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Rehabilitation of The Superintendent's Residence

Parks Canada Agency
Sault Ste. Marie National Historic Site of Canada

Contract Documents and Specifications

Prepared By;

WSP

Prepared For;

Parks Canada Parcs Canada

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Canada

SECTION	TITLE	PAGES
Division 00 – Procedures and Contracting Requirements		
00 01 07	Seals Page	1
00 01 11	List of Contents	7
00 40 00	Site Assessment	2
Division 01 – General Requirements		
01 11 00	Summary of Work	4
01 14 00	Work Restrictions	2
01 21 00	Mobilization/Demobilization	1
01 29 83	Payment Procedures Testing	2
01 31 19	Project Meetings	3
01 32 16.07	Construction Schedule	3
01 33 00	Submittal Procedures	4
01 35 29.06	Health and Safety Requirements	7
01 35 43	Environmental Procedures	6
01 41 00	Regulatory Requirements	1
01 45 00	Quality Control	3
01 51 00	Temporary Utilities	3
01 52 00	Construction Facilities	4
01 56 00	Temporary Barriers And Enclosures	2
01 61 00	Common Product Requirements	5
01 71 00	Examination And Preparation	3
01 73 00	Execution	3
01 74 11	Cleaning	2
01 77 00	Closeout Procedures	2
01 78 00	Closeout Submittals	9
01 79 00	Demonstration And Training	2
Division 02 – Existing Conditions		
02 41 99	Demolition For Minor Works	3
02 71 10	Sub-Surface Drainage	3

SECTION	TITLE	PAGES
Division 03 - Concrete		
03 10 00	Concrete Forming and Accessories	5
03 20 00	Concrete Reinforcing	6
03 30 00	Cast-in-Place Concrete	10
03 35 00	Concrete Finishing	4
03 35 05	Concrete Floor Hardening	4
Division 04 – Masonry		
04 03 07	Historic Masonry Repointing	6
04 03 08	Historic – Mortaring	6
04 04 99	Masonry For Minor Works	3
04 05 19	Masonry Anchorage And Reinforcing	2
04 22 00	Concrete Unit Masonry	3
Division 05 -- Metals		
05 50 00	Metal Fabrication	7
Division 06 – Wood, Plastics and Composites		
06 08 99	Rough Carpentry For Minor Works	3
Division 07 – Thermal and Moisture Protection		
07 03 32	Historic Wood Shingle Roofing	5
07 12 13	Foundation Waterproofing	4
07 19 00	Underslab Vaour Barriers	3
07 21 13	Board Insulation	2
07 21 16	Blanket Insulation	3
07 26 00	Vapour Retarders	2
07 46 23	Wood Siding and Trim	3
07 62 00	Sheet Metal Flashings and Trim	4
07 84 00	Firestopping	6
07 92 00	Joint Sealants	6

SECTION	TITLE	PAGES
Division 08 – Openings		
08 50 00	Bi-Folding Windows	5
08 62 10	Wood Windows Restoration	7
Division 09 – Finishes		
09 03 61	Historic – Exterior Painting	5
Division 21 – Fire Suppression		
21 05 01	Common Work Results – Mechanical	7
21 12 00	Portable Fire Extinguishers	3
Division 22 – Plumbing		
22 11 16	Domestic Water Piping	7
22 13 17	Drainage Waste and Vent Piping – Cast Iron and Copper	3
22 13 18	Drainage Waste and Vent Piping – Plastic	3
22 42 01	Plumbing Specialties and Accessories	8
Division 23 – Heating, Ventilating and Air Conditioning		
23 03 01	Use of Mechanical Systems During Construction	2
23 05 53.01	Mechanical Identification	8
23 37 20	Louvres, Intake and Vents	5
Division 26 – Electrical		
26 05 00	Common Work Results Electrical	10
26 05 03	Electrical Coordination and Arc Flash Study	2
26 05 20	Wire and Box Connectors (0-1000V)	2
26 05 21	Wire and Cables (0-1000V)	3
26 05 28	Grounding Secondary	2
26 05 29	Hangers and Supports for Electrical Systems	2
26 05 31	Splitters Junction Pull Boxes and Cabinets	1
26 05 32	Outlet Boxes Conduit Boxes and Fittings	2
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings	3

SECTION	TITLE	PAGES
26 24 16.01	Panelboards Breaker Type	4
26 27 26	Wiring Devices	3
26 28 16.02	Moulded Case Circuit Breakers	3
26 28 23	Disconnect Switches – Fused and Non-Fused	1
26 91 00	Commissioning	15
Division 31 – Earthwork		
31 00 99	Earthwork For Minor Works	6
31 04 31	Historic – Subgrade Shoring And Bracing	4
31 05 16	Aggregate Materials	6
31 11 00	Clearing and Grubbing	4
31 14 13	Soil Stripping and Stockpiling	3
31 22 13	Rough Grading	3
31 22 16.13	Roadway Subgrade Reshaping	2
31 23 33.01	Excavating, Trenching and Backfilling	12
Division 32 – Exterior Improvements		
32 11 16.01	Granular Sub-Base	6
32 11 23	Aggregate Base Courses	6
32 16 15	Concrete Walks, Curbs and Gutters	5
32 32 13.13	Packaged Sewage Lift, Wet Well Type	9
32 91 19.13	Topsoil Placement and Grading	6
32 92 23	Sodding	7
Division 33 -- Utilities		
33 46 13.01	Foundation and Underslab Drainage	5
33 46 16	Subdrainage Piping	5
Appendices		
	Appendix A - ABBREVIATIONS	7
	Appendix B - DESIGNATED SUBSTANCE SURVEY	62
	Appendix C - PWGSC WINDOW CONDITION ASSESSMENT REPORT	18

SECTION	TITLE	PAGES
	Appendix D – AS BUILT DRAWINGS	22

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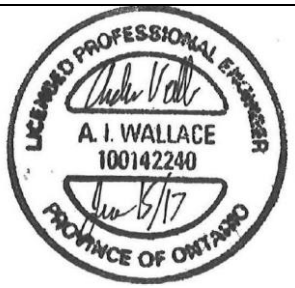
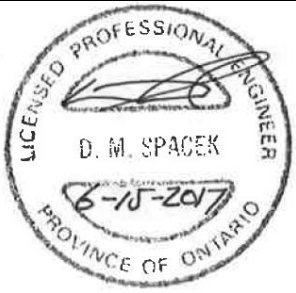
Mechanical	WSP Canada Inc. 1345 Rosemount Avenue Cornwall, Ontario K6J 3E5 Canada Mechanical Engineer: Andrew Wallace, P.Eng.	
Electrical	WSP Canada Inc. 1345 Rosemount Avenue Cornwall, Ontario K6J 3E5 Canada Electrical Engineer: Mathieu Bourbonnais, P.Eng.	
Civil/Structural	WSP Canada Inc. 185 East Street Sault Ste. Marie, Ontario P6B 1C3 Canada Civil/Structural Engineer: David Spacek, P.Eng. PMP	

SECTION №	SPECIFICATION TITLE	# OF PAGES
00 40 00	Site Assessment	2
01 11 00	Summary of Work	4
01 14 00	Work Restrictions	2
01 29 83	Payment Procedures for Testing	2
01 31 19	Project Meetings	3
01 32 16.07	Construction Schedule	3
01 33 00	Submittal Procedures	4
01 35 29.06	Health and Safety Requirements	7
01 35 43	Environmental Procedures	6
01 41 00	Regulatory Requirements	1
01 45 00	Quality Control	3
01 51 00	Temporary Utilities	3
01 52 00	Construction Facilities	4
01 56 00	Temporary Barriers And Enclosures	2
01 61 00	Common Product Requirements	5
01 71 00	Examination And Preparation	3
01 73 00	Execution	3
01 74 11	Cleaning	2
01 77 00	Closeout Procedures	2
01 78 00	Closeout Submittals	9
01 79 00	Demonstration And Training	2
02 41 99	Demolition For Minor Works	3
02 71 10	Sub-Surface Drainage	3
04 03 07	Historic Masonry Repointing	6
04 03 08	Historic - Mortaring	6
04 04 99	Masonry For Minor Works	3
04 05 19	Masonry Anchorage And Reinforcing	2
04 22 00	Concrete Unit Masonry	3
06 08 99	Rough Carpentry For Minor Works	3
07 03 32	Historic Wood Shingle Roofing	5
07 12 13	Foundation Waterproofing	4
07 19 00	Underslab Vapour Barriers	3

SECTION №	SPECIFICATION TITLE	# OF PAGES
07 21 13	Board Insulation	2
07 21 16	Blanket Insulation	3
07 26 00	Vapour Retarders	2
07 46 23	Wood Siding and Trim	3
07 62 00	Sheet Metal Flashings and Trim	4
07 84 00	Firestopping	6
07 92 00	Joint Sealants	6
08 50 00	Bi-Folding Windows	5
08 62 10	Wood Windows Restoration	7
09 03 61	Historic - Exterior Painting	5

PART 1 - GENERAL

1.1 TOXIC AND HAZARDOUS SUBSTANCES AND MATERIALS

.1 A Designated Substance Survey Report prepared by Aecom Consulting Engineers, dated September 5, 2012, (62 pages) is appended to this Section for information purposes only. The report was carried out for Parks Canada for guidance in the design and construction of this project.

.2 All information shall be reviewed by the Contractor. It shall be understood that such examination shall be for reference only and comments and recommendations contained therein shall not be taken as superseding the requirements of the Contract Documents.

.3 No responsibility is assumed by the Departmental Representative nor the Consultant for the scope or accuracy of the Report. The Contractor shall review the reports and the existing site and extract his own conclusions and interpretations. The Contractor shall satisfy himself with regards to all matters relating to toxic and hazardous substances and materials affecting the Work.

.4 Should the Contractor encounter buried items containing environmentally hazardous substances such as, but not limited to, oil tanks and the like, stop work and notify the Departmental Representative immediately. Do not proceed until written instructions have been received from the Departmental Representative.

.5 There are known friable materials containing asbestos in area of Work. Demolition of materials containing hazardous substances can be hazardous to health. Inform all sub-trades of the presence of asbestos and other hazardous materials in areas of Work within the existing residence.

.6 **Provide and pay for the services of a qualified subcontractor to direct all work involving material containing asbestos and other hazardous materials** including provision of inspection and testing services, as required, to verify clean up completed in accordance with requirements of authorities having jurisdiction. Submit reports to Departmental Representative for review. Take adequate precautions to avoid disturbing friable materials containing asbestos except when being dealt with under the direct supervision and using procedures prescribed by this subcontractor.

..7 Conform to Regulation respecting Asbestos on

END OF SECTION

Construction Projects and in Buildings and Repair Operations - made under Occupational Health and Safety Act as amended as well as all other requirements of authorities having jurisdiction.

.8 Carry out all work and dispose of all asbestos and designated hazardous substances in accordance with the requirements of authorities having jurisdiction.

.9 In event of unexpected discovery of friable material that may contain asbestos, suspend work in area in question and immediately report, orally and in writing to office of Construction Health and Safety Branch, Ministry of Labour nearest to work place and to Consultant / Departmental Representative. The Departmental Representative will authorize remedial work, if any, in writing. Do such remedial work as addition to Contract.

.10 In addition to inspection and testing specified to be provided as part of Work or provided by Contractor for its own verification of Work, the Departmental Representative may appoint separately an independent inspection and testing company to confirm asbestos abatement work is satisfactorily performed. The Departmental Representative will pay costs of such additional inspection and testing; except where such additional tests or inspections reveal work not in accordance with Contract then Contractor shall bear cost of such tests and further tests as required, to verify acceptability of corrected Work.

1.2 POLYCHLORINATED BIPHENYLS (PCB'S)

.1 As indicated in the enclosed report, there are known lighting fixture ballasts or transformers potentially containing PCB's in area of Work.

.2 Carry out all work and dispose of all light fixtures in accordance with the requirements of authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Title and description of Work.

.2 Contract Method.

.3 Work by others.

.4 Future work.

.5 Work sequence.

.6 Contractor use of premises.

.7 Owner occupancy.

.8 Partial Owner occupancy.

.9 Pre-ordered products/Pre-Bid work.

.10 Owner furnished items.

.11 Alterations to existing building/site.

1.2 PRECEDENCE

.1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises of general construction/renovation of the Superintendent's Residence, located at the Sault Ste. Marie Canal in Sault Ste. Marie, Ontario.

1.5 CONTRACT METHOD

.1 Construct Work under single contract.

.2 Employ suppliers and subcontractors necessary for the work.

.3 Construct work under lump sum contract.

.4 Purchase and maintain liability insurance to protect Contractor, the Owner, and the Consultant from claims for not less than limits of liability which Contractor is required to provide to the Departmental Representative.

1.6 COST BREAKDOWN

.1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Section aggregating contract amount. Cost Breakdown Forms have been provided however the Departmental Representative has the right to request additional cost breakdown forms to be completed by the Contractor.

.2 Show separately cost of equipment purchased exempt from Ontario Retail Sales Tax under your Ontario Sales Tax license number.

.3 Within 48 hours of acceptance of bid submit a list of subcontractors.

1.7 WORK BY OTHERS

.1 Work of Project which will be executed after completion of Work of this Contract, and which is specifically excluded from this Contract:

.1 Supply and Installation of Kitchen Cooking Appliances.

.2 Supply of Furnishings outside what is specified in the Contract Specifications and Design Drawings.

.2 The Contractor shall for the purpose of the Ontario Occupational Health and Safety Act and Regulations for Construction Projects, and for the duration of the Work of the Contract:

.1 Assume the role of Constructor in accordance with the Authority Having Jurisdictions.

.2 Agree, in the event of two or more Contractors working at the same time and space at the work site, without limiting the General Conditions GC3.7, to the Departmental Representative's order to:

.3 Accept the Departmental Representative's other Contractor's role as Constructor and conform to that Contractor's Site Specific Health and Safety Plan.

1.8 FUTURE WORK

.1 Project is designed for future use of the Facility as a Restaurant and Bed & Breakfast. The Building will not be occupied during the time of construction.

1.9 WORK SEQUENCE

.1 Coordinate Progress Schedule to ensure the Project remains on schedule.

.2 Maintain fire access/control.

1.10 CONTRACTOR USE OF PREMISES

.1 Contractor has unrestricted use of site. The Contractor shall park and store equipment/vehicles in areas designated by the Departmental Representative such that they do not interfere with users of the Park.

.2 Coordinate use of premises under direction of the Departmental Representative.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.11 OWNER OCCUPANCY

.1 The Superintendent's Residence will not require occupancy during the Project Lifecycle.

.2 The remainder of the Park will remain open to the public during construction. The Contractor shall not interfere with the Visitor's Experience in other Sections of the Park.

1.12 PARTIAL OWNER OCCUPANCY

.1 The Superintendent's Residence will not require occupancy during the Project Lifecycle.

1.13 [PRE-ORDERED PRODUCTS] [PRE-BID WORK]

.1 Not Applicable.

1.14 PRE-PURCHASED EQUIPMENT

.1 Not Applicable.

1.15 OWNER FURNISHED ITEMS

.1 Not Applicable.

1.16 ALTERATIONS TO EXISTING BUILDING

.1 Refer to Contract Drawings and Specifications for the extents of Building Alterations under the Scope of this Project.

.2 Provide new openings in existing construction in accordance with the Contract Drawings (See Note 1 Below).

.3 Block in openings [where items removed] with material and finish to match existing adjoining construction.

Note 1: The Superintendent's Residence is classified as a Heritage structure. Any alterations or removals outside of what the extents indicated on the Contract Drawings must be reviewed and approved by the Departmental Representative.

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 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial, federal and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.5 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for pedestrian and vehicular traffic.

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

1.5 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

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

1.0 PAYMENT

.1 The Mobilization and Demobilization Item shall cover the Contractor's cost of mobilization at the beginning of the construction period and demobilization at the close of the construction period. The price entered for this item shall be consistent with the costs involved but shall not, in any event, exceed five percent of the Total Tender Price.

.2 Sixty percent (60%) of the price for the Mobilization and Demobilization Item shall be considered as relating to mobilization and the balance to demobilization.

.3 The Payment for mobilization shall be included in the first Payment Certificate issued for the Contract subject to the Departmental Representative being satisfied that full mobilization has been carried out.

.4 The payment for demobilization shall become due following substantial completion of the works and subject to the Departmental Representative being satisfied that full demobilization has been carried out. The Departmental Representative may, at its discretion, allow partial payment for demobilization before full demobilization has been affected.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative are provided in individual specification Sections.

1.2 APPOINTMENT AND PAYMENT

.1 Departmental Representative will appoint and pay for services of testing laboratory except follows:

.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 conveying systems, mechanical and electrical equipment and systems.

.4 Mill tests and certificates of compliance.

.5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.

.2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

.1 Provide labour, equipment and facilities to:

.1 Provide access to Work for inspection and testing.

.2 Facilitate inspections and tests.

.3 Make good Work disturbed by inspection and test.

.4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify Departmental Representative 48 hours minimum sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

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

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

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 ADMINISTRATIVE

.1 The Departmental Representative shall schedule project meetings throughout the progress of the Work. The Consultant shall administer the meetings.

.2 The Consultant prepare agenda and distribute to stakeholders 48 hours prior to meeting.

.3 The Departmental Representative shall distribute written notice of each meeting four days in advance of meeting date to Contractor and Consultant.

.4 Provide physical space and make arrangements for meetings.

.5 The Consultant / Departmental Representative shall 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 three days after meetings and transmit to meeting participants affected parties not in attendance, and Departmental Representative.

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

1.2 PRECONSTRUCTION MEETING

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

.2 Senior representatives of Departmental Representative, Consultant, Contractor, major Subcontractors, supervisors will be in attendance.

.3 The Departmental Representative shall establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:
.1 Appointment of official representative of participants in the Work.
.2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar

(GANTT) Chart.
.3 Schedule of 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 52 00 - Construction Facilities.
.5 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
.6 Owner provided products.
.7 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
.8 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
.9 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
.10 Monthly progress claims, administrative procedures, photographs, hold backs.
.11 Appointment of inspection and testing agencies or firms.
.12 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work and two (2) weeks prior to project completion, the Departmental Representative shall schedule biweekly progress meetings.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative, and Consultant are to be in attendance.

.3 Notify parties minimum 5 days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.

.5 Agenda to include the following:
.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revision to construction schedule.
.8 Progress schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.
.12 Other business.

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 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

.1 Award.
.2 Shop Drawings, Samples.
.3 Permits.
.4 Mobilization.
.5 Excavation.
.6 Backfill.
.7 Building footings.
.8 Slab on grade.
.9 Structural Steel.
.10 Siding and Roofing.

.11 Interior Architecture (Walls, Floors and Ceiling).
.12 Plumbing.
.13 Lighting.
.14 Electrical.
.15 Piping.
.16 Controls.
.17 Heating, Ventilating, and Air Conditioning.
.18 Millwork.
.19 Fire Systems.
.20 Testing and Commissioning.
.21 Supplied equipment long delivery items.
.22 Engineer supplied equipment required dates.

1.6 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on [weekly] basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 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.

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 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 coordinated 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 coordinated.

.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.

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 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Canada.

.4 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.5 Allow 10 days for Departmental Representative's review of each submission.

.6 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.

.7 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.

.8 Accompany submissions with transmittal letter, 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.

.9 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.

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

.11 Submit electronic copies of shop drawings, product data sheets, brochures, test reports, certificates and the like, for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.12 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept.
.1 This review shall not mean that the 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.

1.3 SAMPLES

.1 Submit for review samples in duplicate as requested 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 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 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workplace Safety and Insurance Board (WSIB) status.

.2 Submit transcription of insurance immediately after award of Contract.

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 REQUIREMENTS

.1 Not Used.

1.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.3 Province of Ontario
- .1 Occupational Health and Safety Act, R.S.O. [1990 Updated 2005].

.4 Ontario Ministry of Labour – Occupational Health & Safety Act - Ont.Reg. 843 Designated Substance – Lead

.5 Ontario Ministry of Labour – Occupational Health and Safety Branch - Guideline - Lead on Construction Projects April 2011.

.6 Fire Protection Standard from the Treasury Board of Canada.

1.3 SUBMITTALS

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

.2 Submit plans, shop drawings and other submittals 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 or equitable adjustments. No claim will be allowed to Contractor for such delays.

.3 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
- .1 Results of site specific safety hazard assessment.
- .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Lead - Base Paint Abatement Plan, including detailed sketches of work areas, proposed enclosures and safety procedures and measures to be followed in each section.
- .4 Hot Work Program meeting Fire Protection Standard from the Treasury Board of Canada

requirements for welding, burning and cutting.

.4 Subcontractor requirements:
- .1 Submit site-specific Health and Safety Plan for review and approval by Contractor.
- .2 Submit signed attestation from Subcontractor confirming they have read the Contractor's site specific Health and Safety Plan and will comply with requirements of the plan when on site.
- .3 Comply with the most stringent safety requirements when there is conflict between Contractor's and Subcontractor's Health and Safety Plans.
- .4 Submit WSIB status report.

.5 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative whenever a reportable incident occurs.

.6 Submit copies of reports or directions issued by Federal or Provincial health and safety inspectors.

.7 Submit copies of incident and accident reports.

.8 Submit records/checklists/topics from all Tailgate Meetings.

.9 Submit WHMIS MSDS - Material Safety Data Sheets.

.10 Departmental Representative will review site-specific Health and Safety Plans and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 days after receipt of comments from Departmental Representative.

.11 Departmental Representative's review of Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.12 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.

.13 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
- .1 for demolition and removals.
- .2 for lead abatement.
- .3 for confined spaces.

.4 for hot work.
.5 for all other work.
.6 for dewatering system.
.7 for excavations.
.8 for foundation underpinning.
.9 for all other work.

1.4 FILING OF NOTICE

.1 File Notice of Project with [Provincial] [Territorial] authorities prior to beginning of Work.

1.5 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

.2 A Potential Hazards Identification for the Superintendent's Residence is presented in the Appendix for Contractor reference.

.3 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.

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.8 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:
.1 Demolitions and removals
.2 Lead-base paint and asbestos on existing structures.
.3 Excavations.
.4 Confined spaces.
.5 Dewatering.
.6 Shoring and support of structures.
.7 Foundation underpinning.
.8 Hot Work.
.9 Silica in concrete.
.10 Concrete dust.
.11 Fresh concrete and cement mortars.
.12 Concrete admixtures and bonding agents.
.13 Hoisting equipment, material and debris.

1.9 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety

Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 RESPONSIBILITY

.1 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.

.2 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.

.3 Ensure Subcontractor to submit signed attestation confirming they have read the Contractor's site specific Health and Safety Plan and will comply with requirements of the plan when on site, and Comply with the most stringent safety requirements when there is conflict between Contractor's and Subcontractor's Health and Safety Plans.

.4 Where applicable, the Contractor shall be designated "Constructor" as defined by the Occupational Health and Safety Act for the Province of Ontario.

1.11 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Health and Safety Act, R.S.O.

.2 Comply with Ontario Ministry of Labour - Occupational Health and Safety Branch - Guideline - Lead on Construction Projects April 2011.

.3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

.4 Fire Protection Standard from the Treasury Board of Canada.

1.12 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have site-related working experience specific to activities associated with lead abatement.

.2 Have working knowledge of occupational safety and health regulations.
.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
.5 Be on site during execution of Work [and report directly to and be under direction of site supervisor.

1.14 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.15 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

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

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

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

1.16 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 GENERAL

.1 Work in compliance with applicable rules and regulations for construction projects and demolition works.

.2 Enforce compliance by employees and subcontractors with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 Submit Contractor and Subcontractor site-specific Health and Safety Plans.

.4 Submit signed attestation from Subcontractor confirming they have read the Contractor's site specific Health and Safety Plan and will comply with requirements of the plan when on site.

3.2 HOT WORK

.1 Follow Fire Protection Standard from the Treasury Board of Canada when performing hot work:

.1 defined as operations such as welding, cutting, burning, heating, grinding, or similar spark, slag, or intense heat producing activities that are capable of igniting combustible materials or flammable atmospheres or providing a source of ignition for a fire. Also defined as cutting and welding operations for construction/demolition activities that involve the use of portable gas or arc welding equipment, open flame or spark-producing apparatus.

.2 Provide Hot Work Program in site specific Health and Safety Plan to address hot work activities during construction.

.3 Obtain approval from Departmental Representative prior to performing hot work activities on site.

.4 Ensure that fire protection and extinguishing equipment is available at the site at least 48 hours before starting the job.

.5 Post approved notices/signs indicating HOT WORK IN PROGRESS for the duration of the hot work.

.6 Provide a standard checklist to be completed and signed prior to each hot work activity. Departmental Representative to review and approve proposed checklist.

.7 Ensure that workers performing hot work are trained and know the procedures that apply to the specific work or task being performed; follow program for hot work as detailed in Health and Safety Plan.

.8 Provide 2 hour burn watch upon completion of the following procedures:

.1 welding
.2 burning
.3 cutting.

.9 Hot work should not be conducted in the presence of explosive mixtures of flammable gases,

vapors, liquids, or dusts or where explosive mixtures could develop.

3.3 SHORING / SUPPORT OF STRUCTURES

.1 Prior to deconstruction/disassembly of load bearing walls and foundations, provide details of jacking design, and drawings of shoring and bracing, in accordance with Provincial(OHSA)regulations and as noted in Sections 01 41 00 - Regulatory Requirements.

.2 Provide temporary supports for existing electrical and mechanical works that may be attached to or supported by masonry to be dismantled.

.3 Submit plans and details to Departmental Representative for approval prior to commencing this work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section N.A.

1.2 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 humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.3 REFERENCES

.1 U.S. Environmental Protection Agency (EPA)/Office of Water
- .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.
- .2 EPA General Construction Permit (GCP) 2012.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for pressure treated wood and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS.

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.

.4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

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

.6 Include in Environmental Protection Plan:
- .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
- .2 Names and qualifications of persons responsible for manifesting 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 identifying 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 and EPA 832/R-92-005, Chapter 3.

.6 Drawings indicating 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 to 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.

.1 Plans to include measures to minimize amount of material 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.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include 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, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying 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, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

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

1.5 FIRES

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

1.6 DRAINAGE

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

.2 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.

.3 Storm Water Pollution Prevention Plans to be included within erosion and sediment control plan.

.4 Provide temporary drainage and pumping required to keep excavations free from water.

.5 Provide dewatering system as necessary to complete the work.

.6 Ensure discharge water into waterways, sewer or drainage systems is free of suspended materials.

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

.1 dewatering systems;

.2 excavations; and

.3 stockpiles

1.7 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site as indicated.

.2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.3 Minimize stripping of topsoil and vegetation.

.4 Restrict tree removal to areas required for new construction.

1.8 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

.2 Use waterway beds for borrow material only after written receipt of approval from Departmental Representative.

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

.4 Avoid indicated spawning beds when crossing waterways.

1.9 POLLUTION CONTROL

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

.2 Control emissions from equipment and plant in accordance with 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.

1.10 HISTORICAL/ ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

.3 Protect all surfaces of the Historical building/ structures/objects from damage due to construction activities.

.4 Provide outdoors protective measures to ensure mature plants and other landscape items are not damaged from construction activity.

.5 Protect subsurface infrastructure, historic features, profiles and ground features, as directed by the Department Representative.

.6 Receive approval of Departmental Representative prior to moving materials and equipment through the building.

.7 Accept liability for any damage caused to historic building or objects due to construction or moving of materials and equipment.

.8 Inform Department Representative and assure protection of historical or archaeological resources not previously known to be on site or in area, if discovered during construction.

1.11 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance 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 Take action only 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.

1.12 EQUIPMENT CONSIDERATIONS

.1 Equipment and heavy machinery used shall meet or exceed all applicable emission requirements.

.2 Provide drip trays to prevent the discharge of oil, grease, antifreeze, or any other materials into the ground.

.3 Leave machinery running only while in actual use.

.4 Conduct all equipment refueling over impermeable / absorptive material situated at a designated site that is located at least 30 metres away from the nearest water body. Obtain approval by Department Representative for proposed location.

.5 Conduct all vehicle/equipment maintenance at an off-site location.

PART 2 – PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 GENERAL

.1 Submit Environmental Protection Plan.

.2 Submit Erosion and Sediment Control Plan.

.3 Submit Traffic Control Plan.

.4 Implement and maintain controls as noted in submitted environmental plans.

.5 Ensure public waterways and storm sewers remain free of waste and volatile materials disposal.

.6 Control public and personnel access to areas where air is exhausted outdoors from lead abatement process by use of fencing or barricades.

.7 Operate and maintain equipment as detailed in clause 1.12 Equipment Considerations.

.8 Conduct all equipment refueling over impermeable/absorptive material situated at a designated refueling site that is located at least 30 metres away from the nearest water body.

.9 Concrete materials: provide appropriate area on job site where grout, testing laboratory equipment, and other concrete works can be safely washed. Contractor is responsible for cleanup of this area once work is completed.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11.

.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.

END OF SECTION.

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Not Used.

1.2 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) 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 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.

.2 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.4 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions and municipal by-laws.

1.5 NATIONAL PARKS ACT

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

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 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 Departmental Representative for purpose of inspecting and/or testing portions of Work.

.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 and/or Consultant] 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 [4] copies of inspection and test reports to Departmental Representative

.2 Provide copies to subcontractor of work being inspected or tested or manufacturer / 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 or as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative's 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 and Consultant will assist in preparing schedule fixing dates for preparation.

.6 Mock-ups may remain as part of Work.

1.9 MILL TESTS

.1 Submit mill test certificates as required of specification Sections.

1.10 EQUIPMENT AND SYSTEMS

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

.2 Refer to Section 01 78 00, Closeout Submittals, for definitive requirements.

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 REFERENCES

.1 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 INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 00 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 Departmental Representative will provide continuous supply of potable water for construction use.

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

.3 Departmental Representative will pay for utility charges at prevailing rates.

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, may be used when available. Be responsible for damage to heating system if use is permitted.

.7 On completion of Work for which permanent heating system is used, replace filters.

.8 Pay costs for maintaining temporary heat, when using permanent heating system. Departmental Representative will pay utility charges when temporary heat source is existing building equipment.

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

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

1.7 TEMPORARY POWER AND LIGHT

.1 Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.

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

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors

and stairs is not less than 162 lx.

1.8 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephone and data hook up lines necessary for own use.

1.9 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.

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 REFERENCES

.1 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.

.2 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(R2003), Access Scaffolding for Construction Purposes.
- .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

.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.

.4 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 INFORMATIONAL SUBMITTALS

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

1.3 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 graveled 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.

1.4 SCAFFOLDING

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

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.

1.5 HOISTING

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

.2 Hoists and cranes are to be operated by qualified operator.

1.6 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.

1.7 CONSTRUCTION PARKING

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

1.8 OFFICES

.1 Provide office heated 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.

1.9 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.

1.10 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.

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

.8 Dust control: adequate to ensure safe operation at all times.

.9 Location, grade, width, and alignment of construction and hauling roads: subject to approval by [Departmental Representative] [DCC Representative] [Consultant].

.10 Provide snow removal during period of Work.

1.12 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.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

2.1 NOT USED

.1 Not Used.

3.1 NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 GUARD RAILS AND BARRICADES

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

.2 Provide as required by governing authoritier as indicated.

1.3 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, 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.

1.4 ACCESS TO SITE

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

1.5 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.

1.6 FIRE ROUTES

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

1.7 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.8 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.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Not Used.

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 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative and Consultant based upon requirements of Contract Documents.

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

.6 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

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

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative satisfaction. Use touch-up materials to match original. Do not paint over

name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

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

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

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.10 REMEDIAL WORK

.1 Refer Section 01 73 00 - Execution Requirements.

.2 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.3 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.12 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.15 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

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 REFERENCES

.1 Owner's identification of existing survey control points and property limits.

1.2 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.

1.3 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Departmental Representative.

.4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.4 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.5 EXISTING SERVICES

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

Representative of findings.

.2 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.6 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.

1.7 RECORDS

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

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

1.8 ACTION AND INFORMATIONAL 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.

1.9 SUBSURFACE CONDITIONS

.1 Promptly notify Departmental Representative and 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.

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 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit written request to Departmental Representative 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 Remove samples of installed Work for testing.

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

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

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

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

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

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

.12 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.

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

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

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 REFERENCES

.1 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 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.

.3 Clear snow and ice from access to building.

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

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

.6 Dispose of waste materials and debris off site.

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

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

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

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

.11 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 WASTE MANAGEMENT AND DISPOSAL

.1 Not Used.

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 REFERENCES

.1 Canadian Environmental Protection Act (CEPA)
.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:
.1 Contractor's Inspection: conduct 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 submit verification that corrections have been made.
.2 Request Departmental Representative inspection.
.2 Departmental Representative Inspection:
.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
.2 Contractor to correct Work as directed.
.3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
.1 Work: completed and inspected for compliance with Contract Documents.
.2 Defects: corrected and deficiencies completed.
.3 Equipment and systems: tested, adjusted and balanced and fully operational.
.4 Certificates required by Boiler Inspection Branch, Fire Commissioner, and Utility companies: submitted.
.5 Operation of systems: demonstrated to Owner's personnel.
.6 Underground and/or aboveground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.
.7 Work: complete and ready for final inspection.
.4 Final Inspection:
.1 When completion tasks are done, request final inspection of Work by Departmental Representative and Consultant.
.2 When Work incomplete according to Departmental Representative complete outstanding items and request re-inspection.

1.3 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

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 REFERENCES

.1 Canadian Environmental Protection Act (CEPA)
.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with contractor's representative, Consultant and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
- .1 Verify Project requirements.
- .2 Review manufacturer's installation instructions and warranty requirements.

