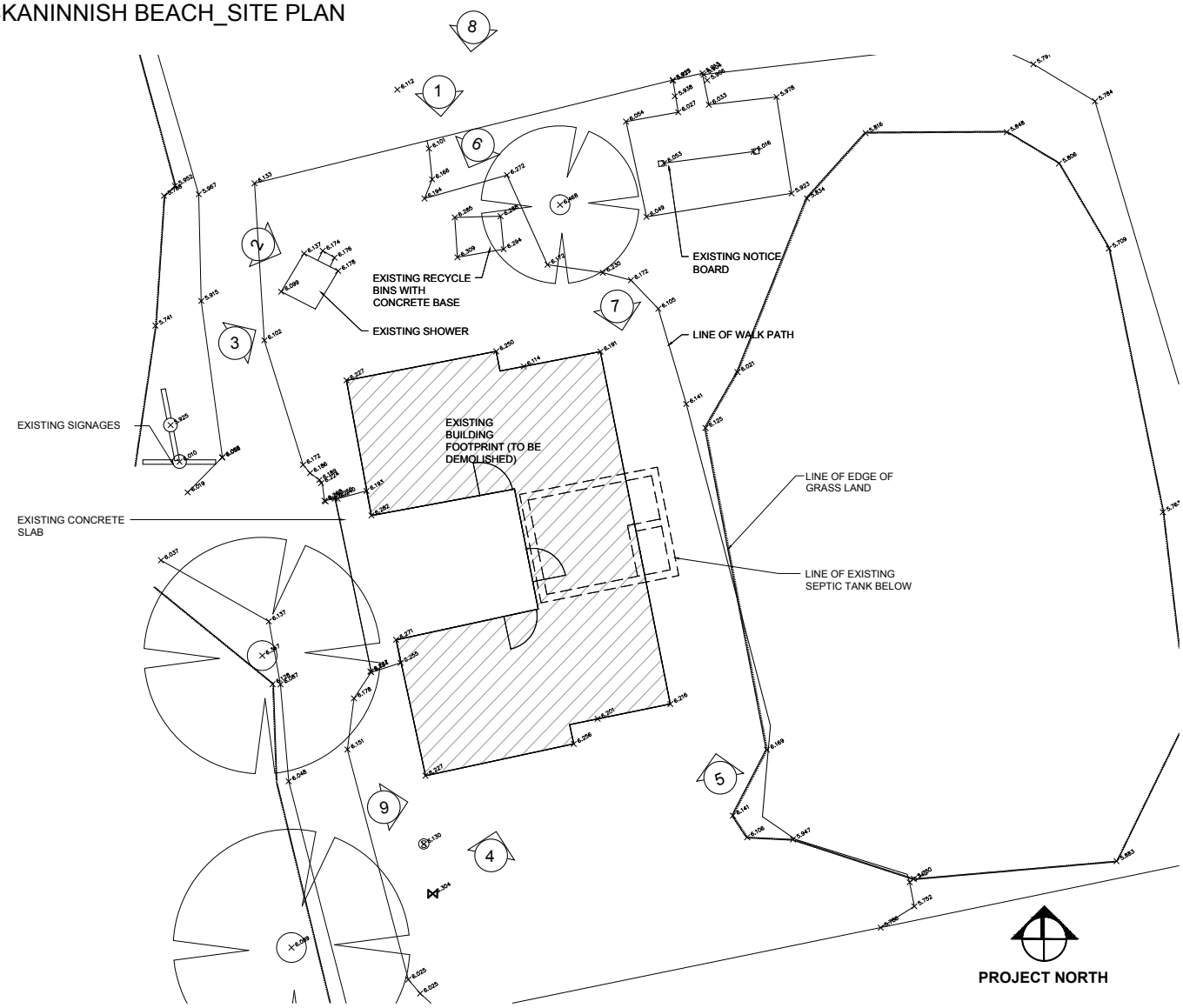
03. JPG

04. JPG

05. JPG

06. JPG

WICKANINNISH BEACH_SITE PLAN



01. JPG

02. JPG

03. JPG

04. JPG

05. JPG

06. JPG

07. JPG

08. JPG

09. JPG

PACIFIC RIM NATIONAL PARK

WASHROOM BUILDINGS

APPENDIX 4

INTERIOR FINISH MATERIAL

AND COLOUR SCHEDULE

REFERENCE SPECIFICATION SECTION	ACCEPTABLE PRODUCTS			REMARKS
	LEGEND	MATERIALS	MANUFACTURER / STYLE / COLOUR	
06 40 00 Architectural Woodwork	**SS-1**	Solid Surface	Slice of Ice CW102 by HANSTONE QUARTZ (LEEZA)	
	SS-2	Solid Surface	Canvas (C) by DUPONT CORIAN (WILLIS)	
09 30 13 Ceramic Tiling	**PRT-1**	Floor Tile – Porcelain	“Evolution”, colour Brown by Olympia	
		Grout	“Charcoal” colour by Flextile	
	PRT-2	Floor Tile - Porcelain	“GRANITI FIANDRE Core Shade”, colour Cloudy Core, slate finish by Savoia	
		Grout	“North Sea Grey” by Flextile	
	PRT-3	Floor Tile - Porcelain	“Regal”, colour Dark Gray, flamed finish by Olympia	
		Grout	“Charcoal” colour by Flextile	
	CT-1	Wall Tile – Porcelain	“Unicolour”, colour Taupe, Polished by Olympia	
		Grout	“Desert” colour by Flextile	
	CT-2	Wall Tile – Ceramic	“Colour & Dimension”, colour Turquoise Bright by Olympia	
		Grout	Same As Field Tiles.	
	CT-3	Wall Tile – Ceramic	“Colour & Dimension”, colour Chartreuse Bright by Olympia	
		Grout	Same As Field Tiles.	
	CT-4	Wall Tile – Porcelain	“Unicolour”, colour Ivory, Polished by Olympia	
		Grout	“Smoke” colour by Flextile	
	CT-5	Wall Tile – Ceramic	“Colour & Dimension”, colour Sapphire Bright by Olympia	
		Grout	Same As Field Tiles.	
	CT-6	Wall Tile – Ceramic	“Colour & Dimension”, colour Papaya Bright by Olympia	
		Grout	Same As Field Tiles.	
	-	Tile Edge Protection	“Jolly” by Schluter	