.2 Departmental Representative to establish communication procedures for:
- .1 Notifying construction warranty defects.
- .2 Determine priorities for type of defects.
- .3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative four final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.4 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.
.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.
.1 Bind in with text; fold larger drawings to size of text pages.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.
.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:
.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.
.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.6 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative and Consultant one record copy of:

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.
.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.
.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative and Consultant.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.
.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.4 Field changes of dimension and detail.
.5 Changes made by change orders.
.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.8 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.9 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.
.1 Give function, normal operation characteristics and limiting conditions.
.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
.1 Include regulation, control, stopping, shut-down, and emergency instructions.
.2 Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.

.15 Underground an aboveground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.

.16 Additional requirements: as specified in individual specification sections.

1.10 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
.1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.11 MAINTENANCE MATERIALS

.1 Spare Parts:

.1 Provide spare parts, in quantities specified in

individual specification sections.
.2 Provide items of same manufacture and quality as items in Work.
.3 Deliver to location on site as directed; place and store.
.4 Receive and catalogue items.
.1 Submit inventory listing to Departmental Representative.
.2 Include approved listings in Maintenance Manual.
.5 Obtain receipt for delivered products and submit prior to final payment.

.2 Extra Stock Materials:
.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
.2 Provide items of same manufacture and quality as items in Work.
.3 Deliver to location on site as directed; place and store.
.4 Receive and catalogue items.
.1 Submit inventory listing to Departmental Representative
.2 Include approved listings in Maintenance Manual.
.5 Obtain receipt for delivered products and submit prior to final payment.

.3 Special Tools:
.1 Provide special tools, in quantities specified in individual specification section.
.2 Provide items with tags identifying their associated function and equipment.
.3 Deliver to location on site as directed; place and store.
.4 Receive and catalogue items.
.1 Submit inventory listing to Departmental Representative.
.2 Include approved listings in Maintenance Manual.

1.12 DELIVERY, STORAGE AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and

for review by Departmental Representative.

1.13 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within [ten] days after completion of applicable item of work.
.4 Verify that documents are in proper form, contain full information, and are notarized.
.5 Co-execute submittals when required.
.6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.

.9 Include information contained in warranty management plan as follows:
.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
.2 Listing and status of delivery of Certificates

of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.14 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:
- .1 Type of product/material.
- .2 Model number.
- .3 Serial number.
- .4 Contract number.
- .5 Warranty period.
- .6 Inspector's signature.
- .7 Construction Contractor.

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 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.
.4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.4 Demonstration and Instructions:
.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled 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 amount of time required for instruction of each item of equipment or system as follows:
.1 Heating Plant: 2 hours of instruction.
.2 Cooling and Ventilation System: 2 hours of instruction.
.3 Control System: 1 hour of instruction.
.4 Plumbing System: 1 hour of instruction.
.5 Electrical System: 1 hour of instruction.

1.2 ACTION AND INFORMATIONAL 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

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 copies 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.

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 REFERENCES

.1 CSA International
.1 CSA S350-[M1980(R2003)], Code of Practice for Safety in Demolition of Structures.

.2 U.S. Environmental Protection Agency (EPA)/Office of Water
.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit demolition drawings:
.1 Submit for review and approval by Departmental Representative shoring and underpinning drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, showing proposed method.

1.3 SITE CONDITIONS

.1 Review "Designated Substance Report" and take precautions to protect environment.

.2 If material resembling spray or trowel-applied asbestos or other designated substance [listed as hazardous] be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
.1 Proceed only after receipt of written instructions have been received from Departmental Representative.

.3 Notify Departmental Representative before disrupting building access or services.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Inspect building and site 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 public utilities within the property 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 utility company 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 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.
.2 Keep noise, dust, and inconvenience to occupants to minimum.
.3 Protect building systems, services and equipment.
.4 Provide temporary dust screens, covers, railings, supports and other protection as required.
.5 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Demolition/Removal:

.1 Remove items as indicated.
.2 Removal of Pavements, Curbs and Gutters:
.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative
.2 Protect adjacent joints and load transfer devices.
.3 Protect underlying and adjacent granular materials.
.3 Remove parts of existing building to permit new construction.
.4 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

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.

.3 Refer to demolition drawings and specifications for items to be salvaged for reuse.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-B182.1-02, Plastic Drain and Sewer Pipe and Pipe Fittings.
- .2 CAN/CSA-B182.2-02, PVC Sewer Pipe and Fittings
- .3 CAN/CSA-B182.4-02, Profile (Ribbed) PVC Sewer Pipe and Fittings
- .4 OPSS 1860-91, Material Specification for Geotextiles

PART 2 - PRODUCTS

2.1 FLEXIBLE PERFORATED FOUNDATION DRAINS AND SUB-SURFACE DRAINAGE PIPE (WEEPING TILE)

.1 Shall be corrugated, 150 mm (6") nominal inside diameter, flexible polyvinyl chloride (PVC) drain pipe conforming to CAN/CSA-B182.1, CAN/CSA-B182.2-M, and CAN/CSA-B182.4-M, including solid and perforated pipe, fittings, caps and push-on joints, as required, and wrapped with factory installed filter fabric covering, as manufactured by Big-O Inc., Oxford Plastics (1983) Inc., Prinsco Inc., Temiskaming Plastics, or other approved manufacturer.

.2 Provide perforated pipe sections typical and non-perforated pipe sections as required for collectors. Provide all adapters, fittings, couplings as required.

2.2 FILTER FABRIC:

.1 Synthetic geotextile fabric by Terrafix Geosynthetics Inc, Mirafi Inc. or approved equivalent, minimum 240 g/m2 and complying with the requirements of OPSS 1860, Class 1.

2.2 FILTER AGGREGATE:

.1 19 mm (3/4") crushed stone.

2.2 GEOTEXTILE DRAINAGE LAYER:

.1 Prefabricated two-part foundation drainage material and protection board consisting of a formed / dimpled polystyrene core covered on one (1) side with a non-woven, needle punched, polypropylene filter fabric.

.2 Acceptable materials:
- .1 'Terradrain 600' as manufactured by Terrafix
- .2 'Mira Drain 6000 as manufactured by Mirafi Inc.
- .3 'Mel-Drain 5035'as manufactured by W.R. Meadows of Canada
- .4 'TremDrain Multi-Composite Drainage and Protection Board as manufactured by Tremco
- .5 'Delta-MS' as manufactured by Cosella-Dorken Products, Inc.

.6 Alternate approved by Departmental Representative.

2.4 BEDDING SAND AND COVER MATERIAL:

.1 Re-use existing salvaged and stockpiled fill materials

PART 3 - EXECUTION

3.1 GENERAL

.1 Excavate trenches for the work of this section as required. Prior to placing bedding, line bottom and sides of trenches with continuous filter fabric to create a filter envelope.

.2 If excavation reveals unexpected subsurface drainage conditions which may necessitate revisions to drainage system, advise Departmental Representative immediately and do not proceed until directed.

.3 Place geotextile in excavation and cover with filter aggregate, to pipe invert elevation. Slope as specified and tamp lightly.

3.2 PIPE BEDDING

.1 Lay drainage piping on a 100 mm thick bedding of granular fill. Spread and hand tamp bedding to ensure proper consolidation, before laying pipe.

.2 Carefully arrange sub-drains to bypass obstructions such as footing irregularities.

3.3 PIPE LAYING

.1 Lay drainage piping around perimeter foundations and/or in configurations as indicated on Drawings and/or described herein.

.2 Use unperforated pipe to join perimeter weepers to sump pits, and for header runs connecting the underfloor weepers to the sump pits.

.3 Use adapter fittings to join perforated weepers to unperforated pipes.

.4 Use standard fittings for corners, bends, elbows, crosses, tees and wyes.

.5 Install end plugs at the terminal ends of pipe runs.

.6 Protect pipe ends from damage and ingress of foreign material at all times.

.7 The drainage system shall drain to the existing sump for collection.

3.4 COVER

.1 Do not cover drains with filter aggregate until reviewed by Departmental Representative. Place a layer of granular fill over and around the sides of all perforated weepers. The layer of filter aggregate shall be 300 mm thick.

.2 Consolidate the cover with a light tamping to compact the material without damaging or dislodging the pipes.

.3 Wrap geotextile around filter aggregate.

.4 Install geotextile drainage layer against foundation walls after waterproofing membrane application and prior to backfilling.

.5 Have drain installation reviewed before backfilling and supervise backfilling to ensure geotextile is not displaced and pipe is not damaged.

3.5 CLEAN-UP

.1 Clean up and remove all unused and discarded materials arising from the work of this Section.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Definitions:
.1 Raking: removal of loose/deteriorated mortar to a depth suitable for repointing until sound mortar, and/or 4x joint thickness and/or a specified mm depth mm is reached.
.2 Repointing: filling and finishing of masonry joints from which mortar is missing has been raked out or has been omitted.
.3 Tooling: finishing of masonry joints using tool to provide final contour.
.4 Low-pressure water cleaning: water soaking of masonry using less than 350 kPa (50 psi) water pressure, measured at nozzle tip of hose.

.2 CSA International
.1 CAN/CSA A23.1/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
.2 CAN/CSA A179-[04(R2009)], Mortar and Grout for Unit Masonry.

1.2 ACTION AND INFORMATIONAL 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 Samples:
.1 Provide labelled samples of materials used on project for approval before work commences.

.4 Test and Evaluation Reports:
.1 Provide certified test reports showing compliance with specified performance characteristics and physical properties.
.2 Provide laboratory test reports certifying compliance of mortar ingredients with specifications requirements.

1.3 QUALITY ASSURANCE

.1 Masonry Contractor:
.1 Use single Masonry Contractor for masonry work.
.2 Masonry contractor to have experience in historic stone masonry work on projects of similar size and complexity to Work of this Contract.
.3 Masonry contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing

stones which are part of structural masonry work.

.2 Masons:
.1 Mason to have experience in historic stone masonry work.
.2 Masons to have proof of license certification for propriety restoration mortars.

.3 Cement grouting: grouting activities should be undertaken by experienced workers in manipulation and cement grouting methods.

.4 Obtain approval from Departmental Representative for changes to qualified personnel.

.5 Mock-ups:
.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
.2 Construct mock-up 0.6 m x 0.6 m to demonstrate raking and repointing procedures for each type of above grade exterior stone masonry material specified in locations designated by Departmental Representative.
.3 Notify Departmental Representative minimum of 24 hours prior to construction of the mock-up.
.4 Perform mock-up of masonry cleaning with low pressure 15 to 45 psi clean water and soft natural bristle brush.
.5 Construct mock-up under supervision of Departmental Representative to demonstrate a full understanding of specified procedures, techniques and formulations is achieved before work commences.
.6 Construct mock-up where directed by Departmental Representative
.7 Work not to proceed prior to approval of mock-up. Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with masonry repointing work.
.8 Accepted mock-up will demonstrate minimum standard for this work. Mock-up will remain as part of finished work.

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:
.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
.2 Store cementitious materials and aggregates in accordance with CAN/CSA A23.1.
.3 Store lime putty in plastic lined sealed drums.
.4 Keep material dry. Protect from weather, freezing and contamination.
.5 Ensure that manufacturer's labels and seals are intact upon delivery.

.6 Remove rejected or contaminated material from site.

1.5 AMBIENT CONDITIONS

.1 Maintain masonry temperature between 10 degrees C and 25 degrees C for duration of work.

.2 When ambient temperature is below 10 degrees C:
.1 Store mortar materials for immediate use within heated enclosure in accordance with Section 01 52 00 – Construction Facilities. Allow mortar materials to reach minimum temperature of 10 degrees C before use.
.2 Ensure only sand and water are heated before use:
.1 Heat and maintain sand temperature to minimum 10 degrees C and maximum 30 degrees C.

.2 Heat and maintain water temperature to minimum of 20 degrees C and maximum of 30 degrees C:
.3 Provide hot water to a maximum 30 degrees C on site during cold weather.

.3 Maintain sand temperature between 10 degrees C and 30 degrees.

.4 Do not mix cement with water or with aggregate or with water-aggregate mixtures having higher temperature than 30 degrees C.

.5 Maintain mortar mix temperature between 10 degrees C and 30 degrees C.

PART 2 - PRODUCTS

2.1 MORTAR

.1 Mortar: in accordance with CAN/CSA A179 and Section 04 03 08 - Historic - Mortaring.

PART 3 - EXECUTION

3.1 SITE VERIFICATION OF CONDITIONS

.1 Report in writing to Departmental Representative areas of deteriorated masonry not previously identified.

.2 Stop work in that area and report to Departmental Representative immediately evidence of hazardous materials.

3.2 SPECIAL TECHNIQUES

.1 Examine mortar joints.
.1 Examine horizontal and vertical joints to determine which were struck first and whether they are the same style, as well as aspects of workmanship which

establish authenticity of original work.
.2 Replicate the style selected by Departmental Representative.

.2 Test mortar joints.
.1 Procedure of testing: examine joints visually for obvious signs of deteriorated masonry.
.2 Test joints not visually deteriorated as follows:
.1 Test for voids and weakness by using hammers or other approved means.
.2 Perform testing in co-operation with Departmental Representative so that unsound joints can be marked and recorded.

3.4 RAKING JOINTS

.1 Use manual raking tool to obtain clean masonry surfaces.
.1 Remove deteriorated and adhered mortar from masonry surfaces to sound mortar but in no case less than 4x joint thickness leaving square corners and flat surface at back of cut.
.2 Clean out voids and cavities encountered.

.2 Remove mortar without chipping, altering or damaging masonry units.

.3 Clean surfaces of joints with non-ferrous brush or by moderate water wash without damaging texture of exposed joints or masonry units.

.4 Flush open joints and voids; clean open joints and voids with low pressure water and if not free draining blow clean with compressed air.

.5 Leave no standing water.

3.5 REPOINTING:

.1 Dampen joints and porous masonry units.

.2 Keep masonry damp while pointing is being performed.

.3 Completely fill joint with mortar.
.1 If surface of masonry units has worn rounded edges keep pointing back from surface to keep same width of joint
.2 Avoid feather edges.
.3 Pack mortar solidly into voids and joints.

.4 Build-up pointing in layers not exceeding 12 mm in depth.
.1 Allow each layer to set before applying subsequent layers.
.2 Maintain joint width.

.5 Finish joints to match existing profile.

.1 Tool, compact and finish using mason's slick to force mortar into joint.

.6 Remove excess mortar from masonry face before it sets.

3.6 PROTECTION DURING CURING PROCESS

.1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
.1 Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent finished work from drying out too rapidly.

.2 Cover with waterproof tarps to prevent weather from eroding recently repointed material.
.1 Maintain tarps in place for minimum of 2 weeks after repointing.

.2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.

.3 Anchor coverings securely in position.

.4 Damp cure:
.1 Provide damp cure for pointing mortars.
.2 Install and maintain wetted burlap protection during the curing process:
.1 Minimum [3] days.
.3 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
.4 Shade areas of work from direct sunlight and maintain constant dampness of burlap.

.5 Protect from drying winds. Pay particular attention at corners of structure.

.6 Maintain ambient temperature of minimum 10 degrees C after repointing masonry for:
.1 Minimum 7 days in summer.
.2 Minimum 30 days in cold weather conditions using dry heated enclosures.

3.7 CLEANING

.1 Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract as work progresses.

.2 Remove droppings and splashings using clean sponge and water.

.3 Do further cleaning using stiff natural bristle brushes after mortar has attained its initial set and has not fully cured.

.4 Clean masonry with stiff natural bristle brushes and plain water only if mortar has fully cured.

.5 Clean masonry with low pressure 15 to 45 psi clean water and soft natural bristle brush.

.6 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

3.8 PROTECTION OF COMPLETED WORK

.1 Protect adjacent finished work against damage which may be caused by on-going work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 04 03 07 – Historic – Masonry Repointing.

1.2 ALTERNATES

.1 Obtain Departmental Representative's approval before changing manufacturer's brands or sources of supply of mortar materials during entire contract or other methods of mixing mortar specified elsewhere in this specification.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C 5-03, Standard Specification for Quicklime for Structural Purposes.
.2 ASTM C 144-04, Standard Specification for Aggregate for Masonry Mortar.
.3 ASTM C 207-06, Standard Specification for Hydrated Lime for Masonry Purposes.
.4 ASTM C 260-06, Standard Specification for Air-Entraining Admixtures for Concrete.
.5 ASTM C 270-07a, Standard Specification for Mortar for Unit Masonry.
.6 ASTM C 780-02, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
.7 ASTM C 1072-06, Standard test Method for Measurement of Masonry Flexural Bond Strength.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-A179-04, Mortar and Grout for Unit Masonry.
.2 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.4 DESIGN/PERFORMANCE REQUIREMENTS

.1 Mortar compressive strength to maximum 25% of compressive strength of bonded masonry units.

1.5 SAMPLES

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

.2 Provide samples in quantity and size in accordance with CAN/CSA-A179.

1.6 TESTING

.1 Flow and cube strength: to ASTM C 270.

STANDARDS

.2 Vicat cone test: to ASTM C 780.

.3 Cube strength: to CAN/CSA-A179, Appendix B.

.4 Flexural bond strength: to ASTM C 1072.

1.7 QUALITY ASSURANCE

.1 Qualifications:

.1 Mechanics to have experience in lime mortars preparation.

.2 Provide and construct mock-ups in accordance with Section 01 45 00 - Quality Control.
.3 Submit methods of reproducing existing mortar colour, texture and pointing styles, and samples.
.3 Mock-up will be used:
.1 To judge workmanship, substrate preparation, operation of equipment and material application.
.2 For testing to determine compliance with performance requirements.
.6 Locate where directed by Departmental Representative.
.7 Allow 24 hours for inspection of mock-up before proceeding with work.
.8 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.8 AMBIENT CONDITIONS

.1 Execute work when ambient temperature is above 0 degrees C. When ambient temperature is below 0 degrees C cover and heat work as directed by Departmental Representative.

.2 Prepare and maintain temperature of mortar between 5 degrees C and 50 degrees C until used.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Water: potable, clean and free from contaminants.

.2 Sand: to ASTM C 144.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4 (4.75 mm)	100	0
No. 8	90	5
No. 16	70	25
No. 30 (600 micron)	50	20
No. 50 (300micron)	30	20
No. 100 (150 micron)	15	15
No. 200 (75 micron)	0	15

.1 Sharp, screened and washed pit sand, free of organic material, with final grading and colour to approval of Departmental Representative.
.2 Custom blend sands where necessary to provide appropriate colour match and gradation to approval Departmental Representative.

.3 Portland cement: to CAN/CSA-A3000 (A5).

.4 Lime:

.1 Processed Lime (Quicklime): to ASTM C 5, fresh, finely ground and crushed; high calcium, 3/16" fines, dry bagged.
.2 Hydrated Lime:
.1 Dolomitic finishing lime, Type "S", to ASTM C 207.
.2 Hydrated, high calcium, Type "N" masons' lime to [ASTM C 207.

.5 Additives:
.1 Obtain written approval of Departmental Representative before using additives.

2.2 ACCESSORIES

.1 Prepare mortars in:

.1 A mortar mill comprising mortar pan with adjustable cast iron sprung rollers on cranked roller shaft, steel scrapers and blades.

2.3 MORTAR MIXES

.1 Property requirements:
.1 Mixes: as required to achieve specified performance criteria, functionally compatible with adjacent materials and components.

PART 3 - EXECUTION

3.1 SITE VERIFICATION OF CONDITIONS

.1 Report in writing to Departmental Representative areas of deteriorated masonry not previously identified.

3.2 GENERAL PREPARATIONS

.1 Special Techniques:

.1 Examine horizontal and vertical joints to determine which were struck first and whether they are same style, as well as aspects of workmanship which establish authenticity of original work.

.2 Prepare measuring boxes to ensure accurate proportioning of materials.

.3 Maintain separate measuring boxes for each component.

.4 Ensure sand is tested and volume corrected for bulking.

.5 Ensure air entraining agent is available together with a graduated container for accurate volume measurements.

.6 Ensure testing equipment is ready and in working order.

3.3 PREPARATION OF HYDRATED LIME PUTTY

.1 Lime putty preparation:

.1 Estimate project requirements, and prepare sufficient lime putty for entire project by slaking hydrated lime in plaster's metal troughs as follows:

.1 Fill trough with minimum 300 mm of hot water.

.2 Add bagged dry hydrated lime to water. (CAUTION: DO NOT ADD WATER TO HYDRATED LIME).

.3 Mix material with hoe or shovel until mixture forms a thick cream.

.4 Run through 3 mm mesh screen into plastic-lined drums to cool.

.5 Store under 100 mm of water.

.6 Seal containers.

.7 Allow to cure for minimum of 48 hours before use.

.2 Label and date all containers.

.3 Keep prepared material from freezing. Discard frozen material.

3.4 BULKING OF SAND

.1 Test sand for bulking:
- .1 At start of work;
- .2 After each new delivery of sand;
- .3 After an excessive change in weather.

.2 Test and adjust sand quantities for bulking.

.1 Obtain sample of sand which accurately reflects average condition of pile of damp sand, by the following method:
- .1 Take 4 shovels full of sand, each from a different level of the pile, and mix thoroughly.
- .2 Place this sand in a conical pile and divide into 4 quarters with a board. Remove 2 opposite quarters from the pile, and combine the 2 remaining quarters and mix thoroughly.
- .3 Repeat this quartering and mixing procedure until a sample of the size required for testing remains.

.2 Fill a 1-litre capacity jar, about two-thirds full with the damp sand to be tested. Drop sand in loosely. Do not pack it in. Level off surface, then measure depth of damp sand (D).
- .1 Carefully empty sand into another container, and half fill first container with water.
- .2 Pour back about half of the test sample of sand slowly into the water so that it is entirely saturated. Rod it thoroughly to remove air.
- .3 Add rest of sand, rodding again to remove air and level off surface. Measure depth of saturated sand (S), which will be less than depth of damp sand.
- .4 Calculate the percentage bulking using formula: [(D-S) x 100%]/S = percentage bulking; where D = depth of damp sand, and S = depth of saturated sand.

.3 Increase volume of sand by percentage bulking shown in test.

3.5 PREPARATION OF LIME-SAND ROUGHAGE (COARSE STUFF)

.1 Prepare measuring boxes to ensure accurate proportioning of lime putty and sand.

.2 Take lime putty from bins, siphon off water by screening lime through muslin, or cheesecloth, to remove excess water. Rework lime without adding water until it regains its plasticity by beating, ramming and chopping.

.3 Adjust sand for bulking as described in article 3.4.

.4 Mix lime and sand thoroughly in mortar mill for minimum 3 and maximum 10 minutes. Add no water. No spots or streaks of lime to remain upon completion of mixing.

.5 Store lime sand roughage in air-tight plastic bins.

.6 Keep prepared material from freezing. Discard frozen material.

.7 Maintain measuring containers for correct quantity of materials for use in batches.

.8 Thoroughly clean mortar boards, measuring boxes and mixers between batches.

3.6 CLEANING

.1 Remove droppings and splashings using clean sponge and water.

.2 Clean masonry with low pressure 15 to 45 psi clean water and soft natural bristle brush.

.3 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

3.7 PROTECTION OF COMPLETED WORK

.1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.

.2 Enclose and protect work using wetted burlap as directed in Article 1.9, AMBIENT CONDITIONS of this Section.

.3 Cover with waterproof tarps to prevent weather from eroding recently laid material.
.1 Maintain tarps in place for minimum of 2 weeks after laying.
.2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.

.4 Anchor coverings securely in position.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
.1 CAN/CSA-A165 SERIES-04(R2009), CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
.2 CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.
.3 CAN/CSA-A370-04(R2009), Connectors for Masonry.
.4 CAN/CSA A371-04(R2009), Masonry Construction for Buildings.

1.3 ACTION AND INFORMATIONAL 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 masonry products and include product characteristics, performance criteria, physical size, finish and limitations.

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 materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

.1 Standard concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1).
.1 Classification: H/15/A/M

.2 Fire rated concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1) as modified below.
.1 Classification: H/15/B/M

2.2 REINFORCEMENT AND CONNECTORS

.1 Bar reinforcement: to CAN/CSA-A371 and CSA G30.18], Grade 400.

.2 Wire reinforcement: to CAN/CSA-A371 and ASTM A 496/A 496M, truss type.

.3 Connectors shall be corrosion resistant: to CAN/CSA-A370 and CSA S304.1.

2.3 MORTAR AND GROUT

.1 Mortar: to CAN/CSA-A179.
.1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.

.2 Mortar Type: N based on property specifications,

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

.1 Concrete block units:
.1 Bond: running.
.2 Coursing height: 200mm for one block and one joint.
.3 Jointing: concave where exposed or where paint or other finish coating is specified.

3.3 CONSTRUCTION

.1 Exposed masonry:
.1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
.2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.

.2 Building-in:
.1 Install masonry connectors and reinforcement where indicated on drawings.
.2 Build in items required to be built into masonry.
.3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
.4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
.5 Install loose steel lintels over openings where indicated.

.3 Concrete block lintels:
.1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
.2 End bearing: not less than 200 mm.
.3 Leave [6] mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.

3.4 REINFORCING AND CONNECTING

.1 Install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371 and CSA S304.1 unless indicated otherwise.

3.12 CLEANING

.1 Clean in accordance with Section 01 74 11 – Cleaning. Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.

3.13 PROTECTION

.1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.2 Repair damage to adjacent materials caused by masonry products installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 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 A179-04, Mortar and Grout for Unit Masonry.
.3 CAN/CSA A370-04, Connectors for Masonry.
.4 CAN/CSA A371-04, Masonry Construction for Buildings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheets illustrating products to be incorporated into project for specified products.

1.3 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.

1.4 FIELD MEASUREMENTS

.1 Make field measurements necessary to ensure proper fit of members.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle masonry anchorage and reinforcing materials in accordance with Section 01 61 00 - Common Product Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Connectors: to CAN/CSA A370 and CSA-S304.1.

.2 Corrosion protection: to CSA-S304.1, galvanized to CSA-S304.1 and CAN/CSA A370.

.3 Ties: hot dip galvanized to CAN/CSA A370 Table 5.2 uncoated steel finish.

2.2 FABRICATION

.1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and [Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada].

.2 Fabricate connectors in accordance with CAN/CSA A370.

.3 Obtain Departmental Representative's and Consultant's approval for locations of reinforcement splices other than shown on placing drawings.

.4 Upon approval of Departmental Representative and Consultant, weld reinforcement in accordance with CSA W186.

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PREPARATION

.1 Direct and coordinate placement of metal anchors for masonry supplied to other Sections.

3.3 INSTALLATION

.1 Supply and install masonry connectors and reinforcement in accordance with CAN/CSA A370, CAN/CSA A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.

3.4 BONDING AND TYING

.1 Install unit, adjustable, single wythe and multiple wythe joint reinforcement where indicated and in accordance with CAN/CSA A370 and CAN/CSA A371.
.1 Install horizontal joint reinforcement [400] mm on centre.
.2 Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.
.3 Place joint reinforcement continuous in first and second joint below top of walls.
.4 Lap joint reinforcement ends minimum 150 mm.
.5 Connect joint corners and intersections with strap anchors 400 mm on centre.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-A165 Series-2004, CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.
.2 CAN/CSA A371-04, Masonry Construction for Buildings.
.3 CSA S304.1-04, Design of Masonry Structures.

.2 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
.1 Product Data: provide product data, including manufacturer's printed data sheets and catalog pages illustrating products to be incorporated into project for specified products.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Standard concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1) .
.1 Classification: H/15/A/M

.2 Fire rated concrete block units: to CAN/CSA-A165 Series (CAN/CSA-A165.1) as modified below.
.1 Classification: H/15/B/M

2.2 REINFORCEMENT AND CONNECTORS

.1 Bar reinforcement: to CAN/CSA-A371 and CSA G30.18, Grade 400.

.2 Wire reinforcement: to CAN/CSA-A371 and ASTM A 496/A 496M, truss type.

.3 Connectors shall be corrosion resistant: to CAN/CSA-A370 and CSA S304.1.

2.3 MORTAR MIXES

. 1 Mortar: to CAN/CSA-A179.

.1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
.2 Colour: ground coloured natural aggregates or metallic oxide pigments.

.2 Mortar Type: N based on property specifications,

.3 Mortar for foundation walls, manholes, sewers, pavements, walks, patios and other exterior masonry at or below grade: type M based on property specifications.

.4 Following applies regardless of mortar types and uses specified above:
.1 Mortar for stonework: type N based on property specifications.
.2 Mortar for grouted reinforced masonry: type S based on property specifications.

.5 Grout: to CAN/CSA-A179, Table 3.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verify surfaces and conditions are ready to accept work of this Section.

.2 Commencing installation means acceptance of existing substrates.

3.2 PREPARATION

.1 Protect adjacent finished materials from damage due to masonry work.

3.3 INSTALLATION

.1 Concrete block units:
.1 Bond: running.
.2 Coursing height: 200mm for one block and one joint.
.3 Jointing: concave where exposed or where paint or other finish coating is specified.

3.4 REINFORCEMENT

.1 Install reinforcing in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

3.5 MORTAR PLACEMENT

.1 Place mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.6 CONSTRUCTION

.1 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.

.2 Construct masonry walls using running bond unless otherwise noted.

.3 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.

.4 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.

.5 Install movement joints and keep free of mortar where indicated.

.6 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.

.7 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.

.8 Ensure compacted head joints. Use full or face-shell joint as indicated.

.9 Tamp units firmly into place.

.10 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.

.11 Tool exposed joints concave; strike concealed joints flush.

.12 After mortar has achieved initial set up, tool joints.

.13 Do not interrupt bond below or above openings.

3.7 REPAIR/RESTORATION

.1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

3.8 CLEANING

.1 Clean in accordance with Section 01 74 11 – Cleaning. Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .2 CSA O141-05(R2009), Softwood Lumber.
- .3 CSA O151-09], Canadian Softwood Plywood.
- .4 CAN/CSA-O325.0-07, Construction Sheathing.

.2 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber 2010.

1.2 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 grade mark in accordance with applicable CSA standards.

1.3 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 materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

PART 2 - PRODUCTS

2.1 MATERIALS

.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.
- .3 CAN/CSA-Z809 or FSC or SFI certified.

.2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
- .1 S2S is acceptable
- .2 Board sizes: "Standard" or better grade.
- .3 Dimension sizes: "Standard" light framing or

better grade.
.4 Post and timbers sizes: "Standard" or better grade.

.3 Plywood Panel: Canadian softwood plywood conforming to CSA 0151, "G1S".

2.2 ACCESSORIES

.1 Fasteners: to CAN/CSA-G164, for exterior work, interior highly humid areas, and pressure-preservative treated lumber.

.2 Nails, spikes and staples: to CSA B111.

.3 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, as recommended for purpose by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry 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 Comply with requirements of NBC, supplemented by the following paragraphs.

.2 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.

.3 Align and plumb faces of furring and blocking to tolerance of [1:600].

.4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using

[galvanized] [steel] fasteners.

.6 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.

.7 Install sleepers as indicated.

.8 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

.9 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.10 Countersink bolts where necessary to provide clearance for other work.

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.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM B 370-03, Standard Specification for Copper Sheet and Strip for Building Construction.

.2 Canadian Standards Association (CSA International)
.1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
.2 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.3 National Building Code of Canada - 2005 (NBC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Samples:
.1 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
.2 Provide duplicate full size shingles, of finish, profile and pattern to match existing.

1.3 QUALITY ASSURANCE

.1 Mock-ups:
.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
.2 Construct 1200 mm x 1200 mm panel of shingle pattern including eave, ridge, hip and valley details.
.3 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with wood shingle and shake Work.
.4 Mock-up may be part of finished work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Provide a platform to prevent bundles or loose shingles coming in contact with ground.

.3 Use boards to cover top of pile to keep out rain and prevent over-drying of bundles or loose shingles in top layer.

1.6 EXTENDED WARRANTY

.1 For work done of this Section, 12 month warranty period prescribed in Section 24, Subsection 32.1 of GC General Conditions "C" will be extended to 24 months.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Circular sawn shingles:
.1 Species: Eastern White Cedar.
.2 Grade: treated.
.3 Profile: 1.6 mm at point; 12.7 mm at butt – field verify and match existing.
.4 Widths: random widths
.5 Lengths: minimum 406 mm– field verify and match existing.
.6 Grain: 100% edge – grain.
.7 Wood: free from all knots, heartwood, sapwood, bark and outer layer of fibre.
.8 Defects: clear butts.
.9 Preparation: corners of feather end - diagonally trimmed, smooth sanded face hand-dressed to match existing.

.2 Wood Strapping: 1 x 3 Cedar

.3 Roof Underlayment - Typical:
.1 Roofing Felt: plain No.15 asphalt-saturated organic felt to CSA A123.3

.4 Roof Underlayment at Valleys and Ridges / Eave Protection:
.1 Composite sheet comprised of rubberized asphalt integrally bonded to a film of high density cross laminated polyethylene. Minimum thickness of membrane shall be 40 mils (1.02 mm) provided in minimum 36" (900 mm) wide rolls.
.2 Acceptable Materials:
.1 Ice and Water Shield as manufactured by W.R. Grace of Canada Ltd.
.2 Esgard as manufactured by Emco Building Products Limited
.3 ArmorGard Ice and Water Protection as manufactured by IKO.
.4 Colphene 1000 GSA as manufactured by Soprema Waterproofing Inc.
.5 Eaveguard Shingle Underlayment as manufactured by Bakor Inc.
.6 Alternate approved by Departmental Representative

.5 Flashing / Drip Flashing:
.1 Copper sheet: to ASTM B 370 cold rolled soft temper 0.072 mm thick.

.6 Flashing nails: to be of same material as sheet metal to CSA B111, flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Shingle nails:
.1 Wire nails:
.1 Shingle: to CSA B111, flat head, round shank, diamond point 32 mm hot-dipped, zinc coated mild steel
.2 Double-coursing: to CSA B111, brad head, dimpled or plain, round-shank, diamond point 45 mm hot-dipped, zinc coated mild steel.

PART 3 - EXECUTION

3.1 STRIPPING OFF OF EXISTING FINISHES

.1 Remove existing roof and dormer finishes, flashings and underlay, and expose sheathing of roof and dormers.

.2 Withdraw existing shingle and flashing nails, setting those nails which break off. Leave surfaces free from dirt and loose material.

.3 Report to Departmental Representative unforeseen deficiencies and deterioration. Repair as directed.

3.2 INSTALLATION OF FLASHINGS

.1 Valley flashings:
.1 Intersecting roof planes of equal pitch: valley sheets to extend from centre line of valley, up each side a distance of at least 300 mm.
.2 Intersecting roof planes of unequal pitch: valley sheets to extend from centre line of valley, up side of valley with steeper pitch at least 300 mm, and up side of valley with lower pitch a distance of 300 mm.

.3 Hip and ridge:
.1 Install hip and ridge flashing beneath last course of shingles. Flashing to extend on each side of ridge to depth of last course.

.4 Cap flashings or counter flashings:
.1 Turn cap flashings down over base flashings to not less than 100 mm and extend to within 25 mm of surface of finished roof.
.2 Reglet: (chimney or wall) cap flashing inserted not less than 50 mm and secured with lead plugs 25 mm wide, 200 mm apart by removing mortar, then filling over flashing with bituminous mastic is turned down over base flashing. Outside edge is turned back on itself at least 13 mm.

3.4 ROOF APPLICATION

.1 Install shingles over dry substrate.

.2 Spacing:
.1 Roof application:
.1 Shingles under 130 mm wide minimum 3 mm joints.

.2 Shingles over 130 mm wide 6-13 mm joints.
.3 Rived or sawn shingles, approx. 6 mm joints.
.4 Hand split shakes 6-10 mm joints.

.3 Joints:
.1 Stagger side lap joints 38 mm with no joint lining up within three courses.

.4 Nailing:
.1 For concealed nailing, typical use 2 nails per shingle up to 200 mm wide, 3 nails per shingle in excess of 200 mm wide. Space nails 19 mm from edge with additional nails 100 mm apart across face of shingle and 40 mm above butt line of following course.
.2 For "butt nailing" double coursed side walling use 2 or more nails. Space nails 19 mm from each edge of shingle, and a third nail in centre of all shingles wider than 200 mm and 50 mm above butt line of following course.
.3 Bottom shingles of double starter course to have additional line of nailing 13 mm back from overhang. Spacing to be similar to that of typical roof course. Ensure nails not driven through eave boards if overhang does not have a soffit.
.4 Provide extra nailing to final course of shingles at ridge, 25 mm plus down from ridge if sawing off, or breaking off of extra shingle length, in situ, is required.
.5 Drive nails flush but do not crush shingles.

3.5 SHINGLE ROOFING

.1 Roof underlayment / eave protection:
.1 Provide roof underlayment / eave protection over entire substrate and as specified in NBC - Subsection 9.27.5.
.2 Fasten bottom edge of eave protection with roofing nails not more than 300 mm on centre.
.3 Install parallel to eaves with head and end lap of not less than 50 mm.
.4 Overlap eave protection by not less than 100 mm.

.2 Hip and ridge protection:
.1 Apply strip of roof underlayment 200 mm wide over crown of hips and ridges.

.3 Starter course:
.1 Double] shingles at eaves.
.2 Block up starter course sufficient to bring high points of all shingle courses into alignment.
.3 Project butts 25 mm from first sheathing board or fascia

.4 Typical course:
.1 Install shingles with weather exposure and having triple thickness of shingles] at any given point.

.2 Lay shingles with grain perpendicular to eaves.
.3 In laying mixed flat and vertical grain shingles, avoid lining up joints with centre lines of "hearts" and never break a joint directly below centre lines of "hearts".
.4 Split flat grained shingles wider than 200 mm. Minimum width: 100 mm.
.5 Keep [shingles] [shakes] 25 mm clear of any vertical flashing.

.5 Finishing gable rake:
.1 Place 150 mm tilting fillet of cedar bevel siding full length of each gable and with thick edge flush with sheathing edge.
.2 Butts of shingles which rest on tilting fillet to be cut back to produce slight slant.
.3 Upper corner of edge shingles to be clipped off.
.4 Edge protection of shingles over end rafters or barge boards and mouldings to be from 25-40 mm.

.6 Finishing the hips:
.1 Mitred hip:
.1 Cut shingles selected for finishing hip, so that grain of wood runs parallel with line of hip.
.2 Run shingle ends over alternately at centre line of hip and dress to bevel of opposite side of roof.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 37-GP-9Ma: Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing
- .2 CGSB 37-GP-15M: Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing
- .3 CGSB 37-GP-36M: Application of Filled Cutback Asphalts for Dampproofing and Waterproofing
- .4 CAN/CGSB-37.58-M86: Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing
- .5 CGSB 37-GP-64M: Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-Up Roofing

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide 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 29.06 - Health and Safety Requirements, and indicate VOC content for:
- .1 Primers.
- .2 Asphalt.
- .3 Sealers.
- .4 Filter fabric.

.3 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens, roofing felts and membrane with specification requirements.

.1 Compatibility of materials: submit written declaration to Departmental Representative as described in PART 2, COMPATIBILITY.

1.3 QUALITY ASSURANCE

.1 Installer qualifications: company or person specializing in application of liquid applied waterproofing systems

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

1.5 SITE CONDITIONS

.1 Ambient Conditions:
.1 Apply waterproofing only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
.2 Do not install waterproofing when air and substrate temperature remains below 5 degrees C in accordance with manufacturer's recommendations or when wind chill gives equivalent cooling effect.
.3 Install waterproofing on dry substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into system.

1.6 WARRANTY

.1 For the Work of this Section, 12 months warranty period is extended to 24 months.

PART 2 - PRODUCTS

2.1 PLANT AND EQUIPMENT

.1 Do not use direct fired equipment.

.2 Use only kettles equipped with thermometers or gauges in good working order.

.3 Locate kettles in safe place outside of building or, if approved by Departmental Representative on noncombustible substrate at location to avoid danger of igniting combustible material below.
.1 When locating kettles, give consideration to direction of prevailing winds, building fans and air handling units to minimize possibility of smoke and fumes entering surrounding occupied buildings.
.2 If wind direction causes smoke and fume problems, relocate kettles on daily basis when directed by Departmental Representative.

.4 Maintain supervision while kettles are in operation and provide metal covers for kettles to smother flames in case of fire.
.1 Provide suitable fire extinguishers.

.5 Maintain efficiency of kettles and equipment by frequent cleaning.
.1 Remove all carbonized bitumen.

2.2 MATERIALS

.1 Surface Conditioner: to CGSB-37-GP-9Ma, asphalt cut-back, Surface Conditioner No. 56170 by Hydrotech Membrane Corporation or PQ 6109 by Permaquik Corporation or 910-02 by Monsey Bakor Inc.

.2 Waterproof Membrane for Hot Application: to CAN/CGSB-37.50-M, Flexible Membrane 6125 by Hydrotech Membrane Corporation, or 790-11 by Monsey Bakor Inc., or PQ 6100 by Permaquik Corporation, supplied in sealed

containers, ready for melting and application.

.3 Heavy Duty Elastomeric Reinforcement: to CGSB 37-GP-64M, minimum 1.6 mm thick sheet, Heavy Duty Elastosheet 6146 by Hydrotech Membrane Corporation, or Globe Glass Mat by Monsey Bakor Inc., or PQ 2063 Butyl Reinforcement by Permaquik Corporation.

.4 Protection Board: geotextile drainage layer in accordance with the requirements of specification Section 02 71 10, Sub-surface Drainage.

PART 3 - EXECUTION

3.1 QUALITY OF WORK

.1 Do examination, preparation and waterproofing Work in accordance with Waterproofing Manufacturer's Specification Manual.

.2 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 SUBSTRATE EXAMINATION

.1 Verification of Conditions: examine substrates to assure they are smooth, dry, and free from conditions that will adversely affect execution, permanence, or quality or work and immediately inform of Departmental Representative in writing of defects. Apply membrane waterproofing after other work which penetrates membrane has been completed.

3.3 PREPARATION

.1 Clean surfaces to receive waterproofing. Substrates shall be sound, dry, free of dust, dirt, paint, grease, oil or other foreign substances.

.2 Remove fins, sharp edges, oil, dust, dirt, grease and loose particles.

3.4 APPLICATION

.1 Melt asphalt in equipment approved by membrane manufacturer, consisting of indirect fired kettle with double shell containing high flash point heat transfer coil, minimum 315 deg C (600 deg F).

.2 Apply surface conditioner to CGSB 37-GP-15M, using roller coater at rate of 600 sq. ft./gal. Follow manufacturer's written directions for minimum drying time before application of membrane.

.3 Apply hot applied membrane to CAN/CGSB-37.51-M and cold applied to CGSB 37-GP-36M.

.4 Reinforce joints and cracks to manufacturer's instructions.

.5 Apply waterproofing to minimum thickness of 3 mm (1/8").

.6 Flash pipes, conduits and other penetrations of horizontal surface and seal pipes in vertical surfaces, to manufacturer's instructions.

.7 Apply membrane waterproofing to allow for differential movement of building at expansion and control points, and span 3 mm (1/8") cracks in substrate materials.

.8 Apply protection board to cover waterproofing membrane.

3.5 FIELD QUALITY CONTROL

.1 Obtain manufacturer's representative's inspection of substrate prior to commencement of work, during application of membrane and upon completion of work.

.2 Manufacturer's representative shall provide technical assistance to applicator and assist where required in correct installation of waterproofing.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- .2 ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
- .3 ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- .4 ASTM E1745-11 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- .5 ASTM F1249-01 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.2 SUBMITTALS

.1 Submit product data in accordance with the requirements of Section 01 33 040 - , Submittal Procedures.

.2 Include manufacturer's installation instructions for placement, seaming and penetration repair instructions.

.3 Submit certified copies of test reports in accordance with the requirements of specification Section 01300, Submittals, verifying the underslab vapour barrier meets or exceeds the test results of ASTM E 1745, Paragraph 8.3.

1.3 QULAIFICATIONS

.1 Employ only skilled workers having experience in the work specified, and having an understanding of the design principles of the materials which they are providing.

1. DELIVERY, STORAGE AND HANDLING

.1 Store packaged materials in their original wrappings or containers with manufacturer's labels and seals intact. Store flammable materials outside the building and protect from weather hazards and open flame. Abide by fire protection regulations imposed by the authorities having jurisdiction, and take precautionary measures to avoid fires.

.2 In cold weather, provide warm storage for materials such that their consistency is suitable for ease of application.

PART 2 - PRODUCTS

2.1 UNDERSLAB MEMBRANE VAPOUR BARRIER

.1 Vapour barrier membrane at underslab installations shall be manufactured of polyolefin-based resin / chemical technology and shall meet or exceed all requirements of ASTM E 1745 Classes A, B, & C, including the following performance characteristics:

.1 Thickness: not less than 15 mils in accordance with ACI 302.2.
.2 Permeance: less than 0.01 Perms in accordance with ASTM E 1745, Section 7.
.3 Tensile Strength: 84 lb. force/inch in accordance with ASTM E 154, Section 9.
.4 Strength: Class A in accordance with ASTM E 1745.
.5 Puncture Resistance: 4,135 Grams in accordance with ASTM D 1709, Method B.
.6 Water Vapor Retarder: meet or exceed Class A, B & C in accordance with ASTM E 1745.

.2 Acceptable Materials: the following products are acceptable **provided they meet or exceed** the requirements of these specifications:

.1 "Stego Wrap Vapor Barrier" as manufactured by Stego Industries.
.2 "Perminator 15" as manufactured by W. R. Meadows, Inc.
.3 "Griffolyn 15" as manufactured by Reef Industries, Inc.
.4 "Moistop Ultra 15" as manufactured by Fortifiber Building Systems.
.5 Alternate approved by Departmental representative

2.1 ACCESSORIES

.1 Seam / Joint Tape: minimum 100 mm (4") wide, pressure sensitive, self-adhesive, high density polyethylene tape, "Stego Tape" as manufactured by Stego Industries or "Sealtight Vapor-Mat Tape" as manufactured by W.R. Meadows, "Griffolyn Ultra VR Tape" as manufactured by Reef Industries, Inc. or "Moistop Tape and the Boot" as manufactured by Fortifiber Building Systems and for use in sealing vapour retarder seams and attachment to footings, foundation walls, protrusions, etc.

.2 Mastic: as recommended by vapour barrier manufacturer. Material shall be a permanent air / vapour seal and be compatible with the products used for the underslab vapour barrier. Use for sealing breaks, holes, penetrations and other projections, and elsewhere as recommended by the manufacturer.

.3 Pipe Boots: construct pipe boots from vapor barrier

material and pressure sensitive tape per manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Underslab vapour barrier installations shall be inspected and approved by the Departmental Representative prior to the installation of concrete or other slab finishing materials.

.2 Conform with manufacturer's recommendations for storage and application of underslab vapour barrier sheet.

.3 Permanently seal vapour retarder at all penetration, punctures, etc. using vapour barrier membrane and/or joint sealant tape.

3.2 INSTALLATION

.1 Unroll vapour retarder membrane over the area where slab-on-grade is to be poured. Cut to size, as required. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement.

.2 Lap vapor barrier over footings and/or seal to vertical foundation walls or grade beams with joint tape and/or mastic.

.3 Overlap all joints / seams, both lateral and butt, minimum 150 mm (6") and seal with joint tape. The joint tape area shall be free from dust, dirt and moisture to allow maximum adhesion of tape.

.4 Seal all penetrations, including pipes, as per manufacturer's instructions.

.5 No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.

.6 Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 150 mm (6") and taping all sides with tape.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

PART 2 - PRODUCTS

2.1 INSULATION

.1 Extruded polystyrene (XPS): to CAN/ULC-S701.
.1 Type: 2.
.2 Compressive strength: 110 kPa (16 p.s.i.
.3 Flexural strength: 240 kPa (35 p.s.i.).
.4 Water absorption: less than 0.70% by volume
.5 Water vapour permeance: 90 ng/Pa s m2 (1.5 perms)
.6 Thickness: as indicated.
.7 Edges: shiplapped.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.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 WORKMANSHIP

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, and other protrusions.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected

and approved by Departmental Representative.

3.3 EXAMINATION

.1 Examine substrates and immediately inform Departmental Representative in writing of defects.

.2 Prior to commencement of work ensure:
.1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.4 PERIMETER FOUNDATION INSULATION

.1 Exterior application: extend boards below finish grade as indicated to top of footing.

3.5 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S702-03, Standard for Mineral Fibre Insulation.

1.2 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 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 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 Co-ordinate with other building sub-trades.
.4 Review [manufacturer's] installation instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 BATT INSULATION

.1 Batt and blanket mineral fibre: preformed, friction fit glass or mineral fibre batt insulation conforming to the requirements of CAN/ULC-S702, minimum thermal resistance value of R3.8 per inch (RSI 0.58 per 25.4 mm).

.2 Batt sizes shall be of largest practical size and as required to suit wall assemblies and in thicknesses and/or thermal resistance values as indicated on Drawings.

.3 Acceptable materials:

.1 "Pink Fiberglas" Thermal Batt Insulation as manufactured by Owens-Corning Canada Inc.
.2 "Sustainable Insulation" as manufactured by CertainTeed Corporation.
.3 "Wood Frame Thermal Fiber Glass Insulation" as manufactured by Johns Manville
.4 "EcoBatt" as manufactured by Knauf Insulation
.5 "Flexibatt" as manufactured by Roxul Inc.
.6 Alternate approved by Departmental Representative.

2.2 SOUND ATTENUATING INSULATION

.1 For use at all sound attenuated partitions shall be light density preformed, friction fit glass or mineral fibre batt insulation conforming to the requirements of CAN/ULC-S702, in thicknesses as scheduled.

.2 Batt sizes shall be of largest practical size and as required to suit wall and/or ceiling assemblies and in thicknesses as indicated on Drawings.

.3 Acceptable materials:

.1 "Quietzone" Acoustic Batt Insulation as manufactured by Owens-Corning Canada Inc.
.2 "NoiseReducer" Fibreglass Insulation as manufactured by CertainTeed Corporation
.3 "EcoBatt Insulation" as manufactured by Knauf Insulation
.4 "Thermafibre" as manufactured by Canadian Gypsum Company Limited
.5 "AFB" as manufactured by Roxul Inc.
.6 "SAFB" as manufactured by Fibrex Insulations Inc.
.7 Alternate approved by Consultant.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.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 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

.4 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.3 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

PART 2 - PRODUCTS

2.1 SHEET VAPOUR BARRIER

.1 Polyethylene film: to CAN/CGSB-51.34, 0.10 mm thick.

2.3 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer.

.3 Staples: minimum 6 mm leg.

.4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 EXTERIOR SURFACE OPENINGS

.1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.3 PERIMETER SEALS

.1 Seal perimeter of sheet vapour barrier as follows:
.1 Apply continuous bead of sealant to substrate

at perimeter of sheets.
.2 Lap sheet over sealant and press into sealant bead.
.3 Install staples through lapped sheets at sealant bead into wood substrate.
.4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 LAP JOINT SEALS

.1 Seal lap joints of sheet vapour barrier as follows:
.1 Attach first sheet to substrate.
.2 Apply continuous bead of sealant over solid backing at joint.
.3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
.4 Install staples through lapped sheets at sealant bead into wood substrate.
.5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 ELECTRICAL BOXES

.1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
.1 Install moulded box vapour barrier. Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
.2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

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 REQUIREMENTS

.1 Section 07 62 00 – Sheet Metal Flashing and Trim

.2 Section 07 92 00 – Joint Sealants.

.3 Section 09 03 61 – Historic – Repainting Exterior Surfaces.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
.1 ASTM D 5116-97, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.2 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 Canadian Standards Association (CSA International).
.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
.2 CSA O121-M1978(R1998), Douglas Fir Plywood.
.3 CSA O151-M1978(R1998), Canadian Softwood Plywood.
.4 CAN/CSA-Z808-[96], A Sustainable Forest Management System: Guidance Document.

.4 Environmental Choice Program (ECP).
.1 CCD-045-[95], Sealants and Caulking Compounds.

.5 National Lumber Grades Authority (NLGA).
.1 NLGA Standard Grading Rules for Canadian Lumber 2003.

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 for caulking materials during application and curing.

.2 Samples:
.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit duplicate 405 mm size for each profile specified or required.

.3 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 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Lumber siding: to NLGA Standard Grading Rules for Canadian Lumber.
.1 Bevel siding: Eastern White Cedar, Grade 'A Clear" and better, in side and profile to match existing.
.5 Boards and battens: Eastern White Cedar, Grade 'A Clear" and better, in side and profile to match existing.

.2 Accessories: exposed trim, closures, cap pieces of manufacturer's standard, paint finish.

.3 Exterior wall sheathing paper: to CAN/CGSB-51.32 spunbonded olefin type.

.4 Fasteners: nails to CSA B111, hot galvanized steel, sized as required, smooth shank or spiral type with flat finishing head.

2.2 RAINWARE

.1 In accordance with the requirements of specification Section 07 62 00 – Sheet Metal Flashing and Trim.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.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 SIDING INSTALLATION

.1 Install wood siding in accordance manufacturers' instructions.

.2 Install one layer sheathing paper horizontally by stapling lapping edges 100 mm.

.3 Install sill flashings, wood starter strips, inside corner flashings, edgings and flashings over openings.

.4 Fasten wood siding in straight, aligned lengths to sheathing at 405 mm on centre maximum using two nails at each fixing location. Stagger butt joints not less than 800 mm and distribute evenly over wall faces. Cut butt joints at 45 degrees and for vertical siding slope to outside. Seal cut surfaces. Apply battens over vertical joints where scheduled.

3.3 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 04 04 99 – Masonry for Minor Works

.2 Section 07 03 32 – Historic – Wood Shingle Roofing

.3 Section 07 46 23 - Wood Siding and Trim.

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-[07, 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-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
.3 ASTM B 32-04, Standard Specification for Solder Metal.
.4 ASTM B 370-[03], Standard Specification for Copper Sheet and Strip for Building Construction.

.3 Canadian General Standards Board (CGSB)
.2 CAN/CGSB-93.1-[M85], Sheet Aluminum Alloy, Prefinished, Residential.

1.3 ACTION AND INFORMATIONAL 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.

.3 Samples:
.1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section with contractor's representative and Departmental Representative and Consultant 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.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

.1 Copper sheet: to ASTM B 370 temper designation with minimum mass of 20 oz.

.2 Aluminum sheet: factory applied coating to CAN/CGSB-93.1

2.2 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.

.3 Fasteners: of same material as sheet metal, to CSA B111, of length and thickness suitable for metal flashing application.

.4 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION - GENERAL

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details, and as required to match existing installations / profiles.

.2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.

.3 Form pieces in 2400 mm maximum lengths.
.1 Make allowance for expansion at joints.

.4 Hem exposed edges on underside 12 mm.
.1 Mitre and seal corners with sealant.

.5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 REGLETS AND CAP FLASHINGS

.1 Form reglets and metal cap flashing, as required, of copper sheet to match existing, to be built-in existing masonry work and in accordance with CRCA FL series

details.

2.5 EAVES TROUGHS AND DOWNPIPES

.1 Form eaves troughs and downpipes from prefinished aluminum sheet metal.

.2 Eaves troughs shall be equivalent to 125 mm (5") Type K seamless, prefinished aluminum eaves trough profile as manufactured by Alcan Building Products.

.3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.

.4 Install at all horizontal fascia locations as indicated, complete with all inside and outside mitre corners, elbows, end caps, and accessory sections and fasteners as required.

.5 Provide 75 mm x 100 mm (3" x 4") downpipes in locations indicated.

.6 Provide 60mm x 600 mm precast concrete splash pads.

PART 3 - 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] [CRCA FL series details and AAI-Aluminum Sheet Metal Work in Building Construction.

.2 Use concealed fastenings except where approved before installation.

.3 Lock end joints and caulk with sealant.

.4 Install surface mounted reglets true and level, and caulk top of reglet with sealant.

.5 Insert metal flashing into reglets to form weather tight junction.

3.3 EAVES TROUGHS AND DOWNPIPES

.1 Install eaves troughs and secure to building at 750 mm on centre with eaves trough spikes through spacer ferrules.
.1 Slope eaves troughs to downpipes as indicated.
.2 Seal joints watertight.

.2 Install downpipes and provide goosenecks back to wall.

.1 Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.

.3 Install splash pads as indicated.

3.4 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

PART 1 - GENERAL

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.2 Underwriter's Laboratories of Canada (ULC)
.1 ULC-S115-1995, Fire Tests of Fire stop Systems.

1.2 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.3 ACTION AND INFORMATIONAL 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 two copies of WHMIS MSDS - Material Safety Data Sheets.

.3 Shop Drawings:
.1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.

.2 Construction details should accurately reflect actual job conditions.

.4 Samples:
.1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.

.5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
.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, cleaning procedures.
.4 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in fire stopping installations.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and 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.

.3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
.2 Twice during progress of Work at 25% and 60%

complete.
.3 Upon completion of Work, after cleaning is carried out.

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 - Common Product Requirements.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.

.2 Storage and Protection:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
.1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN- ULC-S115 and not to exceed opening sizes for which they are intended [and conforming to specified special requirements described in PART 3].

.2 Fire stop system rating: 1 hour.

.2 Service penetration assemblies: systems tested to CAN-ULC-S115.

.3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

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 datasheets.

3.2 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation [without interruption to vapour barrier].

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Mechanical pipe insulation: certified fire stop system component.
.1 Ensure pipe insulation installation precedes fire stopping.

3.6 FIELD QUALITY CONTROL

.1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

.2 Manufacturer's Field Services:
.1 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 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 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.8 SCHEDULE

.1 Fire stop and smoke seal at:
.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
.2 Top of fire-resistance rated masonry and gypsum board partitions.
.3 Intersection of fire-resistance rated masonry and gypsum board partitions.
.4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
.5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.6 Openings and sleeves installed for future use through fire separations.

.7 Around mechanical and electrical assemblies penetrating fire separations.

.8 Rigid ducts: greater than 129 cm2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International
.1 ASTM C 919-[08], Standard Practice for Use of Sealants in Acoustical Applications.

.3 Canadian General Standards Board (CGSB)
.1 CGSB 19-GP-5M-[1984], Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
.2 CAN/CGSB-19.13-[M87], Sealing Compound, One-component, Elastomeric, Chemical Curing.
.3 CGSB 19-GP-14M-[1984], Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
.4 CAN/CGSB-19.17-[M90], One-Component Acrylic Emulsion Base Sealing Compound.
.5 CAN/CGSB-19.24-[M90], Multi-component, Chemical Curing Sealing Compound.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL 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 joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
.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 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Samples:
.1 Submit 2 samples of each type of material and colour.
.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions:
.1 Submit instructions to include installation instructions for each product used.

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 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, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect joint sealants from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

.1 Ambient Conditions:
.1 Proceed with installation of joint sealants only when:
.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
.2 Joint substrates are dry.
.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:
.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:
.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 ENVIRONMENTAL REQUIREMENTS

.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 Health Canada.

PART 2 - 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 off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Sealant Type A – Urethane Based:
.1 Exterior, non-traffic bearing, weather side of construction: multi-component modified urethane base chemical curing conforming to CAN/CGSB-19.24-M, Type 2, Class B or one component modified urethane base chemical curing conforming to CAN/CGSB-19.13-M, Class MCG-2-25-B-N, in colours as selected by the Consultant

.2 Sealant Type B – Acrylic Latex Based
.1 Interior, non-traffic bearing: one (1) component, interior acrylic latex emulsion base, conforming to CAN/CGSB-19.17-M.

.3 Sealant Type C – Silicone Based:
.1 Interior sanitary caulking: one (1) component, chemical curing, mildew resistant, silicone conforming to ASTM C920-05, containing non-toxic fungicidal agents.

.4 Sealant Type D – Acoustic
.1 Interior acoustic caulking: one (1) component, non-skinning, non-hardening synthetic butyl rubber sealant for use in reducing sound transmission in drywall partitions and for sealing wall penetrations chemical curing.

.5 Preformed compressible and non-compressible back-up materials:
.1 Polyethylene, urethane, neoprene or vinyl foam:
.1 Extruded closed cell foam backer rod.
.2 Size: oversize [30 to 50 %].
.2 Neoprene or butyl rubber:
.1 Round solid rod, Shore A hardness 70.
.3 High density foam:
.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by

manufacturer.

.4 Bond breaker tape:

.1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION SCHEDULE

.1 General: use one (1) of the sealants specified for each type in the following locations. Ensure sealant chosen (from several specified under each type under "MATERIALS") for each location is recommended by manufacturer for use for conditions encountered.

.2 Sealant Type A: install in the following exterior locations:

.1 Joints between exterior wood and hollow metal door and window frames and adjacent masonry wall assemblies and wood or metal cladding or panels in exterior wall construction.

.2 Exposed expansion and/or control joints in masonry walls; masonry wall corners and masonry-to-column junctures.

.3 Raked joints in junction of walls running at different angles, and at junction of walls to columns.

.4 All other exterior locations where sealing is required or noted on Drawings except in locations designated for Types B, C and D and except where sealing is specified in other Sections.

.3 Sealant Type B: install in the following interior locations:

.1 Joints between interior hollow metal door frames and adjacent wall / partition construction.

.2 Joints between masonry and concrete surfaces.

.3 Joints between gypsum board, wood casings and trim, or other materials.

.4 Joints between louvres and other surfaces.

.5 Penetrations through roofs, floors and walls other than firestopping.

.6 All other interior locations where sealing is required or noted on Drawings except in locations designated for Types A, C and D and except where sealing is specified in other Sections.

.4 Sealant Type C: install in the following locations:

.1 Joints between counters and backsplashes and adjacent wall surfaces in washrooms and wet areas.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.

.2 Primer: in accordance with sealant manufacturer's written recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants 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 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.
.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.

3.7 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 adjacent surfaces immediately.
.3 Remove excess and droppings, using recommended cleaners as work progresses.
.4 Remove masking tape after initial set of sealant.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 08 62 10 – Wood Windows Restoration.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-A440-M90, Windows

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB 19-GP-24-M90, Multi-component Chemical Curing Sealing Compound
.2 CAN/CGSB-79.1-[M91], Insect Screens.
.3 CAN2-12.2-M76, Glass, Sheet, Flat, Clear

1.3 ACTION AND INFORMATIONAL 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 new bi-fold windows **at existing Sunroom 104** and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim, junction between combination units, elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes, fasteners, and caulking. Indicate location of manufacturer's nameplates.
.2 **Note all bi-fold windows at Sunroom 104 shall be custom sizes and configurations as indicated on Drawings**.

.4 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit one representative model of each type window.
.4 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.
.5 Include 150 mm long samples of head, jamb, sill, meeting rail, mullions to indicate profile.

.5 Test and Evaluation Reports:
.1 Submit test reports from approved independent testing laboratories, certifying compliance with

specifications, for:
.1 Windows classifications.
.2 Insect screens.
.3 Air tightness.
.4 Water tightness.
.5 Wind load resistance.
.6 Condensation resistance.
.7 Forced entry resistance.

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 windows 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, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors or in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect windows from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

1.7 EXTENDED WARRANTY

.1 Warrant work of this Section against defects and deficiencies for period of five (5) years in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Departmental Representative and at no expense to Owner. Defects include but are not limited to failure of seal of enclosed air space and deposits on inner face of insulated glass units that are detrimental to vision.

PART 2 - PRODUCTS

2.1 MANUFACTURE

.1 Drawings and specifications for work of this Section are based on custom fabricated, mulit-leaf, bi-folding type, extruded aluminum clad wood window products, c/w

extruded aluminum brick moulds, sills and trim, similar to the "Architect Series" as manufactured by Pella Corp.. Products manufactured by Kolbe Windows and Doors, Marvin Windows and Doors Inc., Bonneville Windows and Doors and Loewen Windows are also acceptable provided they conform to the requirements of the drawings and specifications, including available range of colour selections.

.2 **Window Units**: shall meet or exceed the requirements of CAN/CSA A440-00 Windows, for air leakage (A-3), water leakage (B-7), windload resistance (C-4) and forced entry resistance (F-2).

.3 **Frame and Sash**: shall be fabricated from **Birch or Maple**, kiln-dried lumber and finished with extruded aluminum brickmould exterior and clear **Birch or Maple** interior and suitable for interior paint finish. Provide matching custom interior jamb extensions and trim, as required, to suit existing wall assemblies. Exterior sash shall be fabricated of hollow extruded aluminum profiles complete with integral brick mould, sill and trim in configurations as indicated on Drawings.

.4 **Aluminum Sections, including Sills and Brick Moulds**: extruded from 6063-T5 aluminum alloy, minimum wall thickness .062 mm (1/16").

.5 **Finish of Aluminum:** all exposed aluminum finishes shall be alodine treatment, "Duracron" thermosetting acrylic finish, or "EnduraClad Plus" fluoropolymer resin, colour 'white' to match existing wood window finishes.

.6 Isolation coating: alkali resistant bituminous paint.

2.3 FABRICATION

.1 Fabricate in accordance with CSA-A440/A440.1 supplemented as follows:

.2 Design and fabricate necessary concealed brackets and anchorage devices so that, when installed, they will compensate for unevenness and dimensional difference in the structure to which they are secured, will allow full expansion and contraction of framing members as a result of such expansion and contraction of framing members and will adequately sustain themselves, the windows and superimposed wind and rain loads and all other stresses.

.3 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.

.4 Face dimensions detailed are maximum permissible sizes.

.5 Brace frames to maintain squareness and rigidity during shipment and installation.

.6 Provide thermal break which will maintain interior surface of frames and glass free from condensation and frosting under conditions of -23 deg C (-10 deg F) outside temperature with 23 deg C (74 deg F) inside temperature and 35% relative humidity.

.7 Finish steel clips and reinforcement with 380 g/m² zinc coating to ASTM A 123/A 123M.

2.4 GLAZING

.1 Glaze windows in accordance with CSA-A440/A440.1.

.2 Glazing for exterior windows shall be equivalent to 'Heatsmart 1', argon gas filled double seal glass units with low E coating on the third surface and thermally-broken spacers in accordance with the requirements of CAN2-12.8-M90 and IGMAC. Provide with exterior dry glazed gaskets and co-extruded flexible vinyl seals on the interior.

2.5 HARDWARE

.1 Hardware: stainless steel or white bronze sash locks and aluminum handles to provide security and permit easy operation of units. Hardware finish to match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative and Consultant.
.2 Inform Departmental Representative and Consultant of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Window installation:
.1 Install in accordance with CSA-A440/A440.1.
.2 Arrange components to prevent abrupt variation in colour.

.2 Sill installation:
.1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with

plumb upstands and faces. Maximize lengths and minimize joints at each location.

.2 Secure sills in place with anchoring devices located at ends joints of continuous sills and evenly spaced 600 mm on centre in between.

.3 Caulking:

.1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window frame. Caulk butt joints in continuous sills.

.2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within window units except where exposed use is permitted by Departmental Representative and Consultant.

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.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by window installation.

END OF SECTION

PART 1 - GENERAL

1.1 INTENT

.1 The intent of this section is that the final work match as closely as possible the design and arrangement of the original windows.

1.2 GENERAL DESCRIPTION OF WORK

.1 This Section refers to the repair or restoration of existing wood windows, frames, and glazing, as indicated on the drawings and the scope of work described in the attached Sault Ste. Marie Canal Window Condition Assessment Report prepared by Public Works and Government Services Canada (PWGSC), dated August 28, 2013 (181 pages).

1.3 RELATED WORK

.1 Section 09 03 61 – Historic – Repainting Exterior Surfaces.

.2 Section 09 03 62 – Historic – Repainting Interior Surfaces

1.4 QUALITY ASSURANCE

.1 Carpenter, Glazer, and Installer: fully equipped trade specialist, expert craftsmen, highly skilled, and having relevant experience to the Work of this section.

1.5 HARDWARE CUTS SHEETS AND SAMPLES

.1 Submit for each type of new and restored window hardware, and suspension system, showing operation and final finish. Submit cut sheets for all new components.