	-	Coved Tiles Transition (Wall to Floor)	"Dilex-HK" by Schluter	
10 21 13.13 Metal Toilet Compartments	**TP**	Toilet Partitions	Maximum Privacy Series C.H. Ceiling Hung 64" Stainless Steel Toilet Partitions by Shanahan's	
	US	Urinal Screens	Model WH Wall-Hung Stainless Steel Screen by Shanahan's	

REFERENCE SPECIFICATION SECTION	**ACCEPTABLE PRODUCTS**			**REMARKS**
	LEGEND	**MATERIALS**	**MANUFACTURER / STYLE / COLOUR**	
10 28 10 Toilet Bath Accessories	**TTD**	Toilet Tissue Dispenser	"Bobrick" B-2840 Surface-mounted model with utility shelf	
	TTD-DS	Toilet Tissue Dispenser – Disabled Stalls	"Bobrick" B-6867 Double-Roll model, satin finish	
	SD	Soap Dispenser	"Bobrick" B-8226 Lavatory-mounted model	
	ND	Sanitary Napkin Disposal	"Bobrick" B-270 ConturaSeries surface-mounted model	
	MR	Mirror	"Bobrick" B-290 series	
	BCS	Baby Changing Station	"Bradex" Recess-mounted model #962 by Bradley	
	SH-DS	Shelf – Disabled Stalls	"Bobrick" B-295 Stainless steel model	
	SC	Shower Curtain & Hooks	"Bobrick" 204 Series	
		Shower Curtain Rod	"Bobrick" B-6047 ClassicSeries Extra-heavy duty model	
	HC-1	Hook	"Bobrick" B-6827 Surface-mounted single hook, satin finish	
	HC-3 & HC-6	Hook Strip	"Bradex" Surface-mounted model #9943 & #9946 by Bradley	

	WR	Waste Receptacle	“Bradley” Recessed model #315-35	
	BH	Bench	“WB” Manufacturing ADA Bench Kits (BKT)	
	HD	Hand-dryer	“Airblade V” #AB14 by Dyson	
	GC	Garbage Contour	“Discovery” Bear Proof Waste Container by Haul-all	

PACIFIC RIM NATIONAL PARK

WASHROOM BUILDINGS

APPENDIX 5

EXTRA PARTS, MATERIAL AND EQUIPMENT LIST

EXTRA PARTS, MATERIAL AND EQUIPMENT LIST
Provide the following extra spare parts, material, fixtures, and equipment in its original package to Departmental Representative as spare maintenance material.

SPECIFICATION SECTION	PARTS, MATERIAL, FIXTURES, AND EQUIPMENT	QUANTITY
08 71 00 DOOR HARDWARE	Lock set of each type B2, B3, B4 and B5 completed with cylinders keyed to master key .	2
	Door closer C1.	2
09 30 13 CERAMIC TILING	Floor Tile PRT -1, 2 and 3	20 pieces each type (total 60)
	Wall Tile CT-1 to CT-6	20 pieces each type (total 120)
	Cove tiles transition (wall to floor)	30m length
		20 pieces
09 91 13 EXTERIOR PAINTING	Paint	One 8 litre (2 gallons) can of each type and color
09 91 23 INTERIOR PAINTING	Paint	One 8 litre (2 gallons) can of each type and colour
10 28 10 TOILET AND BATH ACCESSORIES	Mirror	12
	Hand Dryer	6
	Shower curtain & shower rod	4 Shower rods 8 Shower curtains
	Recessed Water Receptacle	12
22 34 05 DOMESTIC WATER HEATERS	Domestic water heater: DHWT-1 GP #1 [36 kW, 120 gal.] DHWT-1 WB [12 kW, 50 gal.]	1
22 40 00 PLUMBING FIXTURES	WC-1 (toilet only)	2
	WC-2 (toilet only)	2
	UR-1 (urinal only)	2
	Flush valves for WC-1	6
	Flush valves for WC-2	2
	Flush valves for UR-1	6
	SH-1 (shower valves & shower heads only)	3
	SH-2 (less drain)	2

	L-1 (faucet and TMV only)	12
	KS-1 (faucet only)	6
	TMV-1 (lavatories and shower)	4
	TMV-2 (kitchen sinks)	1
23 09 33 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR MECHANICAL SYSTEMS	Solenoid valves for KS-1	6
23 85 00 ELECTRIC HEATERS	3kW Electric cabinet unit heaters	6
	2kW Unit heater	3
	1 kW Electric wall heater	1
26 09 25 LIGHTING CONTROL DEVICES	Outdoor Photoelectric Sensor	6
	Outdoor Motion Sensor	6
	Indoor Daylight Sensor	3
	Indoor Occupancy Sensor	6
	AC Relays	6
	Time Clock	1
26 27 26 WIRING DEVICES	Outdoor Cover Plates	10
26 50 00 LIGHTING	Type ‘A’ Luminaire	6
	Type ‘B’ Luminaire	6
	Electronic Ballast for Type ‘C’ Luminaire	4
	Fluorescent lamps for Type ‘C’ Luminaire	30
	Emergency Lighting Battery Unit With Heads.	3
	Emergency Lighting Remote Heads	6 Sets