1.6 MOCK-UP

.1 Provide mock-up on site for approval by Departmental Representative. Approved mock-ups will be used as the respective standard for quality and become part of the final work. Show restored construction, primed finish, glazing materials, sealant, and hardware. Demonstrate the following:

.1 Exterior frame, sill, brick mould;
.2 Restored sash;
.3 Repaired casement;
.4 Glazing repair (putty); and
.5 All hardware and suspension (expose one side only)

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Wood members: to match existing, generally White Pine. Moisture content to be average of 7% (min. 5% max 9%) at time of fabrication.

.2 Boiled linseed oil.

.3 Penetrating and impregnation epoxy equivalent to "LiquidWood" for penetration and impregnation.

.4 Paste filler epoxy equivalent to "WoodEpox" by Abatron or approved alternate.

.5 Sealants: in accordance with the requirements of specification Section 07 92 00 – Joint Sealants.

.6 Glazing compound, where existing: linseed oil based putty. Note that putty must be well kneaded prior to installation to ensure oil is well mixed.

..7 Use restoration glass to replace retained existing panels damaged during the work. Use metal glazing points for installation of glazing panels.

.8 Weatherstripping: equivalent to products as manufactured by Accurate Metal Weatherstrip and installed in accordance with manufacturer's instructions.

2.2 GLAZING

.1 Glazing: as required, to match existing.

2.3 HARDWARE

.1 Retain or salvage existing historic hardware for reuse.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 On completion of removal of all sash and exposure of frames, review conditions and notify Departmental Representative architect of discrepancies between documents and exposed site conditions.

3.2 PROTECTION OF HISTORIC ELEMENTS FOR RE-USE

.1 Labels for removed components: Prior to commencing, apply labels to all components of the window including hardware. Labels shall be removable but secure.

.2 Storage: Store disassembled elements in a manner that they can be easily sorted and found for re-use at time of re-assembly. Protect reusable historic glazing, from breakage during removal, during repair and during storage period. Store small items in plastic self-sealing bags and label each with indelible ink.

.3 Numbering: As disassembly proceeds, number all components removed with indelible pen in areas hidden from view in final installation. as much as possible, the original components of the windows shall be re-used in the restoration work.

.4 Protection: Where windows are to be removed protect the remaining elements and building interior from weather.

3.3 PROCEDURE FOR REMOVAL FROM INTERIOR

.1 Removal of Hardware and Fixings: Prior to removal of screws or fixings, carefully remove paint from head of fixing and clean out slots so that screw drivers have good contact with the metal of the fixings. Ensure that all fixings are salvaged, bagged and labeled for re-use.

.2 Carefully remove window stops and trim by means of scoring along paint line and easing trim and stops away from casing by putty knife or chisel. Take care not to snap trim or stops.

.3 Remove lower sash and disconnect remaining sash cords. Tie off the weights.

.4 Remove upper sash by chiseling out parting strips (cut new stops to a size to match existing rebate in casing), then removing carefully.

.5 Remove sash weight covers from casing, then re-fix them temporarily in their locations prior to installation of new sash cords.

.6 Remove, clean and free-up sash cord pulleys and apply oil to each shaft to ensure free operation.

.7 Re-install in original locations as soon as this work is complete.

3.3 RESTORATION SCHEDULE

.1 The following repairs will be required except as indicated:

.1 All checked or cracked wood to upper and lower sash and casements.
.2 Replacement of all putty.
.3 Dutchman repairs to match original profiles.
.4 Gluing and clamping of all loose sash/casement members.
.5 Dowel reinforcing as required.
.6 Repairs to missing or broken glass.
.7 Replace all sash cords and missing pulleys.
.8 Interior stops, parting strips and blind stops.
.9 Exterior frames, stops and brick moulds.

3.4 GLASS REMOVAL

.1 To facilitate repair of wood elements, remove glass from sashes as follows:

.1 Prior to removing damaged wood elements (eg. wood muntin bars), mark glass with a wax pencil designating the window sash location and pane reference location, carefully remove all glazing

and safely store for re-installation in the same location.

.2 If glass is not carefully removed (i.e. if it is broken during removal), restorer will be responsible for replacement glazing to match original.

.3 Remove putty by gently heating with a heat gun, soldering iron or a purpose made putty softening device.
- .1 If putty will not break free of glass without danger of breaking glass, cut muntin bar to blade width behind bedding of putty with stanley knife (through wood) then remove window with putty intact.
- .2 Then remove putty on padded bed with putty knife and clean up to make glass ready for re-glazing.
- .3 Alternative use paint remover to soften putty then remove mechanically.

3.5 REPAIR OF SASH

.1 Sash and casement components designated for repair may include rails, styles or muntin bars.

.2 Where only rails and styles are designated for repair, **do not remove glass**. Where muntin bars or inside of styles or rails are designated for repair, remove glass as specified.

.3 Remove damaged or rotted rails, styles or muntin bars designated for replacement by first drilling out wood plugs holding muntins to styles and rails / and styles to rails. Separate elements and clean up parts to be re-used by removing paint and damaged areas.

..4 Fabricate replacement components to duplicate exactly the original components in dimension, profile and installation (including mortises and tenons, dowel plugs, etc.)
- .1 Re-install using scored hardwood dowels.
- .2 Use white glue in dowels and mortises.

3.6 REPAIS USING FILLERS

.1 Some elements (ie: brick mould, sills, frames, interior trim) will be capable of being restored without requiring replacement.

.2 It is expected that the bulk of damaged styles and rails will be restored in this fashion.

.3 Restore these components, as directed, using fillers as follows:

.1 Epoxy Filler:

.1 Follow manufacturer's safety instructions for using epoxy products strictly. Ensure that all workers use proper skin protection (gloves) and that work area is properly ventilated prior to commencing.

.2 Scrape loose wood and brush out dust and fine particles from area to be repaired.

.3 Treat rotted and damaged areas with a liberal brushing of zinc napthenate preservative. Allow to dry for min. 24 hours before proceeding with next stage.

.4 Consolidate damaged wood with penetration and impregnation epoxy as per manufacturer's instructions by brushing into damaged areas.

.1 Allow material to set.

.2 Once wood has been consolidated spread epoxy paste filler into element and fair piece back to original profile.

.3 Allow epoxy to cure.

.5 Where wood sills have severely rotted, prepare a form to match required profile of original sill.

.1 Mix epoxy to pourable consistency.

.2 Ensure lug sills below wood are fully protected from spills of epoxy.

.3 Keep prepared sills protected from water prior to pouring epoxy.

.4 Where a large area (more than 100 mm x 100 mm) is to be poured, install nylon reinforcing bars prior to pouring epoxy.

.2 Putty Filler:

.1 Where wood is only weathered and not rotted (surface grain raised), putty filler may be used or putty filler as follows:

.1 Assuming all paint has weathered off, scrape any remaining and treat surface with boiled linseed oil cut 50/50- with turpentine.

.2 Spread putty on dried surface with putty knife and blend flat.

.3 Finish with primer and paint as noted below.

3.7 SILL REPAIRS

.1 Exterior window sill shall be restored under this section using epoxy technique noted above.

3.8 PREPARATION FOR PAINTING

.1 On completion of reconstruction of damaged elements, scrape loose paint from sash and window elements and lightly sand all surfaces.

.2 Immediately apply primer as specified.

.3 Re-glaze as specified below for restoration glass.

3.9 RE-GLAZING

.1 Apply two (2) coats of boiled linseed oil to unpainted frame and muntin bars in areas to receive putty.

.2 Use boiled linseed oil as un-boiled will not oxidize.

.3 Cut 50/50 with turpentine and apply to dry wood areas. If material is absorbed quickly (ie. wood is very dry), repeat application. Also apply this to glazing rebates prior to putty application to prevent putty vehicle from being absorbed into wood.

.4 Place a thin setting bed of putty in the muntin/frame mortise.

.5 Evenly press the glass pane into the setting bed to avoid breakage and to ensure a complete contact of glass with putty.

.6 Install glazing clips.

.7 Install putty and trim to profile.

3.10 SHOP AND SITE PAINTING

.1 Refer to the requirements of specification Section 09 03 61 – Historic – Repainting Exterior Surfaces and Section 09 03 62 – Historic – Repainting Interior Surfaces.

.2 Allow putty to skim prior to painting.

.3 Shop paint removed units and wood stops prior to shipping and site paint units restored in situ with one coat of primer then one coat of exterior enamel.

.4 Ensure that paint coat is installed after putty has skinned (approximately 24 hours).

.5 Ensure that paint laps edge of putty onto glass surface by minimum 1.6 mm to seal putty/glass junction.

.6 Site-paint with final coat of enamel after installation.

3.11 INSTALLATION

.1 Prior to final installation, pre-paint all sash and stops on all exposed and hidden areas except for sides of movable sash which will have to be field planed.

.2 Set window units in restored openings plumb, square and level, free from warp, twist or superimposed loads. For opening windows:

.1 Prior to securing window stops, rub a heavy layer of paraffin wax on hidden planed edges of movable sash to seal and permit easy movement.

.2 Do not use soap.

.3 Secure stops adequately and accurately in required position. For opening windows secure in manner not restricting normal movement of wood windows.

.4 Re-install sash cords and sash weight covers where indicated.

.5 For opening windows adjust opening sash and hardware to operate smoothly.

3.12 CAULKING

.1 Refer to the requirements of specification Section 07 92 00 – Joint Sealants.

.2 Seal joints between frame members at fixed window units and other non-operating components of window assembly with sealant to provide weathertight seal at outside and air, vapour seal at inside.

.3 Apply sealant in accordance with Section 07 92 00 – Joint Sealants. Conceal sealant within window components except where exposed use is permitted by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 References

.1 CGSB 1-GP-2M-80 Oil, Linseed, Boiled.

.2 CGSB 1-GP-16M-79 Shellac Varnish.

.3 CGSB 1-GP-28M-77 Paint, Exterior, Alkyd, House.

.4 CGSB 1-GP-40M-79 Primer, Structural Steel, Oil Alkyd Type.

.5 CGSB 1-GP-55M-82 Primer, Wood Exterior.

.6 CGSB 1-GP-59M-78 Enamel, Exterior, Gloss, Alkyd Type.

.7 CGSB 1-GP-61Ma-85 Enamel, Alkyd, Marine, Exterior and Interior.

.8 CGSB 1-GP-69M-79 Paint, Aluminum.

.9 CGSB 1-GP-138M-78 Paint, Exterior, Latex Type, Flat.

.10 CGSB 1-GP-140M-78 Primer, Red Lead, Iron Oxide, Oil Alkyd Type.

.11 CGSB 1-GP-166M-79 Primer, Basic Lead Silico - Chromate, Oil, Alkyd Type.

.12 CGSB 1-GP-167M-80 Enamel, Exterior, Basic head Silico-Chromate, Alkyd Type.

.13 CGSB 1-GP-189M-78 Primer, Alkyd, Wood, Exterior.

1.2 Source Quality Control

.1 Retain purchase orders, invoices and other documents to prove that material used in contract meets requirements of specification and produce when requested by Departmental Representative.

1.3 Samples

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

1.4 Delivery and Storage

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver and store materials in manufacturers original container with labels intact.

.3 Ensure dry delivery and storage of materials and equipment at site.

.4 Store materials and equipment in a well ventilated place with temperature range 20 to 30° C.

1.5 Existing Conditions

.1 Investigate structural problems related to safe execution of preparation of structure to be painted and report unsatisfactory conditions to Departmental Representative before beginning work.

.2 Report to Engineer conditions of deteriorated materials found during preparation, not previously disclosed.

1.6 Environmental Requirements

.1 Substrate and ambient temperature must be within limits prescribed in paint standard by manufacturer.

1.7 Protection

.1 Protect paint and painting equipment before use and during length of contract from climatic elements.

.2 Protect exterior of structure from markings and other damage. Protect completed work from paint droppings. Use non-staining coverings.

.3 Provide for protection of passing pedestrians and the general public.

1.8 Scheduling of Work

.1 Submit work schedule starting and final completion dates for approval by Departmental Representative.

.2 Take measures necessary to complete work within approved scheduled time. Change in schedule must be approved by Departmental Representative

.3 Co-ordinate execution with other work at site.

1.9 Alternates

.1 Products conforming with this specification must be identified in writing by contractor for approval by Departmental Representative.

.2 Changing manufacturers brands, sources of supply of painting materials from those previously approved must be approved by Departmental Representative.

.3 Request for alternative approval must be submitted in writing and be accompanied by full literature and recommendations from manufacturers concerned.

PART 2 - PRODUCTS

2.1 Materials

.1 Paint materials for each coating formulae to be products of a single manufacturer.

.2 Paint materials to be as specified.

.4 Liquid paint remover to CGSB or proprietary liquid paint remover of known performance.

2.2 Tools and Equipment

.1 Departmental Representativewill determine areas where power tools or equipment may be used for both preparing and painting of substrate.

2.3 Mixing Paint

.1 Paint to be ready for application by brush or roller when received.

.2 Add thinners for brush or roller application only with prior approval of Departmental Representative.

.3 Mix paint in full containers up to 25 litres capacity by viberator shaker method.

.4 Mix paint in full containers up to 5 litres by propeller mixer method.

.5 Reproduce historic paint by:
.1 Adding small amount of vehicle to pigment.
.2 Mixing well by propeller method.
.3 Adding slowly remainder of vehicle while mixing until coating is homoneneous.
.4 Adding small amounts of colouring matter (if necessary) until colour achieved.
.5 Mixing until homogeneous.
.6 Checking all labels for special manufacturer's instructions.

.6 Do not mix or keep paint in suspension by means of an air stream under paint surface.

PART 3 - EXECUTION

3.1 Preparation for Tasks

.1 Ensure that workers are informed of safety rules.

.2 Ensure that safety measures have been taken each day before any job is started.

.3 Verify that equipment meets safety standards.

.4 Encourage workers to report hazards in their work.

.5 Place safety devices and signs near work area as indicated or directed.

3.2 Surface

.1 Prepare wood surfaces exposed to normally dry rural atmosphere to CGSB 85-GP-2M.

Preparation

.2 Clean wood surfaces exposed to maritime atmosphere:
.1 Scrub area with diluted detergent solution and clean warm water using a stiff bristle brush to remove salt, dirt and oil.
.2 Hose down scrubbed area with clean water until foreign matter is flushed from surface.
.3 Allow washed area to drain completely and allow to dry thoroughly.

.3 Prepare wood area to CGSB 85-GP-2M.

.4 Prepare steel surfaces exposed normally to dry weather to CGSB 85-GP-15M.

.5 Prepare steel surfaces exposed to salt or fresh water to CGSB 85-GP-18M.

.6 Prepare galvanized steel surfaces to CGSB 85-GP-16M.

.7 Prepare copper and copper alloys surfaces to CGSB 85-GP-20M.

.8 Prepare masonry, stucco and brick surfaces to CGSB 85-GP-31M.

3.3 Paint Application

.1 Method of application and uniform coats of specified film thickness be in agreement with painting contractor, paint supplier and Departmental Representative.

.2 **Note recommended coating systems will generally apply to new construction as well.**

3.4 Finishes

.1 Wood primers:
.1 CGSB 1-GP-55.
.2 CGSB 1-GP-189.
.3 A related approved proprietary primer of known performance.
.4 Prepared new primer to match sample.

.2 Wood topcoats:
.1 CGSB 1-GP-28, type 1.
.2 CGSB 1-GP-28, type 2.
.3 CGSB 1-GP-41.
.4 CGSB 1-GP-138.
.5 A related approved proprietary topcoat of known performance.
.6 Prepared new topcoat to match sample and/or existing finishes.

.3 Apply primers and topcoats to previously painted exterior copper and copper alloys to CGSB 85-GP-20M.

.4 Apply coatings to previously painted cementitious surfaces to CGSB 85-GP-31M.

3.5 Workmanship

.1 All painting work to be carried out by qualified personnel and to job specifications.

3.6 Field Quality Control

.1 Examine surface for adequate preparation.

.2 Check all materials for correctness.

.3 Inspect during application for correct procedures.

3.7 Cleaning

.1 Avoid paint splashings on exposed surfaces not to be painted. Smears and spatter be removed immediately, using compatible solvent.

.2 Avoid scuffing newly applied paint.

3.8 Protection of Completed Work

.1 Protect area where paint has been applied.

.2 On completion of specified work remove surplus materials, tools and equipment and debris on work area; leave clean and tidy to complete satisfaction of Departmental Representative.

END OF SECTION

SECTION NO.	TITLE	NO. OF PAGES
21 05 01	Common Work Results - Mechanical	7
21 12 00	Portable Fire Extinguishers	3
22 11 16	Domestic Water Piping	7
22 13 17	Drainage Waste and Vent Piping – Cast Iron and Copper	3
22 13 18	Drainage Waste and Vent Piping – Plastic	3
22 42 01	Plumbing Specialties and Accessories	8
23 03 01	Use of Mechanical Systems During Construction	2
23 05 53.01	Mechanical Identification	8
23 37 20	Louvres, Intake and Vents	5

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Common work results for Division 21, 22, 23 and 25.
- .2 Sustainable requirements for construction and verification.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.

.2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.3 Submit for approval as indicated in Division 01.

.4 Shop drawings to show:
- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.5 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.

.6 Equipment put forward by this contractor shall meet all the spec'd requirements, dimensioning to fit on site, and connections to tie in with additional systems/equipment. All equipment shop drawings are to be coordinated with site conditions, dimensions, additional equipment and existing systems before submitting.

.7 In addition to transmittal letter referred to in Section 01 33 00: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.8 Closeout Submittals:
- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.
- .2 Operation and maintenance manual approved by, and final copies deposited with Departmental Representative before final inspection.
- .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 manufacturer's performance datasheets with point of operation as left after commissioning is complete.
.2 Equipment performance verification test results.
.3 Special performance data as specified.
.4 Testing, adjusting and balancing reports as specified in Section 23 05 93.

.6 Approvals:
.1 Submit 2 copies 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.

.8 Site records:
.1 Departmental Representative will provide 1 set of reproducible 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 reproducibles, revising reproducibles to show work as actually installed.
.3 Use different colour waterproof ink for each service.
.4 Make available for reference purposes and inspection.

.9 As-built drawings and specifications:
.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
.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 to Departmental Representative for approval and make

corrections as directed.
.4 Perform testing, adjusting and balancing for HVAC using as-built drawings and specifications.
.5 Submit completed reproducible as-built drawings and specifications with Operating and Maintenance Manuals.
.10 Submit copies of as-built drawings and specifications for inclusion in final TAB report.

1.3 HALOCARBONS

.1 Comply with Federal Halocarbon Regulations 2003 under the Canadian Environmental Protection Act 1999, EPAM and PWGSC Ontario Region Halocarbon Information Sheet dated March 2010.

1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.

1.5 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 as follows:
.1 One set of packing for each pump.
.2 One casing joint gasket for each size pump.
.3 One head gasket set for each heat exchanger.
.4 One glass for each gauge glass.
.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
.6 As indicated in individual sections.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Complete list of equipment and materials to be used on this project and forming part of bid documents by adding manufacturer's name, model number and details of materials, and submit for approval.

.2 All materials, equipment, trim, etc.,used in this project must be certified for use in Ontario by a registered certification agency for use in Ontario. (Ex., CSA, UPC(c), NFP(c), etc..

PART 3 EXECUTION

3.1 REPAIRS/RESTORATION

.1 To Division 09.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged extensively for priming and touch-up.

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:
- .1 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 Quality requirements in accordance with Section 01 45 00, 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.

3.4 DEMONSTRATION

.1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to all systems.

.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 Where specified elsewhere in Division 22 or 23 manufacturers to provide demonstrations and instructions.

.5 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.6 Instruction duration time requirements as specified in appropriate sections.

.7 Departmental Representative will record these demonstrations on video tape for future reference.

3.5 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

3.6 EXISTING SYSTEMS

.1 Connections into existing systems to be made outside normal hours operation for the building. Request written approval of time when connections can be made. Include for any overtime and premium charges.
.2 Be responsible for damage to existing systems/building by this work.
.3 Where connections are made to existing services, existing insulation shall be made good under this Division.

3.7 INTERRUPTION OF SERVICES

.1 Any interruption of mechanical services to any part of the building shall be schedules with the owner and general contractor, and shall be completed outside of normal hours of operation for the building. Make all necessary arrangements with those concerned and include for any overtime required to ensure that the interruption is held to a minimum.

.2 All such overtime work shall be carried out without additional cost to the project.

3.8 DEMOLITION

.1 Division 21, 22, 23 and 25 contractor shall remove existing systems and equipment indicated on drawings. In order to determine the extent of the demolition of the existing system, the contractor, before tendering, shall examine the site and determine the extent of existing systems to be removed. The contractor shall be responsible for obtaining an understanding of the extent of the existing systems. No additional costs to the project will be entertained due to failure of the contractor to review the site and understand the extent of removals.

.2 The demolition drawings indicate the extent of the mechanical demolition and some of the major pieces of equipment. The contractor shall visit the site and bring up any issues. This contractor shall carry an additional two (2) man days for demolition of additional items within the building for items which may not be shown on the drawings.

.3 Review all systems and connections before demolition to determine no additional areas of the building will be affected by the demolitions. Bring forward any issues to the Departmental Representative.

.4 Unless noted otherwise, removed equipment/materials shall become the property of the contractor and disposed of off-site at an approved location.

3.9 ABANDONED SERVICES

.1 Within the work areas of the existing building, unknown abandoned services may be encountered. Obtain clarification from the owner regarding these services.

3.10 IDENTIFICATION

.1 All systems and equipment will be provided with a different tag name during construction. Equipment identification (physical nameplates and controls programming) shall follow the Parks Canada tag naming provided during construction for all final systems and equipment.

3.11 DRAWINGS

.1 All drawings are in part diagrammatical. They do not include every fitting, elevation change, obstruction, etc., within the building. The contractor shall verify their extent of work on site before placing the bid.

3.12 HOUSE KEEPING PADS

.1 All indoor equipment shall be placed on 1m high housekeeping pads, where possible. Where not possible, pads should be as high as is practical to allow for installation of the other services. All pads shall be designed by a structural engineer (also provided by this contractor)to carry the equipment selected by this contractor. Pads shall meet or exceed the Ontario Building Code and National Building Code requirements for supports and for seismic bracing.

3.13 OUTDOOR EQUIPMENT SUPPORTS

.1 All outdoor equipment shall be provided with a 1m high structural support system (concrete base and galvanized structural steel support), to keep the equipment out of the expected typical snow buildup. All supports shall be designed by a structural engineer (also provided by this contractor) to carry the equipment selected by this contractor. Pads shall meet or exceed the Ontario Building Code and National Building Code requirements for supports and for seismic bracing.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
  .1 Materials and installation for fire extinguishers.
  .2 Sustainable requirements for construction and verification.

.2 Related Sections:
  .3 Section 23 00 00 - Commissioning.

1.2 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00.

.2 Coordinate submittal requirements and provide submittals required by Section 01 33 00.

.3 Product Data:
  .1 Submit manufacturer's printed product literature, specifications and data sheets.
  .2 Submit WHMIS MSDS in accordance with Section 01 35 29. Indicate VOC's for adhesive and solvents during application and curing.

.4 Shop Drawings.
  .1 Submit shop drawings to indicate: chemicals, ratings and mounting.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Instructions: submit manufacturer's installation instructions.

.7 Manufacturers' Field Reports: manufacturers' field reports specified.

.8 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00, include:
  .1 Manufacturers name, type, model year, capacity and serial number.
  .2 Details of operation, servicing and maintenance.
  .3 Recommended spare parts list with names and addresses.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meeting:.
- .1 Convene pre-installation meeting one week prior to beginning work of this Section.
  - .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.

.2 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling.
- .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 Divert unused materials from landfill to recycling facility as approved by Departmental Representative.
- .5 Unused 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.
- .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection.

.2 FE-1: extinguisher with surface mounting bracket
- .1 Size: 4.5kg
- .2 Rating: 6A, 20BC
- .3 Type: dry chemical extinguisher
- .4 Mounting bracket to come from the same manufacturer as the extinguisher.

.2 FE-2: extinguisher with surface mounting bracket
- .1 Size: 6.8kg
- .2 Rating: K

.3 Type: K dry chemical extinguisher
.4 Mounting bracket to come from the same manufacturer as the extinguisher.

.4 Identification
.1 Identify extinguishers in accordance with recommendations of NFPA 10 and the NFCC.
.2 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

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 Mount extinguishers on brackets with top of extinguisher at 1200mm above finished floor.

.2 Install new extinguishers:
.1 within fire hose cabinets provided under this contract, and
.2 as indicated on drawings

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
- .1 ANSI/ASME B16.15-2011, Cast Copper Alloy Threaded Fittings: Classes 125 and 250.
- .2 ANSI B16.18-01(R2005), Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22-01(R2005), Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24-2001(2006), Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 ASTM International Inc. (ASTM)
- .1 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM B88M-05(2011), Standard Specification for Seamless Copper Water Tube (Metric).

.3 American Water Works Association (AWWA)
- .1 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International)
- .1 CSA B242-05(R2011), Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
- .1 MSS-SP-67-2002a, Butterfly Valves.
- .2 MSS-SP-70-2006, Gray Iron Gate Valves, Flanged and Threaded Ends.
- .3 MSS-SP-71-2005, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
- .4 MSS-SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.

.8 National Research Council (NRC)/Institute for Research in Construction
- .1 NRCC 47668, National Plumbing Code of Canada (NPC) - 2010.

.9 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Closeout Submittals:
.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 61 00.

.2 Packaging Waste Management:
.1 Separate and recycle waste materials.

.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.

PART 2 PRODUCTS

2.1 MATERIALS REQUIREMENTS

.1 Materials and products in accordance with Section 01 61 00.

2.2 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
.2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.3 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS 2 and larger: roll grooved to CSA B242.

2.4 JOINTS

.1 Rubber gaskets, latex-free 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.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.

.6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.5 GATE VALVES

.1 NPS 2 and under, soldered:
.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01.

.2 NPS 2 and under, screwed:
.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23.01.

.3 NPS 2-1/2 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 specified Section 23 05 23.02.

.4 NPS 2-1/2 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 specified Section 23 05 23.02.

2.6 GLOBE VALVES

.1 NPS2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 23.01.
.2 Lockshield handles: as indicated.

.2 NPS 2 and under, screwed:
.1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 23.01.
.2 Lockshield handles: as indicated.

2.7 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 as specified Section 23 05 23.01.

.2 NPS 2 and under, screwed:
.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01.

.3 NPS 2-1/2 and over, flanged:
.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap specified Section 23 05 23.02.

2.8 BALL VALVES

.1 NPS 2 and under, screwed:
.1 Class 150.
.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE/Bunan seat, steel lever handle as specified Section 23 05 23.01.

.2 NPS 2 and under, soldered:
.1 To ANSI/ASME B16.18, Class 150.
.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE/Bunan seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01.

2.9 BUTTERFLY VALVES

.1 NPS 2-1/2 and over, lug:
.1 To MSS-SP-67, Class 200.
.2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.
.3 Lever operated, NPS8 and over, gear operated.

.2 NPS 2-1/2 and over, grooved ends:
.1 Class 300, bubble tight shut-off, bronze body.

.2 Operator:
.1 NPS 4 and under: lever handle.
.2 NPS 6 and over: gear operated.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with NPC, Provincial Plumbing Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 05, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install cold water piping below and away from hot water or hydronic piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.6 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.

3.3 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

.1 Conform to requirements of Section 23 05 05.

.2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is acceptable for potable water use to Provincial and Federal potable water guidelines. Let system flush for additional 2 h, then draw off another sample for testing. If any samples fail the process shall be repeated until two successive clean tests are achieved.

3.6 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.

3.7 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of Departmental Representative. (repeat until samples are determined to be potable as per 3.5 above)

.2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.8 START-UP

.1 Timing: Start up after:
- .1 Pressure tests have been completed.
- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:
- .1 Establish circulation and ensure that air is eliminated.
- .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
- .3 Monitor piping systems for freedom of movement, pipe expansion as designed.
- .4 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.9 PERFORMANCE VERIFICATION

.1 Scheduling:
- .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures:
- .1 Verify that flow rate and pressure meet Design Criteria.
- .2 TAB in accordance with Section 23 05 93.
- .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
- .4 Sterilize domestic water systems for Legionella control.
- .5 Verify performance of temperature controls.
- .6 Verify compliance with safety and health requirements.
- .7 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 re-charge air chambers. Repeat for outlets and flush valves.
- .8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:
- .1 In accordance with Section 01 77 00, 01 78 00 and Division 23.
- .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.10 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 01.

3.11 CLEANING

.1 Clean in accordance with Section 01 74 11.

.2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 ASTM International Inc.
- .1 ASTM B32-08, Standard Specification for Solder Metal.
- .2 ASTM B306-09, Standard Specification for Copper Drainage Tube (DWV).
- .3 ASTM C564-11, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).
- .1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
- .2 CSA B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .3 CAN/CSA-B125.3-11, Plumbing Fittings.

.3 Green Seal Environmental Standards (GSES)
- .1 Standard GS-36-00, Commercial Adhesives.

.4 South Coast Air Quality Management District (SCAQMD), California State
- .1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:
- .1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return, pallets, crates, paddling and packaging materials.

PART 2 PRODUCTS

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary, storm and vent Type DWV to: ASTM B306.
- .1 Fittings.
  - .1 Cast brass: to CAN/CSA-B125.3.

.2 Wrought copper: to CAN/CSA-B125.3.

.2 Solder: lead free, tin-silver-copper, to ASTM B 32.

2.2 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary, storm and vent minimum NPS 3, to: CSA B70, with one layer of protective coating.

.1 Joints:

.1 Mechanical joints:

.1 Neoprene or butyl rubber compression gaskets: to CSA B70. ASTM C564 or

.2 Stainless steel clamps.

.2 Hub and spigot:

.1 Caulking lead: to CSA B67.

.2 Cold caulking compounds.

.2 Above ground sanitary, storm and vent: to CSA B70.

.1 Joints:

.1 Hub and spigot:

.1 Caulking lead: to CSA B67.

.2 Mechanical joints:

.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 In accordance with Section 23 05 05.

.2 Install in accordance with most stringent requirements of the National Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 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 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 VERIFICATION

.1 Verification requirements to include:
  .1 Materials and resources.
  .2 Storage and collection of recyclables.
  .3 Construction waste management.
  .4 Resource reuse.
  .5 Local/regional materials.
  .6 Low-emitting materials.

3.6 CLEANING

.1 Clean in accordance with Section 01 74 11.

.2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 ASTM International Inc.
.1 ASTM D2235-04(2011), Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
.2 ASTM D2564-04(2009)e1, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA International)
.1 CAN/CSA-Series B1800-06, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.

.3 Green Seal Environmental Standards (GSES)
.1 Standard GS-36-00, Commercial Adhesives.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.5 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Provide two copies WHMIS MSDS - Material Safety Data Sheets.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Store at temperatures and conditions recommended by manufacturer.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials..

PART 2 PRODUCTS

2.1 GENERAL

.1 This section is for underground piping only.

2.2 PIPING AND FITTINGS

.1 For buried DWV piping to:
  .1 CAN/CSA-B1800.

2.3 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 In accordance with Section 23 05 05.

.2 Install in accordance with most stringent requirements of the National Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 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 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 VERIFICATION

.1 Verification to include:
- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Resource reuse.
- .5 Local/regional materials.
- .6 Low-emitting materials.

3.6 CLEANING

.1 Clean in accordance with Section 01 74 11.

.2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Materials and installation for plumbing specialties and accessories.

.2 Related Sections:

.1 Section 01 33 00 – Submittal Procedures.
.2 Section 01 78 00 – Closeout Submittals.

1.2 REFERENCES

.1 American Society for Testing and Materials International (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).
.1 AWWA C700-02, Cold Water Meters-Displacement Type, Bronze Main Case.
.2 AWWA C701-02, Cold Water Meters-Turbine Type for Customer Service.
.3 AWWA C702-1-01, Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA International).
.1 CSA B64 Series-11, Backflow Preventers and Vacuum Breakers.
.2 CSA B79-08, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
.3 CSA B356-00(R2005), Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.5 Plumbing and Drainage Institute (PDI).
.1 PDI-G101-96, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
.2 PDI-WH201-92, Water Hammer Arresters Standard.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00.

.2 Co-ordinate submittal requirements and provide submittals required by Section 01 33 00 and 01 78 00.

.3 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
.2 Indicate dimensions, construction details and materials for specified items.
.3 Submit WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.

.4 Shop Drawings:
.1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details and accessories.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Instructions: submit manufacturer's installation instructions.

.7 Manufacturers' Field Reports: manufacturers' field reports specified.

.8 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00, include:
.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
.2 Details of operation, servicing and maintenance.
.3 Recommended spare parts list.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meetings:
.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.
.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.

.2 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.

.3 Construction requirements: in accordance with Section 01 45 00.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 61 00.

.2 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling.
- .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 Divert unused materials from landfill to recycling facility as approved by Departmental Representative.
- .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 61 00.

2.2 DRAINS

.1 Drains shall be to CSA B79 standard.

.2 FD-1: general duty; cast iron body round, adjustable head, nickel bronze strainer, integral seepage pan, integral trap seal primer connection, and clamping collar. 75Ø drain connection.

.3 FFD-1: combination funnel floor drain; cast iron body with integral seepage pan, trap seal primer connection, clamping collar, nickel-bronze adjustable head strainer with integral funnel. 75Ø drain connection.

.4 HD-1: hub drain; cast iron body, trap seal primer connection. 75Ø drain connection.

2.3 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 square cover with flush head securing screws, beveled 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: nickel bronze 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.

2.4 WATER HAMMER ARRESTORS

.1 Copper construction, bellows type: to PDI-WH201.

2.5 BACK FLOW PREVENTERS

.1 Preventers: to CSA B64 Series, application as indicated,
.1 reduced pressure principle type back flow preventer with intermediate atmospheric vent.
.2 Double check valve assembly back flow preventer for use on sprinkler system, to NFPA 13.

2.6 VACUUM BREAKERS

.1 Breakers: to CSA B64 Series, vacuum breaker (atmospheric) for each hose connection.

2.7 Plumbing Roof Flashing

.1 Vent through roof passing through roof from warm ceiling space: Insulated aluminum stack jack flashing with integral deck flashing bitumen protection cup 300mm high minimum. Aluminum vent to seal with manufacturer supplied mechanical seal around outside of vent (do not decrease the size of the vent)

2.8 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.

2.9 TRAP SEAL PRIMERS

.1 Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection. Unit shall be packaged 120V powered, solenoid controlled unit with integral adjustable timer and manifold to provide pressurized water to all floor, funnel floor and hub drains. Provide needle valves at each take-off from the manifold to allow for adjustment of each primer line.

2.10 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.

2.11 EXPANSION TANK

.1 Butyl diaphragm unit suitable for 110°C operating temperature. Air pre-charged to initial fill pressure of system. Provide unit with support brackets and seismic restraints.

.2 Unit shall be ASME rated as required by size and pressure, and rated for use in a potable water system.

.3 Size and Capacity as indicated.

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 Install in accordance with the most stringent of the National Plumbing Code of Canada, the Ontario Building Code and the local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

.3 Provide isolation valves for every fixture connection, in addition

to the main and branch lines indicated on the drawings.

3.3 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.

.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.

3.4 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures, as well as where indicated.

3.5 BACK FLOW PREVENTORS

.1 Install in accordance with CSA B64 Series, where indicated and elsewhere as required by code. (see sprinkler drawings as well as plumbing drawings)

.2 Drain pipe discharge to terminate over nearest drain for all back flow preventers with drains.

3.6 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Install at bottom of risers, at low points to drain systems, and as indicated elsewhere in the drawings.

3.7 TRAP SEAL PRIMERS

.1 Install and prime all floor drains, funnel floor drains, hub drains, and elsewhere, as indicated.

.2 Install soft copper tubing to each drain listed above.

.3 Set timer to provide priming once per day.

.4 Adjust needle valves to prevent water from squirting out of any primed fixtures.

3.8 STRAINERS

.1 Install with sufficient room to remove basket.

3.9 START-UP

.1 Timing: start-up only after:
.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Certificate of static completion has been issued.
.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.10 FIELD QUALITY CONTROL

.1 Quality assurance, in accordance with Section 01 45 00, 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 Wood.
.8 Low-emitting materials.

3.11 TESTING AND ADJUSTING

.1 General:
.1 General Requirements, supplemented as specified.

.2 Timing:
.1 After start-up deficiencies rectified.
.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Application tolerances:
.1 Pressure at fixtures: +/- 70 kPa.
.2 Flow rate at fixtures: +/- 20%.

.4 Adjustments:
.1 Verify that flow rate and pressure meet design criteria.
.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.5 Drains:
.1 Verify operation of trap seal primer.
.2 Prime, using trap primer. Adjust flow rate to suit site conditions.
.3 Check operations of flushing features.
.4 Check security, accessibility, removability of strainer.
.5 Clean out baskets.

.6 Vacuum breakers, backflow preventers, backwater valves:
.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
.3 Verify visibility of discharge from open ports.

.7 Access doors:
.1 Verify size and location relative to items to be accessed.

.8 Cleanouts:
.1 Verify covers are gas-tight, secure, yet readily removable.

.9 Water hammer arrestors:
.1 Verify proper installation of correct type of water hammer arrester.

.10 Pressure regulators, PRV assemblies:
.1 Adjust settings to suit locations, flow rates, pressure conditions.

.11 Strainers:
.1 Clean out repeatedly until clear.
.2 Verify accessibility of cleanout plug and basket.
.3 Verify that cleanout plug does not leak.

.12 Trap Seal Primer:
.1 Adjust flow to ensure all drains are provided adequate water and that no splashing from drains occurs.

.13 Emergency Wash Equipment:
.1 Adjust flow rates of equipment to match or exceed those required by ANSI-Z358.1-2009.
.2 Adjust tepid water temperature of equipment to match or exceed those required by ANSI-Z358.1-2009.
.3 Adjust orientation of equipment to match plans.

.19 Commissioning Reports:
.1 In accordance with Section 01 78 00 and 23 00 00, supplemented as specified.

.20 Training:
.1 In accordance with Section 01 78 00 and 23 00 03, supplemented as specified.
.2 Demonstrate full compliance with Design Criteria.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 51 00 - Temporary Utilities.

1.2 USE OF SYSTEMS

.1 If use of new and existing permanent mechanical systems for supplying temporary services for more than one day occurs, the following items must be undertaken on those systems:

- .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 Protection shall be provided for the systems to ensure there is no possibility of damage from any cause.
- .5 Supply ventilation systems are protected by 60% 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.

.3 Exhaust systems are not included in any approvals for temporary heating ventilation.

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 REFERENCES

.1 Canadian Standards Association (CSA)
  .1 CAN/CSA-B149.1-10, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
  .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 Master Painters Insitute (MPI)
  .1

.4 National Fire Protection Association (NFPA)
  .1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
  .2 NFPA 14-2010, Standard for the Installation of Standpipe and Hose Systems.

1.2 SUBMITTALS

.1 Product Data: submit product data for each item specified.

.2 Submittals: in accordance with Section 01 33 00.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:
  .1 Submit samples in accordance with Section 01 33 00.
  .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00.

.2 Health and Safety:
  .1 Do construction occupational health and safety in accordance with Section 01 35 29.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
  .1 Deliver, store and handle in accordance with Section 01 61 00.
  .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.

.2 Dispose of unused paint, coating and other hazardous/controlled material at official hazardous/controlled material collections site approved by Departmental Representative.
.3 Do not dispose of unused paint, coating or controlled material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

1.5 IDENTIFICATION

.1 All systems and equipment will be provided with a different tag name during construction. Equipment identification (physical nameplates and controls programming) shall follow the Parks Canada tag naming provided during construction for all final systems and equipment.

.2 All identification must match Parks Canada standards.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Materials and products in accordance with Section 01 61 00.

2.2 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.

2.3 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 or white anodized aluminum, matte finish, with square corners, letters accurately aligned and

machine engraved into core.

.3 Sizes:
.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 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 Locations:
.1 Terminal cabinets, control panels: use size #5.
.2 Equipment in Mechanical Rooms: use size #9.

.5 Identification for Parks Canada 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.

2.4 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Departmental Representative.

2.5 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:
.1 Standpipe and hose systems: to NFPA 14.
.2 Fire extinguishers: to National Fire Code of Canada and

Ontario Fire Code.

2.6 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
City water	Green	CITY WATER
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Hot glycol heating supply	Yellow	GLYCOL HEATING SUPPLY
Hot glycol heating return	Yellow	GLYCOL HEATING RETURN
Boiler Feed Water	Yellow	BOILER FEEDWATER
Domestic hot water supply	Green	DOM. HW SUPPLY
Domestic cold water supply	Green	DOM. CWS
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID

2.7 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.

2.8 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.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.

2.9 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.

2.10 LANGUAGE

.1 Identification in English and French.

.2 Use one nameplate and label for each language.

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 in Division 09 has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to Parks Canada 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 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 FIELD QUALITY CONTROL

.1 Quality assurance in accordance with Section 01 45 00, 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.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.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 Mechanical louvers; intakes; vents; and reinforcement and bracing for air vents, intakes and gooseneck hoods.
- .2 Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 National Fire Protection Association (NFPA)
- .1 ANSI/NFPA 96-2011, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.2 ASTM International
- .1 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.5 Society of Automotive Engineers (SAE)

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. Include product characteristics, performance criteria, and limitations.
  - .1 Submit [two] copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

- .2 Indicate following:
  - .1 Pressure drop.
  - .2 Face area.
  - .3 Free area.
  - .4 Water entrance velocity
  - .5 Dimensions and weights

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00.
- .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 Departmental Representative will make available 1 copy of systems supplier'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 29.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .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.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Materials and products in accordance with Section 01 61 00.

2.2 GOOSENECK TERMINATION

.1 Thickness: to ASHRAE and SMACNA.

.2 Fabrication: to ASHRAE and SMACNA.

.3 Joints: to ASHRAE and SMACNA

.4 Supports: as required by seismic and wind loading.

.5 Complete with integral birdscreen of 2.7 mm diameter ss wire. Use 12 mm mesh on exhaust and 19 mm mesh on intake.

.6 The goosenecks are to be painted a custom colour. This colour will be chosen by the architects at the time of shop drawings. Colour should be shall be factory applied enamel, not site painted.

2.3 FIXED LOUVRES - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy AA 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm.

.4 Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 12 mm exhaust and 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish: factory applied enamel. The lovers are to be painted a custom colour. This colour will be chosen by the architects at the time of shop drawings.

2.4 FIXED LOUVRED PENTHOUSE - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy AA 6063-T5.

.3 Blade: see above section "fixed louvers – aluminum". Blades to cover all four sides of the penthouse.

.4 Unit shall be 1.2mx1.2mx1.2m, with louvers on all 4 sides and come with complete cover designed for snow loads upto 2,400Pa.

.5 Provide seismically rated and insulated roof for the unit. See details for curb height/size and additional trim.

.6 The penthouse lovers are to be painted a custom colour. This colour will be chosen by the architects at the time of shop drawings.

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 to ensure weather tightness.

3.3 FIELD QUALITY CONTROL

.1 Quality assurance requirements in accordance with Section 01 45 00, 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 Low-emitting materials.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

SECTION NO.	TITLE	NO. OF PAGES
26 05 00	Common Work Results Electrical	10
26 05 03	Electrical Coordination and Arc Flash Study	2
26 05 20	Wire and Box Connectors (0-1000V)	2
26 05 21	Wire and Cables (0-1000V)	3
26 05 28	Grounding Secondary	2
26 05 29	Hangers and Supports for Electrical Systems	2
26 05 31	Splitters Junction Pull Boxes and Cabinets	1
26 05 32	Outlet Boxes Conduit Boxes and Fittings	2
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings	3
26 24 16.01	Panelboards Breaker Type	4
26 27 26	Wiring Devices	3
26 28 16.02	Moulded Case Circuit Breakers	3
26 28 23	Disconnect Switches – Fused and Non-Fused	1
26 91 00	Commissioning	15

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 03 – Electrical Coordination and Arc Flash Study

.2 Section 26 05 20 – Wire and Box Connectors(0-1000 V)

.3 Section 26 05 21 – Wires and Cables (0-1000 V)

.4 Section 26 05 28 – Grounding – Secondary

.5 Section 26 05 29 – Hangers and Supports for Electrical Systems

.6 Section 26 05 31 – Splitters, Junction, Pull Boxes and Cabinets

.7 Section 26 05 32 – Outlet Boxes, Conduit Boxes, and Fittings

.8 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings

.9 Section 26 24 16.01 – Panelboards Breaker Type

.10 Section 26 27 26 – Wiring Devices

.11 Section 26 28 16.02 – Moulded Case Circuit Breakers

.12 Section 26 28 23 – Disconnect Switches – Fused and Non-Fused

.13 Section 26 91 00 - Commissioning

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
- .2 CAN3-C235-83(R2006), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
- .1 EEMAC 2Y-1-1958, Light Gray Colour for indoor equipment.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
- .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.2 Language operating requirements: provide identification nameplates for control items in English.

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 – General Instructions.

.2 Shop drawings:

.1 Submit to Department Representative drawings.

.2 Submit to Department Representative wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 If changes are required, notify Department Representative of these changes before they are made.

.4 Quality Control:.

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.

.3 Submit to Department Representative test results of installed electrical systems and instrumentation.

.5 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 Notify to Department Representative of changes required by Electrical Inspection department prior to making changes.

.4 Furnish Certificates of Acceptance from Electrical Inspection Department and authorities having jurisdiction on completion of work to Department Representative.

1.6 QUALITY ASSURANCE

.1 Quality Assurance:

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license.

Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Department Representative with schedule within 2 weeks after award of Contract.

1.8 SYSTEM STARTUP

.1 Instruct Department Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 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 will aspects of its care and operation.

.3 Refer to Section 26 91 00 – Commissioning.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 11 00 – General Instructions.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 – SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.2 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for copper conductors.

.2 All terminating devices are to be suitable for copper except where connecting to existing aluminum conductors, in which case they must be compatible with copper and aluminum conductors.

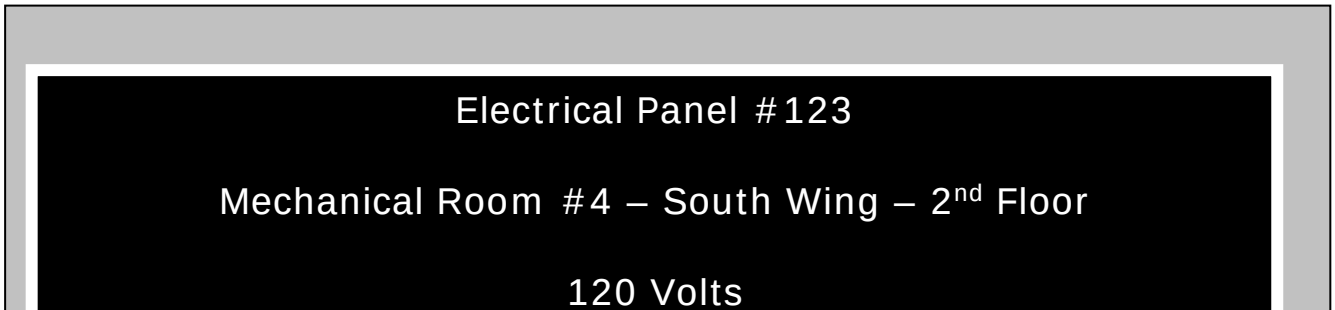
2.3 EQUIPMENT IDENTIFICATION

.1 The Contractor shall:
- .1 Ensure all new equipment is labelled appropriately as per the specifications below. Work that does not include proper labelling will be considered incomplete and will be marked as deficient until labelling is implemented as per specifications below.

.2 Normal Label Specifications:
- .1 All equipment must be labelled.
- .2 Obtain written approval of identification system from Department Representative before starting manufacture of labels. Contractor must NOT label items by name and number on the construction plan unless advised to do so by the Department Representative.
- .3 Contractor must supply 3 separate labels as follows:
  - .1 Label 1:
    - .1 Name and Inventory Number of the Equipment – as per the building inventory list (inventory equipment name and equipment number must be provided to contractor by Department Representative).
  - .2 Label 2:
    - .1 Where the Equipment is being fed from - the equipment inventory number, the location and the voltage.
  - .3 Label 3:
    - .1 Where the Equipment is feeding – the equipment inventory number, the location and the voltage.
- .4 Labels for equipment must include the following:
  - .1 All Font must be 'Veranda'.

.2 Where possible, all Font size must be '16'; Label font may be reduced to suit equipment if size '16' is too large - at the discretion of the Department Representative.
.3 All Font style must be 'Regular'.
.4 All Font colour must be in 'White'.
.5 All labels must be done on **black** plastic "Lamacoid".
.6 All label edging must be bevelled.
.7 All labels must have double-sided tape on the perimeter of the sign.
.8 All labels must have a minimum ¼" border around all letters.
.9 All labels must have a minimum ½" spacing between each line item.

.5 Please see example below:



2.4 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, 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 coding: to CSA C22.1.

2.5 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and Teck cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals. Paint conduit couplings, connectors and box covers.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	PRIME	**AUXILIARY**
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Fire Alarm	Red	
EMCS	Orange	

2.6 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3-10 No.1 and CSA C22.3 No. 7-10 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Locate light switches on latch side of doors.

3.4 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centerline 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 (to centre line of outlet box) unless indicated otherwise. Refer to millwork drawings prior to roughing in receptacles in or near millwork. Co-ordinate as required.

- .1 Local switches: 1100mm.
- .2 Wall receptacles:
  - .1 General: 600mm.
  - .2 Above top of continuous baseboard heater: 200mm.
  - .3 Above top of counters or counter splash backs: 175mm.
  - .4 In mechanical rooms: 1400mm.
- .3 Panelboards: as required by Code or as indicated.
- .4 Fire alarm stations: 1200mm.
- .5 Fire alarm indicating devices: 2000mm.
- .6 Fire alarm EOL and control modules: 1525mm.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

.1 The following tests shall be made prior to putting the electrical equipment into service to ensure that the distribution equipment has been installed in a satisfactory manner and suitable for placing into service, without endangering personnel or the system.

.2 Include in Tender amount, all costs and fees incurred for this testing. No additional costs will be accepted by the Owner.

.3 Equipment which fails to meet the specified requirements and performance test shall be corrected and retested until operation is satisfactory without additional cost to the Owner.

.4 The Department Representative shall be advised in advance of all tests and shall be given the opportunity to witness any or all tests.

.5 Provide infrared thermographic inspection of the major pieces of electrical equipment including panel boards, transfer switch, splitter boxes, distribution transformers and all panels after entire system is in operation. The infrared thermographic inspection shall be performed by a qualified testing firm. A complete report shall be submitted with thermal scan pictures of all piece of equipment inspected with comments and recommendations.

.6 Conduct following tests.

.1 Power generation and distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.1 Insulation resistance testing:

.2 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.3 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.4 Check resistance to ground before energizing.

.7 Carry out tests in presence of Departmental Representative.

.8 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.9 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.

.10 Measure phase voltage at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.11 Record phase and neutral currents on panelboards, transformers and motor starters, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

.12 Ensure that test reports are submitted as soon as tests are completed. These reports should be included in the O&M Manual only once it is reviewed and approved.

3.7 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

PART 1 GENERAL

1.1 SHORT CIRCUIT, CO-ORDINATION AND ARC-FLASH STUDY

.1 General

.1 Immediately on award of Contract, prepare a co-ordination and arc fault study and submit for approval.Co-ordination and arc flash study to be completed prior to distribution shop drawing submittals. All distribution change costs associated with not following this sequence to be born by this trade.

.2 Co-Ordination Study Data

.1 The co-ordination study data shall be presented in tables and on composite charts and shall include and not be limited to the following:

.1 Maximum available short circuit current 4.16KV, 600V, and 120/208V systems based on 500MVA available at the utility. This shall be calculated for every bus down to the lighting panel level.

.2 Maximum available ground fault current of 4.16kV, 600V, and 120/208V systems.

.3 Power supply authority system protective devices with which Owners equipment must co-ordinate.

.4 Power Supply Authority feeder cables thermal short circuit damage curve.

.5 Power transformer thermal short circuit damage curve, 3 phase, phase to ground.

.6 Main and feeder circuit breakers.

.7 Distribution transformer thermal short circuit damage curves.

.8 Largest distribution breaker characteristics in each panel.

.9 Largest branch breaker in each panel.

.10 Establish the required setting for all ground fault protective devices.

.11 General damage and decrement curves.

.12 Cable damage curves.

.13 Co-ordination charts shall be drawn in ink on log paper. Each chart shall include single line diagram of the appropriate devices with description and numbering matching that shown on the contract documents. Transformers shall be shown complete with KVA rating, primary and secondary voltages, winding connections, grounding method and impedance.
A copy of the single-line in Autocad 2010 .DWG format on magnetic media will be made available if requested. (This is offered for those firms utilizing software which has a graphical interface to CAD drawings.)

.14 The co-ordination study shall include a list of recommendations to improve co-ordination or protection where possible.

.15 Selective co-ordination is required to the last branch breaker on the essential system.

.3 Arc-Flash Study

.1 Perform arc flash study and install proper labeling on existing and new 600V and 120/208V equipment for the project.

.4 Reports

.1 Test reports are to be included in O & M in manuals after review.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 CSA International
- .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
- .2 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:
- .1 Submit to Department Representative manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit to Department Representative in accordance with Section 01 33 00.

.2 Operation and Maintenance Data: submit to Department Representative operation and maintenance data for wire and box connectors for incorporation into manual.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:
- .1 Connector body and stud clamp for stranded round copper conductors tube bar.
- .2 Clamp for stranded round copper conductors bar.
- .3 Stud clamp bolts.

.4 Bolts for copper conductors bar.
.5 Sized for conductors tubes bars as indicated.

.4 Clamps or connectors for armoured cable, TECK cable flexible conduit, as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of. Department Representative.
.2 Inform Department 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 Department Representative.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables and:
.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
.2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2 NEMA.

3.3 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

.2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 CSA C22.2 No.0.3-09, Test Methods for Electrical Wires and Cables.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00.

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RWU90 XLPE.

.3 Copper conductors: size as indicated with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 XLPE.

2.2 TECK CABLES

.1 Conductors: insulated, copper size as indicated.

.2 Type: Teck 90, 600V.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Teck is indicated on drawings.

.5 Teck shall be approved to be used in hazardous locations when used in classified locations.

2.3 MINERAL-INSULATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.

.3 Outer covering: annealed seamless copper sheath, type MI rated 600v, 250 degrees C.

.4 Two hour fire rating.

.5 Connectors: watertight, field installed, approved for MI cable.

.6 Termination kits: field installed approved for MI Cable.

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90

.3 Armour: interlocking type fabricated from galvanized steel strip.

.4 Connectors: anti short connectors.

PART 3 EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring in conduit systems in accordance with Section 26 05 34.

.2 Install all panel feeder circuits without break or splice.

.3 Provide dedicated bond for each conduit run.

.4 Use 600V insulated conductors for all 208V or lower.

.5 Install wiring in rigid threaded conduits with EYS seals in hazardous locations.

3.2 INSTALLATION OF TECK CABLES

.1 Group cables wherever possible.

.2 Use approved cable gland when installed in hazardous locations.

.3 Direct burial installation.

.4 Install Teck with approved cable glands in hazardous locations.

3.3 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Install cable exposed, securely supported by hangers.

.2 Support 2 hour fire rated cables at 1m intervals.

.3 Make cable terminations by using factory-made kits.

.4 Cable terminations: use thermoplastic sleeving over bare conductors.

.5 Where cables are buried in cast concrete or masonry, sleeve for entry, exit of cable.

.6 Do not splice cables unless indicated.

3.4 INSTALLATION OF ARMORED CABLES

.1 Group cables wherever possible.

.2 Use of armoured cable shall be limited to lighting, switching and outlet drops in stud walls.

.3 Armoured cable shall be connected to junction boxes in accessible ceiling space within the room served or adjacent corridor if drywall.

.4 Junction boxes shall be appropriately labelled per Section 26 05 00 – Common Work Results – Electrical.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.2 Canadian Standards Association, (CSA International)

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Copper conductor: minimum 3.05 m long for each electrode, bare, stranded, tinned, soft annealed, size as indicated.

.2 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.

.3 Insulated grounding conductors: green, type RW90

.4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Bolted type conductor connectors.

.3 Bonding jumpers, straps.

.4 Pressure wire connectors.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.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.

3.1 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list:

- .1 Frames of motors
- .2 Starters
- .3 Control panels
- .4 Make up air unit
- .5 Exhaust fans

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 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.

.5 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.

.6 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

.7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.9 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.10 Do not use supports or equipment installed for other trades for conduit or cable support.

.11 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

PART 1 GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit to Department Representative shop drawings and product data for cabinets in accordance with Section 01 33 00.

PART 2 PRODUCTS

2.1 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.

PART 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, PULL BOXES AND CABINETS 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 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Install identification labels indicating system name, voltage and phase.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 CSA C22.1- Current Canadian Electrical Code, Part 1.

PART 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.

.4 347 V outlet boxes for 347 V switching devices.

.5 Blank cover plates for boxes without wiring 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.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONDUIT BOXES

.1 Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

.2 Cast Feraloy with copper-free aluminum cover conduit outlet boxes with factory-threaded hubs and mounting feet Class I Div. 1&2 explosion proof in classified areas.

2.5 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.

.5 Factory made vapour barriers designed for sheet steel outlet boxes.

PART 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 Outlets, which occur at the same general location, are to be installed as a symmetric group with centres aligned either vertically or horizontally.

.4 Install knockout fillers in unused openings.

.5 Identify circuit numbers on junction box covers using black marker.

.6 Provide correct size of openings in boxes for conduit and armoured cable connections. Reducing washers are not allowed.

.7 Provide vapour barrier around all boxes installed in exterior walls. Seal gap between vapour barrier and cable or conduit so that air is not permitted to pass freely from the exterior side of the vapour barrier to the interior of the box.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
- .2 CSA C22.2 No. 45, Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No.83.1-07, Electrical Metallic Tubing.

PART 2 PRODUCTS

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45.1-07, galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.1-07, with couplings.

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2-06.

.4 Flexible metal conduit: to CSA C22.2 No. 56-13, steel, liquid-tight flexible metal.

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 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 m oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

.4 EYS seal fittings to be used in classified areas for rigid metal conduits.

2.4 FISH CORD

.1 Polypropylene.

PART 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 electrical metallic tubing (EMT) except in cast concrete above 2.4 m not subject to mechanical injury.

.3 Use flexible metal conduit for connection to motors in dry areas, connection to surface or recessed fluorescent fixtures.

.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: 19 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 19 mm dia.

.8 Install fish cord in empty conduits.

.9 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.10 Dry conduits out before installing wire.

.11 Use rigid galvanized steel threaded conduit in classified areas.

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 suspended or 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.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

1.2 REFERENCES

.1 CSA International
  .1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit to Department Representative in accordance with Section 01 33 00.

.2 Product Data:
  .1 Submit to Department Representative manufacturer's instructions, printed product literature and data sheets for [panelboards] and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
  .1 Submit to Department Representative drawings.
  .2 Include on drawings:
    .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.4 CLOSEOUT SUBMITTALS

.1 Submit to Department Representative in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  .2 Store and protect panelboards from nicks, scratches, and blemishes.
  .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
.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.

.2 250 V panelboards: bus and breakers rated for 10kA symmetrical interrupting capacity or as indicated.

.3 600v panelboards: bus and breakers rated for 25KA symmetrical interrupting capacity or as indicated.

.4 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.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.6 Minimum of 2 flush locks for each panel board.

.7 Two keys for each panelboard and key panelboards alike.

.8 Copper bus with neutral of same ampere rating of mains.

.9 Mains: suitable for bolt-on breakers.

.10 Trim with concealed front bolts and hinges.

.11 Trim and door finish: baked grey enamel.

.12 Panelboard: product of one manufacturer.

.13 Drip hood for surface mounted panelboards.

.14 Separate main circuit breakers where indicated. The use of a backed branch breaker is not acceptable as a main breaker.

.15 Surface mount and free standing distribution type panelboards c/w hinged access doors with captive knurled thumb screws.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02.

.2 Breakers:

.1 Bolt-on moulded case circuit breaker quick-make, quick break type for manual and automatic operation.
.2 Common trip breakers with single handle for multi-pole applications.
.3 All 600V breakers to be equipped with lock-out provision for pad lock.
.4 Provide GFCI breakers as indicated on drawings.

.3 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.4 Lock-on devices for fire alarm door supervisory, telephone, stairway, and exit circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

PART 3 EXECUTION

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on c-channel. Where practical, group panelboards on common c-channel.

.3 Mount panelboards to height specified in Section 26 05 00 or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 CSA International
- .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CAN/CSA-C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices.
- .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
- .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit to Department Representative in accordance with Section 01 33 00.

.2 Product Data:
- .1 Submit to Department Representative manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit to Department Representative drawings.

1.3 CLOSEOUT SUBMITTALS

.1 Submit to Department Representative in accordance with Section 01 33 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

PART 2 PRODUCTS

2.1 SWITCHES

.1 15 A, 120 V, single pole, switches to: CSA C22.2 No.55 and CSA C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:
- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine moulding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Brown toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

.5 Classified Class 1, Zone 2 as indicated on drawing.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
- .1 Brown urea moulded 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 rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
- .1 Ivory Brown urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, 1 mm thick cover plates 1 mm for wiring devices mounted in flush-mounted outlet box.

.4 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.4 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Switches:
- .1 Install single 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 as indicated.

.2 Receptacles:
- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles at height in accordance with Section 26 05 00 as indicated.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .4 Install GFI type receptacles as indicated.

.3 Cover plates:
- .1 Install suitable common cover plates where wiring devices are grouped.
- .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 CSA International (CSA)
  .1 CSA C22.2 No. 5-[09], Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit to Department Representative in accordance with Section 01 33 00.

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Include time-current characteristic curves for breakers with ampacity of 200 A and over.

.4 Certificates:
  .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit [3] copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
    .1 Production certificate of origin must be submitted to Departmental Representative for approval.
  .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
  .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
  .4 Production certificate of origin must contain:
    .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
    .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

.3 Contractor's name and address and person responsible for project.

.4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

.5 Name and address of building where circuit breakers will be installed:

.1 Project title:.

.2 End user's reference number:.

.3 List of circuit breakers: .

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 01 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 circuit breakers off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect circuit breakers from nicks, scratches, and blemishes.

.3 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 20.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, Circuit breakers, and ground-fault circuit-interrupters to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from [3-8] times current rating.

.5 Circuit breakers to have minimum 10KA symmetrical RMS interrupting capacity rating for 250V maximum system and 25 KA symmetrical RMS for 600V system.

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.

2.5 SOLID STATE TRIP BREAKERS

.1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time short time instantaneous tripping for phase ground fault short circuit protection.

2.6 OPTIONAL FEATURES

.1 Include:
- .1 On-off locking device for 600V breakers.
- .2 Handle mechanism.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for 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.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

3.3 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 PRODUCT DATA

.1 Submit to Department Representative product data in accordance with Section 01 33 00.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure 12, size as indicated for disconnect switches installed inside and CSA Enclosure 4 for outside installation.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated.

.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

.8 Auxiliary contact for disconnect switches provided for variable frequency drives.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 GENERAL

1.1 DEFINITIONS

.1 BAS: Building automation system for controls.

.2 Certify: For documents (including as-built drawings): thoroughly review for accuracy and completeness and record all deficiencies.

.3 Data Sheet: Pre-start-up checklist, provided by the Commissioning Agent, and completed by the Contractor. The CA may, at his discretion, approve a substitute form.

.4 Commissioning:

.1 The process by which the Contractor, his sub-contractors, the Commissioning Agent, the Department Representative, and the Owner all ensure that the Commissioning Objectives named below are carried out.
.2 Not to be confused with individual sub-contractor commissioning, which is meant to validate individual sub-systems, and to ensure that the individual contractor has completed his own work
.3 The commissioning process shall conform to and is based on NETA, ATS-2012 Acceptance Testing specifications For Electrical Power Distribution Equipment and Systems.
.4 Where specified tests in any other Section of this Specification does not agree with the testing in this Section, whether in quantity or quality, include for the more stringent requirements.
.5 Where specified tests in any other Section of this Specification is equal to that which is specified in this Section, the test shall only be conducted once, provided all requirements in all Sections are met.

.5 Commissioning Agent (CA):Firm hired and paid by the contractor.

.6 Controls Contractor: A technical representative of the Controls Contractor who has been approved by the Owner.

.7 Distribution Panels: Includes switches, interrupting devices, relay and control panels, instrument transformers and

metering, conductors, bus ways, associated supporting structures, and metal enclosures.

.8 Validate: For start-up and performance testing: to witness and confirm proper and complete performance testing; to record all deficiencies; to re-validate after correction of all deficiencies; and to provide full and detailed documentation for the Department Representative certification.

.9 Verify: The commissioning agent's witnessing of the specified performance tests. The Contractor shall attend all verifications, and record all deficiencies.

1.2 REFERENCES

.1 NETA, ATS-2013 Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

.2 ASHRAE Guideline 4-1993 – Preparation of O & M manuals.

PART 2 COMMISSIONING OBJECTIVES

2.1 This project will have selected building systems commissioning. The equipment and systems to be commissioned are specified in this Section. The commissioning process, which the Contractor is responsible to execute, is defined in this Section. A Commissioning Agent, whose services will be provided by the Contractor, will direct the commissioning process.

2.2 The objectives of the commissioning process are:

.1 To support quality management through monitoring, checking, and validation of the installation.

.2 To verify system performance through testing and verification of the completed installation.

.3 To move the completed facility from the "static completion" state to the optimal "dynamic" operating state.

.4 To transfer the facility from the Contractor to the Owner in such a manner that provision of a quality facility to the Owner has been assured.

.5 To optimize operations and maintenance through delivery of comprehensive quality training and instruction to the Owner's operating personnel.

.6 To assure provision of accurate and useful historical records, such as as-built drawings, test certificates, etc. to the Owner. Such records provide important data for operating and maintaining the systems as well as for future system testing, maintenance or renovations and to trouble shoot and repair the components of the systems.

.7 To extend the commissioning into the operational phase in order to verify performance levels under a range of operating conditions; such as change of seasons. This process will help to avoid unforeseen or hidden operating and maintenance expenses that may develop later on;

.8 To optimize systems' performance under normal, operating, partial, and "full-load" conditions, under the direction of the Owner, the Department Representative, and the Commissioning Agent. This phase lasts throughout the warranty period. It may, however, involve activities to ensure completion of:
.1 system debugging and optimization;
.2 ongoing training and instruction for the operating and maintenance personnel;
.3 completion of all commissioning activities on defective, or seasonally-sensitive systems, for varying modes and periodic simulated Life Safety conditions.

2.3 Commissioning shall be considered complete when all of the objectives of commissioning, as specified herein, have been achieved.

PART 3 SCHEDULING AND MEETINGS

3.1 The Contractor shall schedule work to include specified Commissioning-related tasks. Cooperate with the Owner's Commissioning Agent, and coordinate sub-trades as required, to schedule commissioning milestones, and successfully demonstrate and verify commissioning-related tests prior to occupancy.

3.2 The Contractor shall schedule the successful completion of all commissioning-related testing prior to Owner's demonstration and Owner's training.

3.3 The Contractor and sub-trades shall attend commissioning meetings at intervals as specified later in this section, and as called by the Commissioning Agent.

3.4 The meetings shall address commissioning-related responsibilities as well as all specified testing, documentation, O & M manuals, training, and post-construction requirements. Where construction may be completed in phases, allow for frequency of meetings to correspond to the varying stage of construction of each phase.

PART 4 SUBMITTALS

The Contractor shall provide the Commissioning Agent with one copy of the shop drawings and all other submittals related to the relevant systems.

PART 5 WARRANTY

5.1 The involvement of the Commissioning Agent shall not void any guarantees or warranties nor shall it relieve the Contractor of any contractual responsibilities. Testing required for the Commissioning Agent's verification shall not relieve the Contractor of any other contractual obligation, including equipment or facility acceptance.

PART 6 GENERAL SUMMARY OF INVOLVEMENT

Commissioning Work Component	Consult.	PWGSC Dep.Rep.	Contractor	Env.Can. Staff	Comm'g Agent
Identification of Major Systems	Prov	A	N/A	R	R
Statement of Design Intent	Prov	A	N/A	R	R
Identification of Design Parameters	Prov	A	N/A	R	R
Commissioning Matrix	A	A	A	A	Prov
Commissioning Data Sheets	N/A	A	Fill out	R	Prov
Start-up & reporting	A	R	Prov	Attend	R
Inspection	Prov	R	R	R	R
Performance Testing	R	A	Prov	Attend	Direct

Prove equipment performance	R	A	Prov	Attend	Direct
O & M Manuals	A	R	Prov	R	R
Systems Description Manual	R	A	N/A	R	Prov
Specified demonstration & training	A	R	Prov	Attend	Co-ord.
Post-Occupancy Evaluations	R	A	Attend	Attend	Attend

A = Approve; R = Review; Prov = Provide; Co-ord = Set dates to co-ordinate training, which shall take place subsequent to the contractor's start-up, and the Commissioning Agent's verification.

PART 7 RESPONSIBILITIES OF THE CONTRACTOR

7.1 The responsibilities of the Contractor are as follows:

.1 Pre-Construction Phase:

.1 Become fully familiar will all commissioning process requirements, in relation to standards, forms, and submittals.

.2 Construction Phase:

.1 With input from the owner, Department Representative, and commissioning agent, implement standard procedures, as they relate to a "constructor", "contractor", and, until Substantial Completion related to new or retrofitted equipment has been attained, as "maintenance staff".

.2 Submit detailed installation/interference drawings showing conformance to all equipment access requirements. These must include structural as well as architectural disciplines, as any of these will affect access for maintenance purposes;

.3 Submit installation method statement. This shall generally include:

.1 Method and timing for equipment delivery to the installation location on site.

.2 Prerequisite preparation for delivery, such as completion of the factory testing and the completion of site work to accept this equipment.
.3 Installation method and sequences of installing the equipment and the associated connections to the equipment.

.4 Submit an installation schedule. This schedule shall include:
.1 Time schedule of each commissioning-related activity as detailed in the Commissioning Responsibilities Matrix; as supplied by the Commissioning Agent. Time schedule shall be complete with lead and lag time forecast as being required.
.2 Shop drawings and working detail drawings submission.
.3 Major equipment delivery, including for the co-ordination of factory equipment testing as required under the contract.
.4 Installation activities and sequences in compliance with the installation, and start-up schedules of the General Contractor, other trades, and own sub-trades, specialty subcontractors, and manufacturer's on-site testing.
.5 Commissioning-related testing and verification of systems and equipment.

.5 Attend commissioning meetings, as follows:
- During the first 50% of construction: once every 4 weeks,
- During the next 25% of construction: once every 2 weeks,
- During the last 25% of construction: once every week.

.6 promptly rectify reported deficiencies and defects.

.7 Where required by codes and/or specifications, retain manufacturers and/or independent third parties to provide testing and certification of systems.

.8 Maintain an on-going updated as-built set of drawings as specified, and provide access to the Commissioning Agent for periodic inspection of same.

.9 Prior to performing start-up to the manufacturer's recommendations, advise the Owner and Commissioning Agent.

.10 Perform testing of equipment and systems to the satisfaction of the Department Representative and Commissioning Agent, and as specified herein.

.11 Document all commissioning-related activities.

.12 Perform verification of equipment and systems to the satisfaction of the Department Representative and Commissioning Agent, as specified herein, and under direction of both. Provide all necessary test equipment for this task. Provide recently validated calibration certificates for all equipment to be used for verification prior to testing and commissioning commencement. The equipment used for the contractor's testing is to be the same equipment provided for the Commissioning Agent's testing.

.13 Compensate the owner for the Department Representative costs related to failed tests that are due to incomplete work.

.14 Record all tests on approved test and record forms. submit test and record forms with the signature of the tester for review and approval to the Department Representative and Commissioning Agent. Ensure all subcontractors and manufacturers follow the same method of documenting on-site testing. Ensure that reports are submitted as soon as test is completed.

.15 Provide the Operating and Maintenance Manuals, and a draft set of as-builts for review by the Department Representative and Commissioning Agent. Ensure that the drawings are updated in all respects, including the new room numbers if required.

.16 Subsequent to providing the O & M Manuals and draft

as-builts and completing all commissioning tasks, and prior to applying for a certificate of substantial completion, provide all specified training.

7.2 TRAINING

.1 The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

.2 The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment or systems.

.3 Retain manufacturers to provide training, as specified elsewhere in the contract documents, which are in addition to those requirements specified in this section.

.4 During training, provide a copy of the pertinent section(s) of the O & M Manuals, which shall include:

.5 Systems description and performance criteria supported by schematic drawings, operating instructions and equipment data for all components comprising the system.
.1 A copy of all reviewed shop drawings.
.2 Recommended Preventive Maintenance schedules;
.3 Recommended spare parts lists.
.4 A list of the as-built drawings.

.6 Provide the CA with a training plan two weeks before the planned training. This plan shall include the outline of all sessions and identification of the Training presenters.

.7 Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems operation and maintenance. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.

.8 During any demonstration, should the system fail to perform in accordance with the requirements of the O & M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

.9 The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.

.10 The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

.11 The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O & M manuals for reference.

.12 Training shall include:

.1 Use of the printed installation, operation and maintenance instruction material included in the O & M manuals.

.2 A review of the written O & M instructions emphasizing safe and proper operation requirements, preventative maintenance, special tools needed, and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover and any Life Safety procedures.

.3 Discussion of relevant health and safety issues and concerns.

.4 Discussion of warranties and guarantees.

.5 Common troubleshooting problems and solutions.

.6 Explanatory information included in the O & M manuals and the location of all plans and manuals in the facility.

.7 Discussion of any peculiarities of equipment installation or operation.

.13 Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

.14 Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any Life Safety procedures and preventative maintenance for all pieces of equipment.

.15 The Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

.16 Video record all hands-on training and demonstrations and specified training sessions, and provide two complete copies of these tapes; one to the Owner and one to the Commissioning Agent.

.17 Wherever possible, provide the O & M manual data in electronic format. Provide two copies, one to the owner, and one to the Commissioning Agent.

7.3 POST CONSTRUCTION PHASE

.1 General cross-reference list cross-referencing the construction room numbers with the user's room numbering scheme. Provide this list to the owner in Excel format.

.2 Complete system checks:
- .1 Once during the first month of building operation.
- .2 Once during the third month of building operation.
- .3 Once between the fourth and tenth months in a season opposite to the first or third month visit.

.3 Complete rectification of all deficiencies revealed by these checks. Equipment manufacturers involved in commissioning shall participate systems checks.

.4 Revise all as-built and operating and maintenance documents to reflect all changes that may be necessary as a result of commissioning.

.5 Schedule a one-day question and answer session through the Commissioning Agent for the operating and maintenance personnel

three (3) months after handover of the facility to the Owner.

7.4 O & M MANUAL

.1 Update all manual sections referencing room numbers with the cross-referencing index noted above.

.2 Wherever possible, provide the O & M manual data in electronic format. Otherwise, Provide one copy to the Commissioning Agent in good quality, white vinyl covered binders.

.3 Generate O & M manuals as specified. In addition, provide the following:

.1 Each Electrical manual shall be organized as follows, but not limited to the following:

A – Project Directory;

B – Distribution Panels;

C – Panelboards;

D – Motor Controls Panels;

E – Transformers;

F – Cables;

G – Fire Alarm System;

H – Miscellaneous System

.4 The project directory shall contain the names, addresses, fax numbers and telephone numbers of Contractors, Sub-Contractors, Manufacturers and Manufacturers' representatives.

.5 Each section shall be divided into the following subsections;

.1 shop drawings (reduced to 216mm to 290mm);
.2 as-built drawings (reduced to 216mm to 290mm);
.3 as-built riser diagrams (reduced to 216mm to 290mm);
.4 spare parts list;

.5 equipment list
.6 testing and verification forms;
.7 certification forms;
.8 panel directory as applicable;
.9 manufacturer's literatures on installation, operation and maintenance of the equipment, including trouble shooting procedures;

.6 Recommended special tools and equipment for the operation and maintenance of the equipment.

.7 The operating procedures shall be the recommended Manufacturer's operating procedures for the equipment.

.8 The maintenance procedures shall include Scope of Work, frequency of activity, parts required and necessary documentation.

.9 The spare parts list shall be the Manufacturer's recommended list for maintenance purposes.

.10 The trouble shooting guide shall be the Manufacturer's recommendations for the equipment.

.11 The equipment list shall include make, model, serial number, voltage, rated current, number of phase and wire and fault rating.

.12 The Operating and Maintenance Manual shall be submitted to the Owner in three (3) copies.

7.5 EXECUTION

Generally, the Contractor's Commissioning activities will include the following systems, and will include the following steps.

.1 CSA standard Data Sheets
.1 CSA provides forms for several phases of a project. Generally, these are as follows:
.1 Pre-fix "S" – Start-up forms.
.2 Pre-fix "VP" – Verifications forms, for confirming proper equipment installation prior to performance testing.
.3 Pre-fix "PE" – Performance testing forms.

.2 Where noted elsewhere in this Section, a manufacturer's start up form may be used to document start-up activities in place of the Start-up forms. This does not relieve the Contractor from completing the Verification and Performance test forms, nor the Commissioning Agent's testing.

.3 The Contractor should note that performance testing by the Commissioning Agent shall follow the successful completion of these forms, and shall be documented separately by the Commissioning Agent.

.4 The Contractor shall fill out the data sheets for the systems to be commissioned;

.5 Fuses

.1 Collect all manufacturers' data and re-fusing instructions for all the types of fuses used on the project.

.2 Provide and properly identify replacement stock, as specified. A minimum of one set of spare fuses or refills for each type and rating used in the installation shall be provided.

.6 Distribution Cables

.1 Visually inspect cable jacket, cable sheath and insulation in cables for signs of corrosion, abrasion, mechanical damage and overheating.

.2 Independent Third Party testing Agent shall carry out the following tests:

.1 Check for correct cable installation and termination;

.2 Check and record cable sizes, types and method of installation;

.3 Check and confirm the installed cable sizes are of adequate rating, taking into consideration the type of cable, the method of installation, the correction factors and any other Code requirements;

.4 Grounding test to ensure the equipment, the conduit and the cable armour/ sheath, if applicable, are properly grounded;

.5 Perform megger test on the cable between phase to phase, phase to ground, phase to neutral and neutral to ground,

if applicable, to check insulation resistance. Insulation resistance reading shall comply with Table 1.

Nominal cable/equipment rating	Minimum test voltage, DC (V)	Recommended minimum insulation resistance in MΩ
Use manufacturer's or Consultant's recommended values. If not available, use the values below.		
300 V	500	25
600 V	1000	100
1000 V	1000	100
15000 V	2500	5000
25000 V	5000	2000
345000 V & above	15000	100000

Table 1: Insulation testing table

.7 DISTRIBUTION PANELBOARDS AND BRANCH PANELBOARDS

.1 Check and record nameplate data;

.2 Check and report the panel enclosure is suitable for the environment in which it is installed;

.3 Check and test to verify the panelboard directory is correct;

.4 Include the directory in the O & M manual. The directory shall contain size of each breaker, equipment served, cable type and size;

.5 Check and test the voltage drop is within the specified limit from the service entrance switchboard to the branch panelboards;

.6 Test branch circuits voltage drop is within the specified requirements;

.7 Grounding test to ensure panelboards are properly grounded;

.8 Megger test the panel feeders in accordance to the commissioning table 1. Megger phase to phase, phase to ground.

PART 8 OWNER'S VALUATION OF COMMISSIONING WORK

.1 Contractor shall hire and pay for the services of the commissioning agent.

.2 The Department Representative will not grant "Substantial Completion" until the Commissioning Agent submits a commissioning report with a recommendation for interim acceptance.

.3 The Department Representative will withhold payment of a portion of funds in proportion to unfinished commissioning work, as detailed by the Commissioning Agent.

END OF SECTION

SECTION №	SPECIFICATION TITLE	# OF PAGES
03 10 00	Concrete Forming and Accessories	5
03 20 00	Concrete Reinforcing	6
03 30 00	Cast-in-Place Concrete	10
03 35 00	Concrete Finishing	4
03 35 05	Concrete Floor Hardening	4
05 50 00	Metal Fabrication	7
31 00 99	Earthwork For Minor Works	6
31 04 31	Historic – Subgrade Shoring And Bracing	4
31 05 16	Aggregate Materials	6
31 11 00	Clearing and Grubbing	4
31 14 13	Soil Stripping and Stockpiling	3
31 22 13	Rough Grading	3
31 22 16.13	Roadway Subgrade Reshaping	2
31 23 33.01	Excavating, Trenching and Backfilling	12
32 11 16.01	Granular Sub-Base	6
32 11 23	Aggregate Base Courses	6
32 16 15	Concrete Walks, Curbs and Gutters	5
32 32 13.13	Package Sewage Lift, Wet Well Type	9
32 91 19.13	Topsoil Placement and Grading	6
32 92 23	Sodding	7
33 46 13.01	Foundation and Underslab Drainage	5
33 46 16	Subdrainage Piping	5

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-04, 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-O86-01, Engineering Design in Wood.

.3 CSA O121-M1978(R2003), Douglas Fir Plywood.

.4 CSA O151-04, Canadian Softwood Plywood.

.5 CSA O153-M1980(R2003), Poplar Plywood.

.6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.

.7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.

.8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.

.9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada

.2 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit shop drawings for formwork and falsework.

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.

.4 Co-ordinate submittal requirements and provide submittals required by Section 01 47 15 - Sustainable Requirements: Construction.

.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. 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 the Departmental Representative /Consultant.

.8 When slip forms, or flying forms are used, submit details of equipment and procedures for review by the Departmental Representative /Consultant.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse & recycling in accordance with Section01 47 21 - Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert wood materials from landfill to a reuse facility as approved by the Departmental Representative /Consultant.

.4 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative /Consultant.

.5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative /Consultant.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.

.2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.

.2 Concrete piers forms: round, internally treated with release material.

.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 25mm dia. in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.4 Panel materials:

.1 Form grade plywood: to CSA O121

.2 Medium dense plywood: to CSA O151

.3 Hardboard: to CAN/CGSB-11.3, untempered, 3mm thick

.5 Form release agent: non-toxic.

.6 Falsework materials: to CSA-S269.1.

.7 Sealant: to Section 07 92 00 - Joint Sealants.

.8 Shear mats: wax coated board, honeycombed, 40mm cell, 55 kPa compressive strength, 300mm deep.

.9 Polyethylene: 0.25mm (10 mil) thick.

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 /Consultant'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 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 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.

.9 Align form joints and make watertight.

.1 Keep form joints to minimum.

.10 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

.11 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.13 Construct forms for architectural concrete, and place ties [as directed.

.1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.14 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.

.15 Line forms for following surfaces:

.1 Outer face of outside, girders, beams, and vertical edge of bridge 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.

.4 Secure lining taut to formwork to prevent folds.

.5 Pull down lining over edges of formwork panels.

.6 Ensure lining is new and not reused material.

.7 Ensure lining is dry and free of oil when concrete is poured.

.8 Application of form release agents on formwork surface is prohibited where drainage lining is used.

.9 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.

.10 Cost of textile lining is included in price of concrete for corresponding portion of Work.

.16 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

.17 When slip forming/flying forms are used, submit details as indicated in PART 1 - SUBMITTALS.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 7 days for walls and sides of beams.

.2 21 days for columns.

.3 28 days for beam soffits, slabs, decks and other structural members, or 7 days when replaced immediately with adequate shoring to standard specified for falsework.

.4 21 days for footings and abutments.

.2 Remove formwork when concrete has reached 70% 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 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N/A

1.2 PRICE AND PAYMENT PROCEDURES

.1 Measurement and Payment:

.1 Measure reinforcing steel in kilograms of steel incorporated into Work, computed from theoretical unit mass specified in CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by the Departmental Representative /Consultant.

.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.

.2 ASTM International

.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.4 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

.3 CSA International

.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.

.3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice SP-66.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.

.1 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Departmental Representative /Consultant with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3.

.4 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by the Departmental Representative /Consultant prior to its use.

1.5 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.

.1 Mill Test Report: upon request, provide the Departmental Representative /Consultant with a certified copy of mill

test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request, submit in writing to the Departmental Representative /Consultant the proposed source of reinforcement material to be supplied.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements or 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 in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by the Departmental Representative /Consultant.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.

.4 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.

.5 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.

.6 Welded steel wire fabric: to ASTM A185/A185M.

.1 Provide in flat sheets only.

.7 Welded deformed steel wire fabric: to ASTM A82/A82M.

.1 Provide in flat sheets only.

.8 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.

.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 - ACTION AND INFORMATIONAL SUBMITTALS.

.10 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.11 Mechanical splices: subject to approval of the Departmental Representative /Consultant.

.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 SP-66 [Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.1 SP-66 unless indicated otherwise.

.2 Obtain the Departmental Representative /Consultant's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of the Departmental Representative /Consultant, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

.1 Ship epoxy coated bars in accordance with ASTM A775A/A775M.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide the Departmental Representative /Consultant 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 /Consultant of proposed source of material to be supplied.

Part 3 EXECUTION

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 the Departmental Representative /Consultant.

.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 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.

.2 When paint is dry, apply thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain the Departmental Representative /Consultant's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 Protect epoxy/paint coated portions of bars with covering during transportation and handling.

3.4 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

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.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 PRICE AND PAYMENT PROCEDURES

.1 Payment for Cast-in-Place Concrete shall be on a lump sum basis.

1.3 REFERENCES

.1 Abbreviations and Acronyms:

.1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.

.1 Type GU, GUb and GUL - General use cement.

.2 Type MS and MSb - Moderate sulphate-resistant cement.

.3 Type MH, MHb and MHL - Moderate heat of hydration cement.

.4 Type HE, HEb and HEL - High early-strength cement.

.5 Type LH, LHb and LHL - Low heat of hydration cement.

.6 Type HS and HSb - High sulphate-resistant cement.

.2 Fly ash:

.1 Type F - with CaO content less than 15%.

.2 Type CI - with CaO content ranging from 15 to 20%.

.3 Type CH - with CaO greater than 20%.

.3 GGBFS - Ground, granulated blast-furnace slag.

.2 Reference Standards:

.1 ASTM International

.1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.5 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.6 ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.7 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.8 ASTM D1752-04a (2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

.2 CAN/CGSB-51.34-M86 (R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure key personnel, the Departmental Representative /Consultant speciality contractor - finishing, forming, and concrete producer, attend.

.1 Verify project requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 At least 2 weeks prior to beginning Work, provide the Departmental Representative /Consultant with samples of materials proposed for use as follows:

.1 5 L of curing compound.

.2 1 m length of each type of joint filler.

.3 1 m length of each type of waterstops.

.4 3 kg of each type of supplementary cementing material.

.5 10 kg of each type of blended hydraulic cement.

.6 5 kg of each admixture.

.7 5 kg of each fine and coarse aggregate.

.3 Provide testing results for review by the Departmental Representative /Consultant and do not proceed without written approval when deviations from mix design or parameters are found.

.4 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

.5 Concrete hauling time: provide for review by the Departmental Representative /Consultant deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

.6 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Provide the Departmental Representative /Consultant, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by the Departmental Representative /Consultant on following items:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

.4 Quality Control Plan: provide written report to the Departmental Representative /Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from the Departmental Representative /Consultant laboratory representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by the Departmental Representative /Consultant.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 Refer to Drawings.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by the Departmental Representative /Consultant and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Portland cement to CAN/CSA A5.

.2 Supplementary cementing materials: to CAN/CSA A23.5.

.3 Cementitious hydraulic slag: to CAN/CSA A363.

.4 Water: to CAN/CSA A23.1.

.5 Aggregates: to CAN/CSA A23.1. Coarse aggregates to be normal density, except as otherwise specified.

.6 Air entraining admixture: to ASTM C260.

.7 Chemical admixtures: to ASTM C494. DCC Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.8 Superplasticizing admixtures: to CSA-A266.5, CSA-A266.6

.9 Concrete retarders: to ASTM C494 water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.

.10 Grout: Portland Cement based non-shrink, non-metallic composition, meeting following requirements:

.1 Not exhibit bleeding or segregation at pumpable consistency.

.2 Compressive Strength: 25 MPa at 1 day.

.3 Bond Strength (ASTM C882) 13 MPa @ 28 days.

.4 Positive expansion confirmed by ASTM C827.

.5 Not produce a vapour barrier.

.11 Non-premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 35 MPa at 28 days.

.12 Cure and sealing compound: to CSA-A23.1 and ASTM C309, Type 1.

.1 Acceptable product:

.1 CPD CIPADECK Cure and Seal 20 (Water Based),

.2 Sika FLORSEAL 25 (Water Based)

.3 WR Meadows VOCOMP 20 (Water Based)

.4 or approved alternate.

.13 Pre-molded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM 1751.

.14 Polyethylene film: 10 mil thickness to CAN/CGSB 51.34 under slabs on grade.

2.4 MIXES

.1 Refer to Drawings for concrete mix design requirements

Part 3 EXECUTION

3.1 PREPARATION

.1 Obtain the Departmental Representative /Consultant's written approval before placing concrete.

.1 Provide 24 hours minimum notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain the Departmental Representative /Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout or epoxy grout to anchor and hold dowels in positions as indicated.

.11 Do not place load upon new concrete until authorized by the Departmental Representative /Consultant.

3.2 INSTALLATION/APPLICATION

.1 Do cast-in-place concrete work to CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by the Departmental Representative /Consultant.

.2 Where approved by the Departmental Representative /Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by the Departmental Representative /Consultant.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from the Departmental Representative /Consultant before placing of concrete.

.5 Confirm locations and sizes of sleeves and openings shown on drawings.

.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts:

.1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from the Departmental Representative /Consultant.

.1 Formed holes: 100 mm minimum diameter.

.2 Drilled holes: to manufacturers' recommendations 25 mm minimum diameter larger than bolts used.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with shrinkage compensating grout or epoxy grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Drainage holes and weep holes:

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.

.2 Install weep hole tubes and drains as indicated.

.5 Dovetail anchor slots: in accordance with Section 04 05 00 - Common Work Results for Masonry.

.1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.

.2 Install continuous vertical anchor slots at 800 mm on centre where concrete walls are masonry faced.

.6 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.7 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.2 Use procedures as reviewed by the Departmental Representative /Consultant or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces. SPEC NOTE: Applies to conductive and static disseminating surface treatment and conductive and static disseminating monolithic or bonded topping.

.4 Finish concrete floor to CSA A23.1/A23.2.

.5 Provide screed finish where floor tile is to be applied.

.6 Provide float finish unless otherwise indicated.

.7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

.8 Waterstops:

.1 Provide waterstops in all joints where exposed to any water (ground or surface)

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by the Departmental Representative /Consultant.

.9 Joint fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by the Departmental Representative /Consultant.

.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form isolation expansion joints as indicated.

.4 Install joint filler.

.5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.10 Dampproof membrane:

.1 Install dampproof membrane under concrete slabs-on-grade inside building.

.2 Lap dampproof membrane minimum 150 mm at joints and seal.

.3 Seal punctures in dampproof membrane before placing concrete.

.4 Use patching material at least 150 mm larger than puncture and seal.

3.3 CURING

.1 Cure and protect concrete in accordance with requirements of Section 7.4 of CSA A23.1.

.2 Concrete surfaces to be cured at a minimum temperature of 10°C for the entire curing period.

.3 Curing regime shall conform to Table 20 of CSA A23.1 and shall depend upon class of exposure.

.4 Upon final finishing of concrete, and once concrete has hardened sufficiently to prevent surface damage, curing shall commence. Curing of concrete surfaces for curing Types 1 and 2 in Table 20 of CSA A23.1 shall be achieved using one or more of following methods:

.1 Curing compound as per section 2.1.11. Apply curing compound per manufacturer's recommendations.

.2 Waterproofing paper or plastic film;

.3 Forms in contact with concrete surface;

.5 Additional curing requirements are required for concrete containing a high volume of supplementary cementing materials, such as fly ash, as per CSA A23.1 Section 8.8.

.6 Workers shall not be allowed on concrete for 12 hours after placement. Ensure that curing method does not interfere with

concrete placing operations, or damage surface of freshly placed concrete.

3.4 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at 7 and 28 days.

.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by the Departmental Representative for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and the Departmental Representative /Consultant.

.4 The Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

.5 The Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

.7 Inspection or testing by Departmental Representative /Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.2 CSA International

.1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.

.3 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005(June 2006), Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.

.2 Include application instructions for concrete floor treatments.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Temporary lighting:

.1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.

.2 Electrical power:

.1 Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

.1 Make work area water tight protected against rain and detrimental weather conditions.

.4 Temperature:

.1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture:

.1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.6 Safety:

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.7 Ventilation:

.1 The Departmental Representative /Consultant will arrange for ventilation system to be operated during installation of concrete floor treatment materials. Ventilate area of work as directed by the Departmental Representative /Consultant by use of approved portable supply and exhaust fans.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Provide continuous ventilation during and after coating application.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.2 PERFORMANCE REQUIREMENTS

.1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

2.3 CHEMICAL HARDENERS

.1 Type 1 - Sodium silicate Type 2 - Magnesium fluosilicate Type 2 - Zinc fluosilicate blend.

.2 Water: potable.

2.4 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based.

.2 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.3 Surface sealer: acrylic carnuba wax.

.4 Surface sealers are not manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium

2.5 CURING COMPOUNDS

.1 Curing compounds to be reviewed by the Departmental Representative /Consultant.

2.6 MIXES

.1 Mixing ratios in accordance with manufacturer's written instructions.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verify that slab, substrate, and site conditions surfaces are ready to receive work and elevations are as recommended by manufacturer's written instructions indicated on shop drawings.

3.2 PREPARATION OF EXISTING SLAB

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.

.2 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.

.3 Use strong solvent mechanical stripping to remove chlorinated rubber or existing surface coatings.

.4 Use protective clothing eye protection respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

.1 Apply concrete finishing floor hardener in accordance with manufacturer's written instructions.

.2 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.

.3 Apply floor treatment in accordance with Sealer manufacturer's written instructions.

.4 Clean over spray. Clean sealant from adjacent surfaces.

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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

3.5 PROTECTION

.1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL 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 concrete hardener and curing compound and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.5 AMBIENT CONDITIONS

.1 Temporary lighting:

.1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 m^2 of floor being finished.

.2 Electrical power:

.1 Sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

.1 Water tight protection against rain and detrimental weather conditions.

.4 Temperature:

.1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of Work and maintain relative humidity not higher than 40% during same period.

.2 Maintain substrate temperature at 10 degrees C minimum.

.5 Moisture:

.1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.6 Ventilation:

.1 The Departmental Representative /Consultant will arrange for ventilation system to be operated during installation of concrete floor hardeners. Ventilate area of work as directed by the Departmental Representative /Consultant by use of approved portable supply and exhaust fans.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Provide continuous ventilation during and for 48 hours minimum after coating application.

Part 2 PRODUCTS

2.1 FLOOR HARDENER

.1 Non-metallic hardener: premixed, dry shake surface hardener, cement to hardener ratio 2 to 1, cement colour to be determined by the Department Representative, light reflective.

.1 Volcanic basaltic aggregate (trap rock):

.1 Quartz aggregate.

.2 Metallic floor hardener: premixed, cement to hardener ratio 2 to 1, light reflective, static disseminating.

.3 Synthetic non-ferrous hardener.

2.2 SLIP RESISTANT ABRASIVE AGGREGATE

.1 Emery aggregate: crushed emery, minimum 50% aluminum oxide.

.2 Homogeneous aluminum oxide, minimum 95%.

.3 Ferric oxide, minimum 25%.

.4 Silicon carbide.

2.3 COLOURING AGENT

.1 Non-metallic type cement colouring agent, colour to be determined by the Department Representative.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions previously installed under other Sections or Contracts are acceptable for concrete hardener and curing compound application installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.2 HARDENING

.1 Apply floor hardener aggregate at rate in accordance with manufacturer's written instructions.

.2 Apply slip resistant coating on floor surfaces as scheduled.

.3 Apply in accordance with manufacturer's written instructions.

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.

.3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect finished installation until floor treatment has completely cured.

.2 Repair damage to adjacent materials caused by concrete floor hardener installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 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.

.3 CSA S16-09, Design of Steel Structures.

.4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).

.5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.

.3 Environmental Choice Program

.1 CCD-047-98(R2005), Architectural Surface Coatings.

.2 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.

.4 Green Seal Environmental Standards (GS)

.1 GS-11-2008, 2nd Edition, Paints and Coatings.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.6 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - current edition.

1.3 ACTION AND INFORMATIONAL 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 sections plates pipe tubing bolts and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.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: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.

.2 Steel pipe: to ASTM A53/A53M standard weight, galvanized finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A307.

.6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Where possible, fit and shop assemble work, ready for erection.

.3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m2 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 Primer Application:

.1 Except where specified otherwise, apply one coat of primer to non-galvanized surfaces.

.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°C.

.3 Take special care when applying primer to prepared surfaces of steelwork to be exposed in the finished installation to obtain a smooth surface capable of allowing a high-quality paint finish. Do additional filling and grinding if required.

.4 Field touch-up: Verify that surfaces to be touched up are free from rust, scale, grease. Touch up with same material as shop primer.

.5 Finish painting is specified in Section 09 91 00 "Painting".

.4 Do not prime the following surfaces:

.1 Steel to be encased in concrete;

.2 Galvanized or non-ferrous metals;

.3 Surfaces and edges to be field welded. If painted, remove paint for field welding for a distance of at least 50 mm in all sides of the paint.

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 Primer: VOC limit 250 g/L maximum to GS-11 CCD-047a CCD-048.

.2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.3 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.

.4 Clean surfaces to be field welded; do not paint.

2.6 MISCELLANEOUS METALWORK

.1 Examine architectural, structural, mechanical and electrical drawings and specifications and furnish all miscellaneous metalwork items required for proper execution of project, including, but not necessarily limited to, the items described herein.

.2 Supply for installation by respective trades, steel brackets, supports and angles as indicated. Drill for countersunk screws and anchor bolts. Prime paint for interior installation, galvanize for exterior installations.

.3 Provide all accessories necessary for proper installation and correlation with adjoining work.

2.7 COORDINATION

.1 Coordinate the work of this Section with the structural steelwork supplier to ensure that all structural steelwork and metal fabrications required for a complete project are included.

.2 Be advised that claims for extras to the Contract Sum for the supply and/or installation of structural steelwork or metal fabrications arising from failure to coordinate the work of this Section with the structural steelwork supplier will not be considered.

.3 Where the work of this Section is furnished for installation by other Sections, coordinate with the appropriate Sections to ensure a proper fit and to schedule delivery dates to ensure the expeditious completion of the project.

2.8 ANCHORS, BRACKETS, AND FITTINGS

.1 Brackets, Flanges, Fittings and Anchors: Provide brackets, end closures, flanges, miscellaneous fittings and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete, masonry and metal stud work.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.2 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 the Departmental Representative /Consultant 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 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CSA S16 Weld field connection.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:

.1 Primer: maximum VOC limit 250 g/L to GS-11.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

.1 Primer: maximum VOC limit 250 g/L to GS-11.

3.3 TRENCH COVERS

.1 Install trench covers in locations as indicated.

3.4 CHANNEL FRAMES

.1 Install steel channel frames to openings as indicated.

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 metal fabrications installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N/A

1.2 REFERENCES

.1 ASTM International

.1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600kN-m/m^3).

.2 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.3 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS 1004-05, Material Specification for Aggregates-Miscellaneous.

.2 OPSS SP 110F13-03, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Regional Materials: submit evidence that project incorporates required percentage 10% 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.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Granular A, B Type I, B Type II, to OPSS SP 110F13. Sand to OPSS 1004.

.2 Gravel and sand, Stone dust, Sand, Crushed Granular 20-0,20-0b,56-0, Natural Gravel 80-0 to CCDG.

.3 Unshrinkable fill: concrete to CSA A23.1/A23.2.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions:

.1 Before commencing work verify locations of buried services on and adjacent to site.

.2 Evaluation and Assessment:

.1 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.

.2 Testing of materials and compaction of backfill and fill, unshrinkable fill will be carried out by testing laboratory designated by the Departmental Representative /Consultant.

.3 Not later than 1 week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill, fill materials proposed for use.

.4 Not later than 48 hours before backfilling or filling with approved material, notify the Departmental Representative /Consultant so that compaction tests can be carried out by designated testing agency.

.5 Before commencing work, conduct, with the Departmental Representative /Consultant, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Use 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, in accordance with requirements of authorities having jurisdiction, or sediment and erosion control plan, specific to site, to EPA 832/R-92-005 and requirements of authorities having jurisdiction.

.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.

.2 Protection of in-place conditions:

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Departmental Representative /Consultant's approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are to remain undisturbed.

.3 Removal:

.1 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.

.2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.3 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

.4 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.

.5 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.

3.3 EXCAVATION

.1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.

.2 Do blasting in accordance with Provincial and Municipal regulations. Repair damage to approval of the Departmental Representative /Consultant. No blasting will be permitted within 3 m of any building and where damage would result.

.3 Topsoil stripping:

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Strip topsoil to depths as directed by the Departmental Representative /Consultant. Avoid mixing topsoil with subsoil.

.3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.

.4 Stockpile in locations as directed by the Departmental Representative /Consultant.

.5 Dispose of topsoil to location as indicated] off site] as directed by the Departmental Representative /Consultant.

.4 Excavate as required to carry out work, in all materials met.

.1 Do not disturb soil or rock below bearing surfaces. Notify the Departmental Representative /Consultant when excavations are complete.

.2 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

.3 Fill excavation taken below depths shown without the Departmental Representative /Consultant's written authorization with concrete of same strength as for footings.

.5 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.

.6 Excavate for slabs and paving to subgrade levels.

.1 Remove topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 SITE QUALITY CONTROL

.1 Fill material and spaces to be filled to be inspected and approved by the Departmental Representative /Consultant.

3.5 BACKFILLING

.1 Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from the Departmental Representative /Consultant.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified

for fill. Fill excavated areas with selected subgrade material, compacted as specified for fill.

.5 Placing:

.1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.

.2 Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.

.6 Compaction: compact each layer of material to following densities for material to ASTM D698:

.1 To underside of basecourses: 95%.

.2 Basecourses: 100%.

.3 Elsewhere: 90%.

.7 Under slabs and paving:

.1 Use 95% up to bottom of granular base courses.

.2 Use 100% for base courses.

.8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

.9 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.

.10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

.11 Underground tanks: use sand to bottom of granular base courses or to bottom of topsoil, as applicable.

3.6 GRADING

.1 Grade to ensure that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Departmental Representative /Consultant. Grade to be gradual between finished spot elevations as indicated.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Dispose of cleared and grubbed material off site daily.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N/A

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A325M-05, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.

.2 ASTM A490M-04a, Standard Specification for High Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric.

.2 Canadian Standards Association (CSA International)

.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.2 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 CAN/CSA O86.1-01, Engineering Design in Wood.

.4 CSA O121-M1978(R2003), Douglas Fir Plywood.

.5 CSA O122-2006, Structural Glued-Laminated Timber.

.6 CSA O151-04, Canadian Softwood Plywood.

.7 CSA O153-M1980(R2003), Poplar Plywood.

.8 CAN/CSA-S16-01, Limit States Design of Steel Structures.

.9 CAN/CSA-S136-01, North America Specification for the Design of Cold Formed Steel Structural Members including supplement CSA-S136.1-01.

.10 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.3 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 Certification Bodies.

1.3 DEFINITIONS

.1 Bracing: temporary support installed in excavation or structure to stabilize against deformations or failure.

.2 Shoring: temporary support installed in an excavation or structure to relieve loads.

1.4 PERFORMANCE REQUIREMENTS

.1 Ensure that materials, equipment and procedures safely supporting existing structure and construction live loads; that allow work to be accomplished and that minimize risk of damage to historic and archaeological elements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario,, Canada.

.3 Shop drawings to indicate shop and erection details in accordance with performance requirements in 1.4.

.4 Submit to the Departmental Representative /Consultant for review of shoring, bracing and temporary framing drawings signed by professional engineer registered or licensed in the Province of Ontario,, Canada.

1.6 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 Waste Management and Disposal:

.1 Separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Refer to Concrete, Wood and Steel Sections.

2.2 SOURCE QUALITY CONTROL

.1 Timber 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.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Before starting work, verify existing conditions and variations from original contract documents and notify the Departmental Representative /Consultant.

3.2 PREPARATION

.1 Remove stored materials from building. Store in area designated by the Departmental Representative /Consultant.

.2 Before shoring is commenced, brace window and door openings to the satisfaction of the Departmental Representative /Consultant.

.3 Before shoring/bracing is begun, drain areas adjacent to foundation, excavation, ground to support bracing. Maintain area free of standing water for the duration of the contract.

.4 Treat wood in contact with ground in accordance with Section 06 05 73 - Wood Treatment.

3.3 INSTALLATION

.1 Commence work as per the Departmental Representative /Consultant instructions.

.2 Obtain approval from the Departmental Representative /Consultant, before execution, if alteration to bracing/shoring system is necessary.

.3 Support individual elements that become loose during shoring bracing installation.

.4 Erect structural timber to CAN/CSA O86.1.

.5 Erect structural steel work to CAN/CSA-S16 and CAN/CSA-S136.

.6 Weld to CSA W59.

.7 Bracing of structures:

.1 Install packing, after review by the Departmental Representative /Consultant, behind wall pieces to compensate for unevenness of wall surfaces.

.2 Install and use bracing system to correct deformations.

.8 Bracing of excavations:

.1 Conduct work in accordance with the Ontario Health & Safety Act.

.2 Excavate by increments of three poling boards and insert boards from bottom of excavation. Fasten poling boards to flanges of soldier piles with wedges.

.3 In water-bearing ground, leave narrow gaps between poling boards to allow drainage.

.9 Shoring of structures:

.1 Cut rectangular hole in wall to firmly accommodate needle. To ensure snug fit, ram dry mortar packing, proportioned: 1 cement: 1 lime: 6 sand.

.2 Install packing after review by the Departmental Representative /Consultant behind wall pieces to compensate for unevenness of wall surface.

.3 Before final raking shores are erected, install temporary shores, consisting of an upright against wall and raker notched in, to stabilize wall.

.4 Install boards, between needles of dead shores, to prevent core escaping.

.10 Shoring of columns for underpinning:

.1 Use method detailed on drawings.

.2 Provide constant monitoring of selected shoring apparatus during shoring operation.

3.4 ADJUSTMENT

.1 Monitor shoring/bracing system performance and maintain its effectiveness by making adjustments, replacing or repairing damaged and weakened elements of system until final completion of project for period of one (1) week after installation of system.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL 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 aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit two (2) samples.

.2 Allow continual sampling by the Departmental Representative /Consultant during production.

.3 Provide the Departmental Representative /Consultant with access to source and processed material for sampling.

.4 Install sampling facilities at discharge end of production conveyor, to allow the Departmental Representative /Consultant to obtain representative samples of items being produced. Stop conveyor belt when requested by the Departmental Representative /Consultant to permit full cross section sampling.

.5 Provide front end loader or other suitable equipment including trained operator for stockpile sampling as necessary. Move samples to storage place as directed by the Departmental Representative /Consultant.

.6 Supply new or clean sample bags or containers according appropriate to aggregate materials.

.7 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

.8 Provide water, electric power and propane to the Departmental Representative /Consultant laboratory trailer at production site.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and in accordance with manufacturer's written instructions.

.2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

.3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.

.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.

.1 Greatest dimension to exceed 5 times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.2 Reclaimed asphalt pavement.

.3 Reclaimed concrete material.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock.

.2 Crushed gravel composed of naturally formed particles of stone.

.3 Light weight aggregate, including slag and expanded shale.

.4 Reclaimed asphalt pavement.

.5 Reclaimed concrete material.

2.2 SOURCE QUALITY CONTROL

.1 Inform the Departmental Representative /Consultant of proposed source of aggregates and provide access for sampling 2 weeks minimum before starting production.

.2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.

.3 Advise the Departmental Representative /Consultant 2 week's minimum in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with topsoil stripping only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative /Consultant.

3.2 PREPARATION

.1 Topsoil stripping:

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Begin topsoil stripping of areas as directed by the Departmental Representative /Consultant after area has been cleared of brush, weeds, grasses, and removed from site.

.3 Strip topsoil to depths as directed by the Departmental Representative /Consultant. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as directed by the Departmental Representative /Consultant. Stockpile height not to exceed 2 m.

.5 Dispose of topsoil to location as indicated off site as directed by the Departmental Representative /Consultant.

.2 Aggregate source preparation:

.1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction.

.2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.

.3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.

.4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.

.5 Trim off and dress slopes of waste material piles and leave site in neat condition.

.6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.

.3 Processing:

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.

.1 Use methods and equipment approved in writing by the Departmental Representative /Consultant.

.4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.

.5 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.

.1 Use only equipment approved in writing by the Departmental Representative /Consultant.

.6 Stockpiling:

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by the Departmental Representative /Consultant. Do not stockpile on completed pavement surfaces.

.2 Stockpile aggregates in sufficient quantities to meet project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Departmental Representative /Consultant within 48 hours of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:

.1 Maximum 1.5 m for coarse aggregate and base course materials.

.2 Maximum 1.5 m for fine aggregate and sub-base materials.

.3 Maximum 1.5 m for other materials.

.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.9 Do not cone piles or spill material over edges of piles.

.10 Do not use conveying stackers.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

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.

.3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.4 Leave any unused aggregates in neat compact stockpiles as directed by the Departmental Representative /Consultant.

.5 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

.6 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to the Departmental Representative /Consultant.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 MEASUREMENT PROCEDURES

.1 Measure following items in hectares within limits as indicated:

.1 Clearing.

.2 Grubbing.

.2 Measure clearing isolated trees as number of isolated trees cleared.

.3 Fixed price payments will be made for:

.1 Clearing.

.2 Clearing isolated trees.

1.3 REFERENCES

.1 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.

1.4 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.5 STORAGE AND PROTECTION

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, water courses, and root systems of trees which are to remain.

.1 Repair damaged items to approval of the Departmental Representative /Consultant.

.2 Replace trees designated to remain, if damaged, as directed by the Departmental Representative /Consultant.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reused.

Part 3 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 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.

3.2 PREPARATION

.1 Inspect site and verify with the Departmental Representative /Consultant, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify the Departmental Representative /Consultant immediately of damage to or when unknown existing utility lines are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify the Departmental Representative /Consultant in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing and grubbing.

.4 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

.1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.4 CLEARING

.1 Clearing includes felling, trimming, cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.

.2 Clear as directed by the Departmental Representative /Consultant, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches overhanging area cleared as directed by the Departmental Representative /Consultant.

.4 Cut off unsound branches on trees designated to remain as directed by the Departmental Representative /Consultant.

3.5 ISOLATED TREES

.1 Cut off isolated trees as indicated directed by the Departmental Representative /Consultant at height of not more than 300 mm above ground surface.

.2 Grub out isolated tree stumps.

.3 Prune individual trees as indicated.

.4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.

.5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

3.6 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated at ground level to within 450 mm of ground surface.

3.7 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^3.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.8 REMOVAL AND DISPOSAL

.1 Remove cleared grubbed materials off site to disposal area as indicated by the Departmental Representative /Consultant.

.2 Dispose of cleared and grubbed materials off site.

.3 Remove diseased trees identified by the Departmental Representative /Consultant and dispose of this material to approval of the Departmental Representative /Consultant.

3.9 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate grading operations stripping of topsoil to approval of the Departmental Representative /Consultant.

3.10 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 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.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 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 or 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.

3.2 STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable Provincial requirements.

.2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.3 Handle topsoil only when it is dry and warm.

.4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation.

.5 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal mulching.

.6 Strip topsoil to depths as directed by the Departmental Representative /Consultant.

.1 Avoid mixing topsoil with subsoil.

.7 Pile topsoil in berms in locations as directed by the Departmental Representative /Consultant.

.1 Stockpile height not to exceed 2.0 m.

.8 Dispose of unused topsoil off-site.

.9 Protect stockpiles from contamination and compaction.

.10 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

3.3 PREPARATION OF GRADE

.1 Verify that grades are correct and notify the Departmental Representative /Consultant if discrepancies occur do not begin work until instructed by.

.1 Grade area only when soil is dry to lessen soil compaction.

.2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

.1 Place topsoil only after the Departmental Representative /Consultant has accepted subgrade.

.2 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.

.3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.

.4 Cultivate soil following spreading procedures.

3.5 SUB-SOILING

.1 Apply sub-soil, following spreading and cultivating procedures to designated areas to improve drainage and agricultural potential of soil.

.2 Work sub-soil area following natural grade contour lines, with vibrating sub-soiler to depth of 40 cm.

.3 Cross sub-soil the area following the first pass.

.4 Cultivate the soil with a chain harrow to de-clod the soil.

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.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D698-07e1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

1.4 EXISTING CONDITIONS

.1 Examine previous subsurface investigation.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

.3 Refer to dewatering in Section 31 23 33.01 - Excavating, Trenching and Backfilling.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Fill material: Granular in accordance with of Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by the Departmental Representative /Consultant.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for rough grading installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.2 STRIPPING OF TOPSOIL

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by the Departmental Representative /Consultant.

.2 Commence topsoil stripping of areas as directed by the Departmental Representative /Consultant after area has been cleared of brush, weeds, grasses, and removed from site.

.3 Strip topsoil to depths as directed by the Departmental Representative /Consultant. Rototill weeds, grasses, and retain as topsoil on site. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as directed by the Departmental Representative /Consultant. Stockpile height not to exceed 2 m.

.5 Dispose of unused topsoil off site as directed by the Departmental Representative /Consultant.

3.3 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to following depths below finish grades:

.1 500 mm for asphalt paving.

.2 200 mm for concrete paving walks precast paving units.

.3 Slope rough grade away from building 2% minimum as indicated.

.4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.5 Compact filled and disturbed areas to corrected maximum dry density maximum dry density to ASTM D698, as follows:

.1 85% under landscaped areas.

.2 95% under paved and walk areas.

.6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.4 TESTING

.1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by ULC. Costs of tests will be paid by the Contractor in accordance with Sections 01 29 83 - Payment Procedures for Testing Laboratory Services and 01 45 00 - Quality Control.

.2 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to the Departmental Representative /Consultant for review.

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 existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by the Departmental Representative /Consultant. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 MEASUREMENT PROCEDURES

.1 Measure reshaping subgrade in square metres reshaped.

.2 Measure additional subgrade material under Section 31 24 13 - Roadway Embankments.

1.3 REFERENCES

.1 ASTM International

.1 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3) 600 kN-m/m^3.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not used.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for roadway subgrade reshaping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.2 SCARIFYING AND RESHAPING

.1 Scarify subgrade to full width as directed by the Departmental Representative /Consultant and to depth of 500 mm minimum.

.2 Where deficiency of material exists, add and blend additional subgrade material as directed by the Departmental Representative /Consultant.

3.3 COMPACTING

.1 Compact to minimum 95% maximum dry density to ASTM D698.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted subgrade surface.

.3 Apply water as necessary during compaction to obtain specified density.

.4 If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected to value not greater than the optimum value for compaction to ASTM D698.

3.4 SITE TOLERANCES

.1 Reshaped compacted surface to be within plus or minus 10 mm of elevation as indicated.

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 and maintain reshaped surface in condition conforming to this Section until succeeding material is applied or until after receipt of written acceptance from the Departmental Representative /Consultant.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.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-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

.2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.4 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 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock: solid material in excess of 1.00 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m3 bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters (1 inch) in any dimension.

.4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.7 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 ASTM C136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.

.2 Submit for review by the Departmental Representative /Consultant proposed dewatering methods as described in PART 3 of this Section.

.3 Submit to the Departmental Representative /Consultant written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

.4 Submit to the Departmental Representative /Consultant written notice when bottom of excavation is reached.

.5 Submit to the Departmental Representative /Consultant testing results as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, or location plan of relocated and abandoned services, as required.

.4 Samples:

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

.2 Inform the Departmental Representative /Consultant at least 2 weeks prior to beginning Work, of proposed source of fill or unshrinkable fill materials and provide access for sampling.

.3 Submit 70 kg samples of type of fill or unshrinkable fill specified, including representative samples of excavated material.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Where the Departmental Representative /Consultant is employee of Contractor, submit proof that Work by the Departmental Representative /Consultant is included in Contractor's insurance coverage.

.3 Submit design and supporting data at least 2 weeks prior to beginning Work.

.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the Province of Ontario, Canada.

.5 Keep design and supporting data on site.

.6 Engage services of qualified professional Engineer who is registered or licensed in the Province of Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.7 Do not use soil material until written report of soil test results are reviewed by the Departmental Representative /Consultant.

.8 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Divert excess aggregate materials from landfill to local quarry for reuse as directed by the Departmental Representative /Consultant.

1.7 EXISTING CONDITIONS

.1 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Prior to beginning excavation Work, notify applicable the Departmental Representative /Consultant and authorities having jurisdiction establish location and state of use of buried utilities and structures. The Departmental Representative /Consultant and authorities having

jurisdiction to clearly mark such locations to prevent disturbance during Work.

.6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods, whichever is suitable.

.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.

.8 Where utility lines or structures exist in area of excavation, obtain direction of the Departmental Representative /Consultant before removing or re-routing.

.9 Record location of maintained, re-routed and abandoned underground lines.

.10 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:

.1 Conduct, with the Departmental Representative /Consultant, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.

.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by the Departmental Representative /Consultant

.3 Where required for excavation, cut roots or branches in accordance with Section 32 01 90.33 - Tree and Shrub Preservation.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.3 Table:

Sieve Designation	% Passing	
Type 1	Type 2	
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

.2 Type 3 fill: selected material from excavation or other sources, approved by the Departmental Representative /Consultant for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

.3 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 0.4 MPa at 28 days.

.2 Maximum cement content of 25 kg/m^3 with 40 by volume fly ash replacement: to CSA-A3001, Type GU.

.3 Minimum strength of 0.07MPa at 24 h.

.4 Concrete aggregates: to CSA-A23.1/A23.2.

.5 Cement: Type GU.

.6 Slump: 160 to 200 mm.

.4 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

.5 Geotextiles: to Section 31 32 19.01 - Geotextiles.

Part 3 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 or 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.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly in accordance with Section 02 41 13 - Selective Site Demolition.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Departmental Representative /Consultant approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as directed by the Departmental Representative /Consultant after area has been cleared of brush, weeds, and grasses and removed from site.

.2 Strip topsoil to depths as indicated as directed by the Departmental Representative /Consultant.

.1 Do not mix topsoil with subsoil.

.3 Stockpile in locations as directed by the Departmental Representative /Consultant.

.1 Stockpile height not to exceed 2 m and should be protected from erosion.

.4 Dispose of unused topsoil off site.

3.5 STOCKPILING

.1 Stockpile fill materials in areas designated by the Departmental Representative /Consultant.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements and Health and Safety Act for the Province of Ontario.

.1 Where conditions are unstable, the Departmental Representative /Consultant to verify and advise methods.

.2 Obtain permit from authority having jurisdiction for temporary diversion of water course.

.3 Construct temporary Works to depths, heights and locations as indicated.

.4 During backfill operation:

.1 Unless otherwise indicated or directed by the Departmental Representative /Consultant, remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for the Departmental Representative /Consultant's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures in manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.8 EXCAVATION

.1 Advise the Departmental Representative /Consultant at least 7 days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as indicated.

.3 Remove concrete, masonry, paving, walks, demolished foundations, and rubble and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.

.4 Excavation must not interfere with bearing capacity of adjacent foundations.

.5 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.6 For trench excavation, unless otherwise authorized by the Departmental Representative /Consultant in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative /Consultant.

.8 Restrict vehicle operations directly adjacent to open trenches.

.9 Dispose of surplus and unsuitable excavated material off site.

.10 Do not obstruct flow of surface drainage or natural watercourses.

.11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.12 Notify the Departmental Representative /Consultant when bottom of excavation is reached.

.13 Obtain the Departmental Representative /Consultant approval of completed excavation.

.14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative /Consultant.

.15 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with fill concrete Type 2 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density in accordance with Section 31 05 10 - Corrected Maximum Dry Density for Fill.

.2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density in accordance with Section 31 05 10 - Corrected Maximum Dry density fir Fill.

.16 Hand trim, make firm and remove loose material and debris from excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.2 Clean out rock seams and fill with concrete mortar or grout to approval of the Departmental Representative /Consultant.

.17 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.9 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 ASTM D1557 in accordance with Section 31 05 10 - Corrected Maximum Dry Density for Fill.

.1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95% of corrected maximum dry density.

.2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 100 % of corrected maximum dry density.

.3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill topped with shearmat filler as indicated to underside of slab. Compact base course to 100 %.

.4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95 %. For remaining portion, use Type 3 fill compacted to 95 %.

.5 Place unshrinkable fill in areas as indicated.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated Section 33 41 00 - Storm Utility Drainage Piping as specified in Section 33 11 16 - Site Water Utility Distribution Piping

.2 Section 33 34 00 - Sanitary Utility Sewerage Force Mains.

.3 Place bedding and surround material in unfrozen condition.

3.11 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 The Departmental Representative /Consultant has inspected and approved installations.

.2 The Departmental Representative /Consultant has inspected and approved of construction below finish grade.

.3 Inspection, testing, approval, and recording location of underground utilities.

.4 Removal of concrete formwork.

.5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed Work to equalize loading.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from the Departmental Representative /Consultant:

.2 If approved by the Departmental Representative /Consultant, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by the Departmental Representative /Consultant.

.6 Place unshrinkable fill in areas as indicated.

.7 Consolidate and level unshrinkable fill with internal vibrators.

.8 Install geotextile in backfill as indicated.

3.12 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by the Departmental Representative /Consultant.

.2 Replace topsoil as directed by the Departmental Representative /Consultant.

.3 Reinstate lawns to elevation which existed before excavation.

.4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.5 Clean and reinstate areas affected by Work as directed by the Departmental Representative /Consultant.

.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 MEASUREMENT AND PAYMENT

.1 Payment for all granular subbase to be Lump Sum.

1.3 REFERENCES

.1 ASTM International

.1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.

.5 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.6 ASTM D1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft^3) (2,700kN-m/m^3).

.7 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Sustainable Design Submittals:

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005 authorities having jurisdiction.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with erosion and sedimentation control plan.

.2 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Granular sub-base material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.3 Table

Sieve Designation	% Passing			
100 mm	-	-	-	-
75 mm	100	100	100	-
50 mm	-	-	-	100
37.5 mm	-	-	-	-
25 mm	55-100	-	-	60-100
19 mm	-	-	-	-
12.5 mm	-	-	-	38-70
9.5 mm	-	-	-	-
4.75 mm	25-100	25-85	-	22-55
2.00 mm	15-80	-	-	13-42
0.425 mm	4-50	5-30	0-30	5-28
0.180 mm	-	-	-	-
0.075 mm	0-8	0-10	0-8	2-10

.4 Other properties as follows:

.1 Liquid Limit: to ASTM D4318, Maximum 25.

.2 Plasticity Index: to ASTM D4318, Maximum 6.

.3 Los Angeles degradation: to ASTM C131.

.1 Maximum loss by mass: 40 50 %.

.4 Particles smaller than 0.02 mm: to ASTM D422, Maximum 3%.

.5 Soaked CBR: to ASTM D1883, Minimum 40 when compacted to 100% of ASTM D1557.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.2 PREPARATION

.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 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.

3.3 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by the Departmental Representative /Consultant.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Begin spreading sub-base material on crown line or high side of one-way slope.

.6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 The Departmental Representative /Consultant may authorize thicker lifts if specified compaction can be achieved.

.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from the Departmental Representative /Consultant before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compact to density of not less than 98% maximum dry density in accordance with ASTM D698 ASTM D1557.

.5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.6 Apply water as necessary during compaction to obtain specified density.

.7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Departmental Representative /Consultant.

.8 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 standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

.2 Obtain written approval from the Departmental Representative /Consultant to use non-standard proof rolling equipment.

.3 Proof roll at level in sub-base as indicated.

.1 If non-standard proof rolling equipment is approved, the Departmental Representative /Consultant 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 areas of defective subgrade:

.1 Remove sub-base and subgrade material to depth and extent as directed by the Departmental Representative /Consultant.

.2 Backfill excavated subgrade with sub-base material and compact in accordance with this section common material and compact in accordance with Section 31 22 14 - Airfield Grading.

.3 Replace sub-base material and compact.

.6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 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.

3.7 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by the Departmental Representative /Consultant.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 MEASUREMENT AND PAYMENT

.1 Payment for all granular base to be Lump Sum.

1.3 REFERENCES

.1 ASTM International

.1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.5 ASTM D1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft^3) (2,700kN-m/m^3).

.6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.7 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Sustainable Design Submittals:

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005 authorities having jurisdiction.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 31 05 16 - Aggregate Materials with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Stockpile minimum 50% of total aggregate required prior to beginning operation.

.2 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.3 Replace defective or damaged materials with new.

.4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed stone or gravel.

.2 Gradations to be within limits specified when tested to ASTM C136 ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.1 Gradation Method #1 to:

Sieve Designation	% Passing		
(1)	(2)	(3)	
100 mm	-	-	-
75 mm	-	-	-
50 mm	100	-	-
37.5 mm	70-100	-	-
25 mm	-	100	-
19 mm	50-75	-	100
12.5 mm	-	65-100	70-100
9.5 mm	40-65	-	-
4.75 mm	30-50	35-60	40-70
2.00 mm	-	22-45	23-50
0.425 mm	10-30	10-25	7-25
0.180 mm	-	-	-
0.075 mm	3-8	3-8	3-8

.2 Gradation Method #2 to: insert name of agency and material type except that percentage finer than 0.075 mm not to exceed 8%.

.3 Material to level surface depressions to meet gradation (2) limits in accordance with Method #1.

.4 Liquid limit: to ASTM D4318, maximum 25

.5 Plasticity index: to ASTM D4318, maximum 6.

.6 Los Angeles degradation: to ASTM C131. Max. % loss by weight: 45

.7 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C136.

Passing	Retained on	
50 mm	to	25 mm
25 mm	to	19.0 mm
19.0 mm	to	4.75 mm

.8 Soaked CBR: to ASTM D1883, minimum 80 100, when compacted to 100% of ASTM D1557.

Part 3 EXECUTION

3.1 PREPARATION

.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 or 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.

3.2 PLACEMENT AND INSTALLATION

.1 Place granular base after sub-base surface is inspected and approved in writing by the Departmental Representative /Consultant.

.2 Placing:

.1 Construct granular base to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Begin spreading base material on crown line or on high side of one-way slope.

.5 Place material using methods which do not lead to segregation or degradation of aggregate.

.6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 The Departmental Representative /Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.

.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.9 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from the Departmental Representative /Consultant before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compacting:

.1 Compact to density not less than 100% maximum dry density to ASTM D698 ASTM D1557.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by the Departmental Representative /Consultant.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.5 Proof rolling:

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from the Departmental Representative /Consultant to use non-standard proof rolling equipment.

.3 Proof roll at level in granular base as indicated.

.1 If use of non-standard proof rolling equipment is approved, the Departmental Representative /Consultant to 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 areas of defective subgrade:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by the Departmental Representative /Consultant.

.2 Backfill excavated subgrade with common material and compact in accordance with Section 31 22 14 -

Airfield Grading sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.

.3 Replace sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-base.

.4 Replace base material and compact in accordance with this Section.

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by the Departmental Representative /Consultant and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this section at no extra cost.

3.3 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by the Departmental Representative /Consultant.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.

.4 ASTM D698-00ae1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.3-99(March 2004), Kerosene, Amend. No. 1, National Standard of Canada.

.2 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and 02 81 01 - Hazardous Materials.

.3 Inform the Departmental Representative /Consultant of proposed source of materials and provide access for sampling at least 2 weeks prior to commencing work.

.4 If materials have been tested by an accredited testing laboratory within previous 2 months and have passed tests equal to requirements of this specification, submit test

certificates from testing laboratory showing suitability of materials for this project.

Part 2 PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.2 Do verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

2.2 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Joint filler Curing Compound: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.4 Granular base: material to Section 31 05 16 - Aggregate Materials following requirements:

.1 Type 1

.2 Crushed stone or gravel.

.3 Gradations: within limits specified when tested to ASTM C136 ASTM C117. Sieve sizes to CAN/CGSB-8.1.

.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 Fill material: to Section 31 05 16 - Aggregate Materials following requirements:

.1 Type 1

.2 Crushed stone or gravel.

.3 Gradations: within limits specified when tested to ASTM C136 ASTM C117. Sieve sizes to CAN/CGSB-8.1.

.7 Boiled linseed oil: to ASTM D260.

.8 Kerosene: to CAN/CGSB-3.3.

Part 3 EXECUTION

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

.1 Dispose of surplus and unsuitable excavated material in approved location on site off site.

.3 Place fill in maximum 150 mm layers and compact to at least 95% of maximum dry density to ASTM D698.

3.2 GRANULAR BASE

.1 Obtain the Departmental Representative /Consultant's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 150 mm layers to at least 95% of maximum density to ASTM D698.

3.3 CONCRETE

.1 Obtain the Departmental Representative /Consultant's approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.4 Provide edging as indicated with 10 mm radius edging tool.

.5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to the Departmental Representative /Consultant can be demonstrated. Hand finish surfaces when directed by the Departmental Representative /Consultant.

3.4 TOLERANCES

.1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic as per OPSD 310.010.

.2 Install expansion joints as indicated as per OPSD 310.010.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints as indicated in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by the Departmental Representative /Consultant.

3.7 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by the Departmental Representative /Consultant.

.2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.8 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as directed by the Departmental Representative /Consultant.

.1 Compact and shape to required contours as directed by the Departmental Representative /Consultant.

3.9 LINSEED OIL TREATMENT

.1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete is clean and dry.

.2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.

.3 Apply treatment when air temperature above 10 degrees C.

.4 Apply first coat at 135 mL/m^2.

.5 Apply second coat at 90 mL/m^2 when first coat has dried.

3.10 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)

.1 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).

.2 ANSI/AWWA C504-10, Rubber-Seated Butterfly Valves.

.3 ANSI/AWWA C508-09, Swing-Check Valves for Waterworks Service, 2 inch (50 mm) through 24 inch (600 mm) NPS.

.2 ASTM International

.1 ASTM C 478M-11, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.

.3 CSA International

.1 CAN/CSA-A257 Series-09, Standards for Concrete Pipe.

.2 CSA B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.

1.3 SCHEDULING

.1 Schedule work to minimize interruptions to existing services.

.2 Maintain existing sewage flows during construction.

1.4 ACTION AND INFORMATIONAL 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 packaged sewage lift 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 the Province of Ontario, Canada.

.2 Submit drawings for civil, structural, hydraulic, mechanical and electrical elements.

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 sewage lift station for incorporation into manual.

.3 Include information as follows:

.1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.

.2 Interconnections with numbers and wire sizes.

.3 Certified pump characteristic curves.

.4 Detailed operation and maintenance instructions.

.5 Parts list comprising complete schedule clearly identified to facilitate re-ordering.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect packaged sewer lift from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 DESCRIPTION

.1 Reinforced concrete enclosure (or approved equivalent).

.1 Pumping system: factory assembled and disassembled for shipment with mating components clearly identified.

.2 Principal items of equipment to include 2 identical submersible sewage pumping units, internal piping and valves, liquid level controls, lifting chains, guide bars, debris screen grate, vents complete with screens, cover, electrical wiring, control panel with circuit breakers and motor starters.

.2 Equipment and installation including as follows:

.1 Temporary sheet piling (if required).

.2 Excavation for sewage lift station.

.3 Placement of 200 mm granular slab.

.4 Connection of power to control panel as indicated.

.5 Connections to existing force main.

.6 Supply and installation of packaged sewage lift station in accordance with manufacturer's recommendations.

.3 Wet well sewage lift station:

.1 Fully automatic, consisting of duplex submersible pumps mounted on rail system.

.1 Ensure control is by series of liquid level bulbs.

.2 Ensure pumps alternate as lead pump on each cycle.

.3 Incorporate time delay relays in control circuits to allow continuation of pump for pre-set time after normal pump shut down signal is received.

.4 Operate both pumps when lag pump "on" water level is reached in wet well.

.1 Ensure lag pump shuts off when water level drops to pump "off" water level.

.5 Locate control system in control station mounted above lift station cover plate.

2.2 WET WELL STRUCTURE

.1 Structure : leak free, precast, reinforced concrete (or equivalent) with access opening, ladder and designed for following forces:

.1 Dead load of station and components, dynamic and kinetic forces of rotating equipment.

.2 Dead load from soil over structure, superimposed live load of 12 kN/m^2 or single wheel load of 54 kN over area of 750 x 750 mm.

.3 Hydrostatic uplift forces.

.4 Horizontal earth loading and full hydrostatic pressure assuming water at ground elevation.

.2 Waterproof exterior surfaces below grade in accordance with Section 07 52 00 - Modified Bituminous Membrane Roofing.

.3 Materials:

.1 Precast concrete to ASTM C478M CAN/CSA-A257 and in accordance with Section 03 41 00 - Precast Structural Concrete.

2.3 PUMPS – SANITARY SEWAGE

.1 2 vertical, single stage, bottom suction, non-clog, heavy duty, totally submersible centrifugal pumps, direct connected to motor by solid stainless steel shaft and fitted with thrust bearings.

.2 Characteristics:

.1 Capacity: 5 L/s minimum Total dynamic head: 33 m.

.2 2 HP 108/240V.

.3 Volute casing: cast iron, minimum grade Class 30, close coupled.

.4 Impeller: bronze, open semi-open, in static and dynamic balance. All fasteners to be stainless steel.

.5 Capable of passing 75 mm solid sphere.

2.4 PUMPS – STORM DISCHAGE

.1 2 vertical, single stage, bottom suction, non-clog, heavy duty, totally submersible centrifugal pumps, direct connected to motor by solid stainless steel shaft and fitted with thrust bearings.

.2 Characteristics:

.1 Capacity: 2.5 L/s minimum Total dynamic head: 7.6 m.

.2 3/4 HP 115V.

.3 Volute casing: cast iron, minimum grade Class 30, close coupled.

.4 Impeller: bronze, open semi-open, in static and dynamic balance. All fasteners to be stainless steel.

.5 Capable of passing 75 mm solid sphere.

2.5 PUMP LIFTING SYSTEM

.1 Ensure pumps are complete with sliding guide and brackets, chains and quick leak-proof disconnect to discharge piping, all allowing for withdrawal of pumps.

.2 Include galvanized lifting chain or stainless steel cable for each pump accessible from roof access hatches.

.3 Use galvanized steel pipe as quick rails for pump.

2.6 SUBMERSIBLE MOTORS

.1 Motors:

.1 3 phase.

.2 Capable of operating pump at any point on selected impeller curve without exceeding motor nominal rating.

.3 Fully overload protected.

.4 Assembly capable of operating continuously in air without overheating.

.5 Complete with NEMA approved winding temperature sensor.

.2 Motor speed: maximum 1800 rpm.

.3 Motor enclosure and seal housing: corrosion resistant, completely watertight, cast iron.

.4 Bearing: anti-friction type, greasable, with lubrication lines and fittings, 50,000 hours minimum, B-10 life.

.5 Terminal box: watertight, with waterproof cable entry glands mounted at motor.

.6 Shaft seals: double mechanical seals with tungsten/carbide faces.

.7 Motor leads and power cords to be sealed and locked in place using strain bushings. All cables to be waterproof.

2.7 PUMP CONTROL SYSTEM

.1 Liquid level switches: shock-proof mercury switches enclosed in leak-proof polypropylene body.

.2 Include independently adjustable control levels as follows:

.1 Lead pump start level.

.2 Lead pump stop level.

.3 Lag pump start level.

.4 Lag pump stop level.

.5 High water alarm (audible).

.3 Ensure lead pump and lag pump controls include alternator relay to provide automatic pump alteration for each pumping cycle when pump sequence selection switch is on automatic.

2.8 PIPING AND VALVES

.1 Cast iron pipe, fittings and joints: to CSA B70, 100 mm minimum.

.2 Butterfly valves: to ANSI/AWWA C504.

.3 Gate valves: solid wedge, Class 125, flanged, to ANSI/AWWA C500.

.4 Check valves: Class 125, swing check type, spring loaded lever, stainless steel shaft, to ANSI/AWWA C508.

2.9 ELECTRICAL CONTROL PANEL AND WIRING

.1 Use only CSA approved components.

.2 Electrical equipment in station in accordance with requirements for Hazardous Locations, Class 1, Group D, Division 2.

.3 Panel enclosure to NEMA 4Xweather proof of fabricated steel suitably braced, double door equipped with locking device, suitable for pole mounting.

.4 Ensure panel is complete with required components including:

.1 1 main circuit breaker with thermal magnetic trip and suitable current rating for station load.

.2 1 3 phase ground detector, neon lamp type with resistors and fuse cut-outs.

.3 1 motor circuit interruptor with toggle handle for each pump motor with adjustable instantaneous trip.

.4 1 magnetic full voltage starter with 120 volts coils and 3 overload relays for each pump.

.5 1 time delay-relay, 2 - 50 second range, 10 amp minimum resistive contacts to prevent concurrent starting of pumps after power restoration.

.6 Dry contacts, normally open, on high water alarm relay for remote indication.

.5 Mount following switches and instrumentation on door of panel:

.1 Pump mode selector switches for hands-off-automatic operation of each pump.

.2 Pump sequence selector switch to permit override of automatic pump alternation and selection of either pump to run as lead pump.

.3 1 high level alarm complete with alarm relay and red light on panel door.

.6 Terminals in circuit of start float switch of lag pump.

.7 Ground connection lug.

.8 Labels: all components on and inside panel to indicate operating routine.

.1 Labels: anodized aluminum with 5 mm minimum letters.

.9 Schematic wiring diagram: mounted inside panel door, varnish protected.

.10 Conductors: copper.

.11 Control wiring: number 14 AWG minimum, stranded type TEW.

.12 Power wire: number 12 AWG minimum, type RW 90.

.13 Wire:

.1 Numbered with printed permanent indelible identifying plastic tapes to correspond to schematic diagram.

.2 Terminated for external control connections by tubular screw type terminal blocks with barrier and labels.

.3 Equipped with grommet and shields for mechanical protection.

.4 Adequately supported and installed in accordance with written approval of the Departmental Representative /Consultant.

2.10 PACKAGE SYSTEM

.1 Cast-in-Place concrete enclosure (or approved equivalent) complete with components specified.

2.11 SOURCE QUALITY CONTROL

.1 Perform operational tests on pumps at factory to check for excessive vibration, for leaks in piping or seals and for correct operation of automatic control system and auxiliary equipment. Pump suction and discharge lines to be coupled to reservoir and pumps to recirculate water for minimum of 1 our under simulated service conditions.

.2 Provide certification that pumps and controls have been factory tested and deficiencies rectified prior to delivery to site.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewage lift installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.2 EXCAVATION BACKFILLING AND COMPACTION

.1 Excavate, backfill and compact in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling and as indicated.

3.3 CONCRETE

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete 33 05 16 - Maintenance Holes and Catch Basin Structures.

3.4 EQUIPMENT INSTALLATION

.1 Install equipment, piping and controls in accordance with manufacturers' recommendations.

3.5 WATERPROOFING

.1 Waterproof in accordance with Section 07 52 00 - Modified Bituminous Membrane Roofing.

3.6 FIELD QUALITY CONTROL

.1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of the Departmental Representative /Consultant.

.2 Test in presence of the Departmental Representative /Consultant 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.

.1 Repeat test until equipment is accepted by the Departmental Representative /Consultant.

3.7 DEMONSTRATION

.1 Operating Personnel Training

.1 Provide on-site training by qualified personnel for designated operating personnel prior to final commissioning.

.1 Schedule and deliver training in accordance with training plan approved in writing by the Departmental Representative /Consultant.

.2 Include training for 3 designated personnel on routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.

.3 Include safety precaution procedures for systems.

3.8 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.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 MEASUREMENT PROCEDURES

.1 Payment or preparation of sub-grade for placing of topsoil will be paid for on a Lump Sum basis.

1.3 PAYMENT

.1 Testing of topsoil: the Contractor will pay for cost of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.

1.4 REFERENCES

.1 Agriculture and Agri-Food Canada

.1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment

.1 PN1340-2005, Guidelines for Compost Quality.

.2 Commercial Interiors.

.3 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.

1.5 DEFINITIONS

.1 Compost:

.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.

.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.

.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminates.

.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality control submittals :

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

Part 2 PRODUCTS

2.1 TOPSOIL

.1 Topsoil for seeded areas planting beds : mixture of particulates, micro-organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Finished surface free from:

.1 Debris and stones over 50 mm diameter.

.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:

.1 Fertility: major soil nutrients present in following amounts:

.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.6 Ph value: 6.5 to 8.0.

.2 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: compost Category A or B in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.

.6 Limestone:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

.1 Advise the Departmental Representative /Consultant of sources of topsoil to be utilized with sufficient lead time for testing.

.2 Contractor is responsible for amendments to supply topsoil as specified.

.3 Soil testing by recognized testing facility for PH, P and K, and organic matter.

.4 Testing of topsoil will be carried out by testing laboratory designated by the Departmental Representative /Consultant.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

Part 3 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 or 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.

3.2 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as directed by the Departmental Representative /Consultant after area has been cleared of brush, weeds, and grasses and removed from site.

.2 Strip topsoil to depths as directed by the Departmental Representative /Consultant.

.1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Stockpile in locations as directed by the Departmental Representative /Consultant.

.1 Stockpile height not to exceed 2 m.

.4 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify the Departmental Representative /Consultant and do not commence work until instructed by the Departmental Representative /Consultant.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by the Departmental Representative /Consultant.

.1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.5 ACCEPTANCE

.1 The Departmental Representative /Consultant will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.6 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required off site where directed by the Departmental Representative /Consultant.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 MEASUREMENT AND PAYMENT

.1 Payment for sodding will be made on a Lump Sum price bid.

1.3 REFERENCES

.1 N.A.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 19 - Project Meetings.

1.5 ACTION AND INFORMATIONAL 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 sod, geotextile and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

.3 Samples.

.1 Submit:

.1 Sod for each type specified.

.1 Install approved samples in1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.

.2 Bio-degradable geotextile fabric.

.3 0.5 kg container of each type of fertilizer used.

.2 Obtain approval of samples by the Departmental Representative /Consultant.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

.5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Contractor: to be a Member in Good Standing of Ontario Horticultural Trades Association.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 in accordance with supplier's recommendations.

.2 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.

.1 Turf Grass Nursery Sod types:

.1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass,

containing not less than 50% Kentucky Bluegrass cultivars.

.2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.

.3 Number One Named Cultivars: Nursery Sod grown from certified seed.

.2 Turf Grass Nursery Sod quality:

.1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.

.2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.

.3 Mowing height limit: 35 to 65 mm.

.4 Soil portion of sod: 6 to 15 mm in thickness.

.2 Commercial Grade Turf Grass Nursery:

.1 Mow sod at height directed by the Departmental Representative /Consultant within 36 hours prior to lifting, and remove clippings.

.2 Not more than 5 broadleaf weeds and up to 20% native grasses per 40 square metres.

.3 Sod establishment support:

.1 Geotextile fabric: biodegradable.

.2 Wooden pegs: 17 x 8 x 200 mm.

.3 Biodegradable starch pegs: 17 x 8 x 200 mm.

.4 Water:

.1 Supplied by the Departmental Representative /Consultant at designated source.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and Fertilizers Regulations.

.2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL

.1 Obtain written approval from the Departmental Representative /Consultant of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from the Departmental Representative /Consultant.

Part 3 Execution

3.1 INSTALLERS

.1 Use installers who are Member in Good Standing of Ontario Horticultural Trades Association.

3.2 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sod installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.3 PREPARATION

.1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify the Departmental Representative /Consultant and commence work when instructed by the Departmental Representative /Consultant.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Fine grade surface free of humps and hollows to smooth, even grade, to contours elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod plus or minus 15 mm for Commercial Grade Turf Grass Nursery, surface to drain naturally.

.4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site in location as directed by the Departmental Representative /Consultant in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

3.4 SOD PLACEMENT

.1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.

.2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.4 Roll sod as directed by the Departmental Representative /Consultant. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.5 SOD PLACEMENT ON SLOPES AND PEGGING

.1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.

.2 Start laying sod at bottom of slopes.

.3 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:

.1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.

.2 Not less than 3-6 pegs per square metre.

.3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by the Departmental Representative /Consultant.

.4 Drive pegs to 20 mm above soil surface of sod sections.

3.6 FERTILIZING PROGRAM

.1 Fertilize on a weekly basis during establishment and warranty periods.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.1 Clean and reinstate areas affected by Work.

.3 Waste Management: separate waste materials for reuse compost recycling 01 74 21 - Construction/Demolition Waste Management and Disposal in accordance with Section .

.1 Remove recycling and compost containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION BARRIERS

.1 Protect newly sodded areas from deterioration with snow fence on rigid frame as directed by the Departmental Representative /Consultant.

.2 Remove protection 2 weeks after installation after inspection as directed by the Departmental Representative /Consultant.

3.9 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.

.3 Maintain sodded areas weed free 95%.

.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.10 ACCEPTANCE

.1 Turf Grass Nursery Sod areas will be accepted by the Departmental Representative /Consultant provided that:

.1 Sodded areas are properly established.

.2 Sod is free of bare and dead spots.

.3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.

.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.2 Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by the Departmental Representative /Consultant provided that:

.1 Sodded areas are properly established.

.2 Extent of surface soil visible when grass has been cut to height of 60 mm is acceptable.

.3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.

.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.5 Fertilizing in accordance with fertilizer program has been carried out at least once.

.3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

.4 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

.5 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.11 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Water sodded Turf Grass Nursery Sod, Commercial Grade areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and re-sod dead or bare spots to satisfaction of the Departmental Representative /Consultant.

.3 Cut grass and remove clippings that will smother grass as directed by the Departmental Representative /Consultant to height as follows:

.1 Turf Grass Nursery Sod:

.1 50 mm during normal growing conditions.

.2 Commercial Grade Turf Grass Nursery Sod:

.1 60 mm during normal growing conditions.

.3 Cut grass at 1 week intervals, but at intervals so that approximately one third of growth is removed in single cut.

.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Eliminate weeds by mechanical means to extent acceptable to the Departmental Representative /Consultant.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D698-07e1, 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-34.22-94, Asbestos-Cement Drain Pipe.

.3 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA B1800-11, Thermoplastic Non-Pressure Pipe Compendium (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8, B182.11 and B182.13).

.1 CSA B182.2-11, PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings.

.3 CAN/CSA-G401-07, Corrugated Steel Pipe Products.

1.3 ACTION AND INFORMATIONAL 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 drainage material and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect drainage material from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 SITE CONDITIONS

.1 Examine existing sub-surface investigation.

.2 Known underground utility lines and buried objects are as indicated on plans.

Part 2 PRODUCTS

2.1 BEDDING AND SURROUND MATERIALS

.1 Coarse filter aggregate: to in accordance with Section 31 05 16 - Aggregate Materials CSA A23.1/A23.2, Group 1 20-5 mm.

.2 Fine filter aggregate: to CSA A23.1/A23.2 in accordance with Section 31 05 16 - Aggregate Materials.

.3 Flexible plastic tubing and fittings: corrugated perforated non-perforated nominal inside diameter 75 100 150 mm.

2.2 BACKFILL MATERIAL

.1 Type 2, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling as indicated.

.2 Excavated or graded material existing on site may be suitable to use if approved by the Departmental Representative /Consultant.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for drainage materials installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

.2 Make sure graded subgrade, sub-base, and base conforms with required drainage pattern before placing bedding material.

.3 Make sure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of the Departmental Representative /Consultant.

.4 Make sure foundation wall and dampproofing, waterproofing, and rigid insulation have been installed and approved by the Departmental Representative /Consultant before placing bedding material.

3.2 BEDDING PREPARATION

.1 Cut trenches in subgrade, base, and sub-base and place bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.2 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe tubing.

.3 Shape transverse depressions, as required, to suit joints.

.4 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.

.5 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.

3.3 PIPE OR TUBING INSTALLATION

.1 Make sure pipe interior and coupling surfaces are clean before laying.

.2 Lay perforated pipe level minimum as indicated. For pipe face perforations and coupling slots downward.

.3 Grade bedding to establish pipe tubing slope.

.4 Connect non-perforated pipe to sump pit by appropriate adapters manufactured for this purpose.

.5 Provide cleanouts on non-perforated pipe tubing at changes of pipe tubing direction and in runs greater than 15 m.

.6 Provide flush cleanouts where directed by the Departmental Representative /Consultant.

.7 Connect drainage system to building storm sewers, as indicated.

3.4 PIPE OR TUBING SURROUND MATERIAL

.1 Upon completion of pipe laying and after the Departmental Representative /Consultant has inspected and approved Work in place, surround and cover pipe and install geotextile filter as indicated.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness, as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe .

.4 Compact each layer from pipe invert to mid-height of pipe to at least 95% of corrected maximum dry density 95% maximum density to ASTM D698.

.5 Compact each layer from mid-height of pipe to underside of backfill to at least 90% maximum density to ASTM D698.

.6 Place low strength unshrinkable fill where compaction cannot be achieved using mechanical methods.

3.5 BACKFILL MATERIAL

.1 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.2 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698. In other areas, compact to at least 90% maximum density to ASTM D698.

.3 Use appropriate compaction equipment.

.1 Conduct hand tamping around confined areas of pipe.

.2 Do not use water or other hydraulic means to place or consolidate backfill material.

3.6 FOUNDATION

.1 Make penetrations through foundation structures only after receipt of written approval from the Departmental Representative /Consultant.

3.7 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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal .

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 N.A.

1.2 MEASUREMENT AND PAYMENT

.1 Excavation and backfill will be paid for on a Lump Sum basis.

1.3 REFERENCES

.1 ASTM International

.1 ASTM C4-04(2009), Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile.

.2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM C444M-03(2009), Standard Specification for Perforated Concrete Pipe Metric.

.4 ASTM C654M-05a, Standard Specification for Porous Concrete Pipe Metric.

.5 ASTM D698-10, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3(600 kN-m/m^3)).

.2 Bureau de normalisation du Québec (BNQ)

.1 BNQ 3624-115-04, Polyethylene (PE) Pipe and Fittings-Flexible Corrugated Pipes for Drainage-Characteristics and Test Methods.

.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.

.4 CSA International

.1 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium.

.2 CAN/CSA-G401-07, Corrugated Steel Pipe Products.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Inform the Departmental Representative /Consultant of proposed source of bedding and filter materials and provide access for sampling at least 4 weeks prior to commencing work.

1.5 ACTION AND INFORMATIONAL 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 pipes, pipe fittings, tiles, and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit for testing, following samples of materials proposed for use.

.4 Certificates:

.1 Submit manufacturer's certification that drain pipe materials meet requirements of this Section.

.2 Certification to be marked on pipe.

.5 Test and Evaluation Reports:

.1 Submit manufacturer's test data that drain pipe materials meet requirements of this Section.

.6 Sustainable Design Submittals:

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005 authorities having jurisdiction.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 in accordance with manufacturer's recommendations.

.2 Store and protect pipes and tiles from damage.

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Plastic pipe and fittings: to BNQ 3624-115, nominal inside diameter 100 mm.

.2 Perforated plastic pipe and fittings: to CAN/CSA-B1800. Nominal pipe sizes 75 100 150 200 250 300 mm.

.3 Bedding gravel or crushed stone; hard, durable particles, graded evenly in size from 16 to 8 mm.

.4 Granular filter material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Screened stone or gravel.

.2 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.5 Table:

Sieve Designation	% Passing
200 mm	-
75 mm	-
50 mm	-
38.1 mm	-
25 mm	-
19 mm	-
12.5 mm	100
9.5 mm	-
4.75 mm	70-100
2.00 mm	60- 95
0.425 mm	15- 40
0.180 mm	0- 10
0.075 mm	-

.6 Geotextile filter: In accordance with Section 31 32 19.01 - Geotextiles.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sub-drainage piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Departmental Representative /Consultant.

.2 Inform the Departmental Representative /Consultant 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 the Departmental Representative /Consultant.

3.2 PREPARATION

.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 or 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.

3.3 TRENCHING

.1 Do excavating/trenching and backfilling in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Place bedding/filter material after approval of excavation/trench by the Departmental Representative /Consultant.

3.4 BEDDING

.1 Place 100 mm layer of bedding filter material to full trench width as indicated and compact to minimum 95% of corrected maximum dry density maximum density to ASTM D698.

3.5 INSTALLATION OF PIPE SUB-DRAINS

.1 Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with bed throughout full length.

.2 Begin laying at outlet and proceed in upstream direction.

.3 Lay perforated pipes with perforations downwards at 4 o'clock and 8 o'clock positions.

.4 Lay bell and spigot pipe with bell ends facing upstream.

.1 Do not mortar joints.

.5 Make joints tight in accordance with manufacturer's instructions.

.6 Make watertight connections to existing drains, new or existing manholes and catch basins where indicated or as directed by the Departmental Representative /Consultant.

.7 Plug open upstream ends of pipes with watertight concrete, steel or wood bulkheads.

.8 Surround pipe with bedding gravel and compact as directed by the Departmental Representative /Consultant.

.9 Surround and cover drain with filter material in uniform 150 mm layers as indicated to an elevation of at least 150 mm above top of drain and compact to at least 95% of corrected maximum dry density 95% maximum density to ASTM D698.

.10 Wrap or sleeve perforated pipe with geotextile filter as indicated.

.11 Do not place bedding surround and backfill materials in frozen condition.

.12 Protect sub-drains against flotation during installation.

.13 Install "Y" connections to surface as indicated, for flushing.

.14 Seal top surface of backfilled excavation with asphalt seal in accordance with Section 33 46 16.01 - Sub-drain Backfill Sealing with Asphalt.

3.6 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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Appendix A

Abbreviations

1. Usage of Abbreviations

1.1 Many words or expressions that are repeated frequently on the drawings are abbreviated to reduce the amount of wording that might obscure the detailing. To avoid misinterpretation, these abbreviations are listed, with their full meaning, in this Section.

1.2 In addition to those noted in Article 2, some other abbreviations, commonly used in Specifications, are separately listed, in Article 4. Refer also to electrical drawings and specifications for other abbreviations used in electrical documents.

1.3 Abbreviations not listed here may be used in Room and Door Schedules, and technical Sections of the specifications and are defined in the Schedules and specification sections where they are used.

2. List of Architectural Drawing Abbreviations

A

ABV	Above	ADH	Adhesive
AFF	Above Finished Floor	ADJ	Adjustable
ACCT CLR	Accent Colour	AGG	Aggregate
AC	Acoustic	A/C	Air Conditioner
ACU	Acoustic Ceiling Unit	AVB	Air Vapour Barrier
AC MET D	Acoustic Metal Deck	AL or ALUM	Aluminum
ACP	Acoustic Panels	AB	Anchor Bolt
AC PLAS	Acoustic Plaster	AN or ANOD	Anodized
ACT	Acoustic Tile	ARCH	Architectural
AWU	Acoustic Wall Unit	AD	Area Drain
AWP	Acoustic Wall Panel	ASPH	Asphalt
ACL	Acrylic Cube Louvre	ADJ	Adjustable

B

BE	Baked Enamel	BH	Bore Hole
B	Base	BOT	Bottom
BSMT	Basement	BL	Bottom Layer
B PL	Base Plate	BR	Brick
BM	Beam	BLDG	Building
BRG	Bearing	BU	Built-up
BLK	Block	BUR	Built-Up Roof
BLKG	Blocking	BH or BLKHD	Bulkhead
BD	Board		

C

CAB	Cabinet	CLG	Ceiling
CANT	Cantilever	CEM	Cement
CPT	Carpet	CEM BD	Cement Board
CPT T	Carpet Tile	CTR	Centre
CI	Cast Iron	C/L	Centre Line
CGL	Cast Glass	CC	Centre to Centre
CB	Catch Basin	CT	Ceramic Tile

C (cont.'d)

CMT	Ceramic Mosaic Tile	CONC BL	Concrete Block
CF	Chair Fabric	CONC/H	Concrete with Hardener
CHAN	Channel	CONC/S	Concrete with Sealer
CHK	Checkered	CS	Concrete Sealed
CH PL	Checker Plate	CE	Conductive Epoxy
CO	Cleanout	COND	Conduit
CLR	Clear	CONN	Connect or Connection
CLOS	Closet	CONST	Construction
COFF	Coffered	CONT	Control or Continuous
CRC	Cold Rolled Channel	CJ or CJT	Control Joint
CW	Cold Water	CONV	Convector
COL	Column	CK	Cork
COMPL	Complete	CG	Corner Guard
C/W	Complete With	CB	Cove Base
CONC	Concrete	CWP	Crystalline Waterproofing

D

DP	Dampproofing	DIV	Division
DL	Dead Load	DR	Door
DGL	Decorative Glass	DWL	Dowel
D or DP	Deep	DS	Downspout
DMNT or D	Demountable	DRP	Drapery
DET	Detail	DWG	Drawing
DIA	Diameter	DF	Drinking Fountain
DIM	Dimension	DD	Dutch Door
DO	Ditto	DGL	Decorative Glass

E

EA	Each	EP	Epoxy
EE	Each End	EP TER	Epoxy Terrazzo
EF	Each Face	EQUIP	Equipment
EW	Each Way	ESO	Owner Supplied Equipment
ELEC	Electrical	EXH	Exhaust
EP	Electrical Panel	EXIST	Existing
EL or ELEV	Elevation	EM	Expanded Metal
ELEV	Elevator	EXP JT or EJ	Expansion Joint
EMERG	Emergency	EXP	Exposed
ENCL	Enclosure	EXP STR	Exposed Structure
EQ	Equal	EXT	Exterior

F

FEAT W	Feature Wall	FA	Fire Alarm
FAP	Fibre Acoustic Panel	FE or FEXT	Fire Extinguisher
FBRGL	Fibreglass	FH	Fire Hose
FLD	Field	FHC	Fire Hose Cabinet
FIN	Finish or Finished	FHR	Fire Hose Rack

F (cont.'d)

FPRG	Fireproofing	FL	Floor
FRR	Fire-resistance Rating	FD	Floor Drain
FLUOR	Fluorescent	FDN	Foundation
FTG	Footing	FR	Frame
FGL	Float Glass	FUT	Future
FF	Force Flow Heater		

G

GALV	Galvanized	GRAN	Granite
GA	Gauge	GRAN T	Granite Tile
GWG	Georgian Wired Glass	GF	Ground Floor
GL	Glass	GB or GBD	Gypsum Board
GL BLK	Glass Block	GPC	Gypsum-Plaster Ceiling
GR	Grade	GPW	Gypsum-Plaster Wall

H

HDW	Hardware	HOR EF	Horizontal Each Face
HDWD	Hardwood	HB	Hose Bibb
HTR	Heater	HW	Hot Water
HT or HGT	Height	HYD	Hydrant
H	Hollow	HP	Hydro Pole
HC	Hollow Core		
HC WD	Hollow Core Wood Door		
HM	Hollow Metal		
HOR	Horizontal		

I

ID	Inside Diameter	INV	Invert
INS or INSUL	Insulation or Insulated		
INT	Interior		

J

J or JAN	Janitor
JT	Joint

K

KPL	Kickplate	KD	Knockdown
kN	Kilonewton	KO	Knockout

\

L

LAM	Laminate	LP	Lighting Panel
LDG	Landing	LWB	Light Weight Block
LAT	Lateral	LIN	Linoleum
LAV	Lavatory	LL	Live Load
LAP	Lay-in Acoustic Panel	LG	Long

M

MH	Manhole	MCL	Metal Cubic Louvre
MR	Marble	MET DK	Metal Deck
MACH	Machine	METF	Metal Flashing
MFR	Manufacturer	MET GRTG	Metal Grating
MAS	Masonry	MET GR CLG	Metal Grid Ceiling
MAS FL	Masonry Flashing	MLP	Metal Lath and Plaster
MO	Masonry Opening	MET LIN CLG	Metal Linear Ceiling
MAX	Maximum	MT	Metal Threshold
MECH	Mechanical	MET T PTN	Metal Toilet Partition
MPa	Megapascal	MIN	Minimum
MWP	Membrane Waterproofing	MTD	Mounted
MET	Metal		

N

NF	Near Face	NTS	Not to Scale
NRC	Noise Reduction Coefficient		
NIC	Not in Contract		

O

OGL	Obscure Glass	OPP	Opposite
OC	On Centre	OD	Outside Diameter
OWSJ	Open-Web Steel Joist	OA	Overall
OPNG	Opening	O/H	Overhead
OPR	Operator		

P

PT	Paint or Patterned	PL	Plaster or Plate
PTD	Painted	PLYWD	Plywood
PR	Pair	PVC	Polyvinyl Chloride
PNL	Panel	PCT	Porcelain Ceramic Tile
PF	Panel Fabric	P or PREC	Precast
PARG	Parging	P CON	Precast Concrete
PTN	Partition	PREFAB	Prefabricated
P ACS FLG	Pedestal Access Flooring	PREF	Prefinished
PER	Perimeter	PRFL	Profile
PL or PLAS	Plaster	PROP L	Property Line
PLAM	Plastic Laminate	PA	Public Address

Q

QT	Quarry Tile

R

R	Radius or Resilient	RSF	Resilient Sheet Flooring
RWL	Rainwater Leader	RA	Return Air
REC	Recessed	REV	Revised or Revision
RECEPT	Receptacle	RM	Room
REINF	Reinforced / Reinforcing	RSD	Rolling Steel Door

R (cont.'d)

RCB	Reinforced Cement Board	RO	Rough Opening
RCONC	Reinforced Concrete	RFT	Rubber Floor Tile
REQD	Required	RSF	Rubber Sheet Flooring
REQT	Requirement	RST	Rubber Stair Treads
RB	Resilient Base	R TERR	Rustic Terrazzo
RD	Roof Drain		

S

SAN	Sanitary	SFPRG	Sprayed Fireproofing
SND	Sanitary Napkin Dispenser	SQ	Square
SNR	Sanitary Napkin Receptacle	ST	Stain
SAN SEW	Sanitary Sewer	S&U	Stain and Urethane
SCHED	Schedule	S&V	Stain and Varnish
SCRN	Screen	SS or ST STL	Stainless Steel
SECT	Section	STD	Standard
SVC	Sheet Vinyl Cove	SPD	Standard Proctor Density
SV	Sheet Vinyl Flooring	STL	Steel
SIM	Similar	STL BM	Steel Beam
SL	Sliding	STL FL DK	Steel Floor Deck
SB	Smart Board	STL PL	Steel Plate
SS	Janitor Slop Sink	STN	Stone
SC WD	Solid Core Wood Door	ST SEW	Storm Sewer
STC	Sound Transmission Class	STR	Structure or Structural
SC	Special Coating	SVT	Solid Vinyl Tile
SPEC	Specification	SUSP	Suspended
SF	Sports Flooring	SWBD	Switchboard
SPR	Spray or Sprayed		

T

TEL	Telephone	THR	Threshold
TP	Telephone Panel	T	Top
TMPD	Tempered	T & G	Tongue and Grooved
TCGL	Tempered Cast Glass	T&B	Top and Bottom
TGL	Tempered Glass	TOPG	Topping
TRR	Temperature Rise Rating	TDD	Towel Dispenser Unit
TERR	Terrazzo	TRGL	Translucent Glass
TER T	Terrazzo Tile	TRANSV	Transverse
TEX	Textured	T	Tread
TSAT	Thermostat	TYP	Typical
TH	Thick or Thickness		

U

UCUT	Undercut	UP or U/P	Unpainted
UGRD	Underground	U	Urethane
U/S	Underside	UR	Urinal
U/F	Unfinished		
UNS	Unless Noted Otherwise		

V

V	Varnish	VEST	Vestibule
VB	Vapour Barrier	VCF	Vinyl Coated Fabric
VENT	Ventilated or Ventilation	VCT	Vinyl Composition Tile
VERT	Vertical	VPF	Vinyl Plank Flooring
VERT B	Vertical Blinds	VT	Vinyl Tile
VERT EF	Vertical Each Face	VWF	Vinyl Wall Fabric

W

WH	Wall Hydrant	WPG	Wired Plate Glass
WR or WRM	Washroom	W/	With
WP	Waterproof or Waterproofing	WD	Wood
WT	Weight	WD BK	Wood Blocking
WCGL	Wired Cast Glass	WDV	Wood Veneer

3. List of Structural Drawing Abbreviations

B	Bottom	REINF	Reinforcement
BM	Beam	RC	Reinforced Concrete
BL.	Bottom Lower Layer		
BUL	Bottom Upper Layer	SECT	Section
		STIRS	Stirrups
CANT	Cantilever	SW	Short Way
COL	Column		
CONC	Concrete	T	Top
		T&B	Top and Bottom
-DO-	Ditto	TLL	Top Lower Layer
DP	Deep	TUL	Top Upper Layer
DWLS	Dowels	T&S	Temperature & Shrinkage Steel
DIAG	Diagonal		
		V	Vertical
EW	Each Way	VEF	Vertical Each Face
		VOF	Vertical Outside Face
H	Horizontal		
HEF	Horizontal Each Face	WCol	Wind Column
HOF	Horizontal Outside Face	WWF	Welded Wire Fabric
L	Long		
LW	Long Way		

4. List of Specification Abbreviations

ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
CAN	Standards Council of Canada
CCDC	Canadian Construction Documents Committee
CEC	Canadian Electrical Code (published by CSA)

CEMA	Canadian Electrical Manufacturer's Association
CGSB	Canadian Government Standards Board
CISC	Canadian Institute of Steel Construction
CSA	Canadian Standards Association
DND	Department of National Defence
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
NAAMM	National Association of Architectural Metal Manufacturers
NBC	National Building Code
NEMA	National Electrical Manufacturer's Association
NRC	National Research Council
OBC	Ontario Building Code
OGCA	Ontario General Contractors Association
OPSS	Ontario Provincial Standard Specifications
ULC	Underwriters' Laboratories of Canada

Conform to these standards, in whole or in part, as specifically requested in the specifications.

* * *

END OF SECTION

Appendix B

Designated Substance Survey
2012

AECOM

Parks Canada Agency – Designated Substance Survey, Sault Canal Superintendent's Residential Building

Report

Environment AECOM

Parks Canada Agency – Designated Substance Survey, Sault Canal Superintendent's Residential Building

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60273267

Date:

September 2012

Statement of Qualifications and Limitations

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September 5, 2012

Mr. Jey Pillai, Project Manager
Parks Canada Agency
1 Canal Drive
Sault Ste. Marie, Ontario P6A 6W4

Project #: **60273267**
Regarding: **Parks Canada Agency Solicitation #10120364**
Sault Canal Superintendent's Residential Building
Designated Substance Survey

Dear Sir,

In response to your Request for Proposal (RFP) #10120364,, please find enclosed one draft copy of AECOM's Report entitled "Parks Canada Agency –Designated Substance Survey" completed for the Sault Canal Superintendent's Residential Building.

Should you have questions, concerns or wish to discuss, please contact the undersigned at your convenience.

Sincerely,
AECOM Canada Ltd.

Colin C Liddiard, C.E.T.
Environmental Coordinator
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Distribution List

# of Hard Copies	PDF Required	Association / Company Name
3	Yes	Parks Canada Agency
	Yes	AECOM – Mr. Keir Thomas

Revision Log

Revision #	Revised By	Date	Issue / Revision Description

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Executive Summary

AECOM Canada Ltd. (AECOM) was retained by the Parks Canada Agency (PCA) to complete a designated substance survey (DS Survey), for the structure known as the Sault Canal Superintendent's Residential Building, located at civic address 1 Canal Drive in the City of Sault Ste. Marie, Ontario, (herein referred to as the 'Site').

The terms of reference for this project are based on PCA's Request for Proposal (RFP) #10120364, and AECOM's proposal No. 4045.44482.005, dated July 16th, 2012. Authorization to proceed was subsequently acknowledged by an Award Letter dated July 20th, 2012, from PCA.

The objective of this DS Survey is to provide a summary of substances that require removal and/or management at the Site, in order to protect occupants of the structure and achieve compliance with applicable regulations. The DS Survey included the collection of building material samples suspected of containing asbestos fibres, paint samples to determine the presence or absence of lead and polychlorinated biphenyls (PCBs).

Furthermore, the Site was investigated for the potential presence of the 11 designated substances defined in Ontario Regulation 490/09 – *Designated Substances* (O. Reg. 490/09) and four potentially hazardous materials, being: PCBs, Ozone Depleting Substances (ODS), mould, and Naturally Occurring Radioactive Materials (NORMs).

Based on AECOM's DS Survey, the following designated substances and potentially hazardous materials were identified within the Site's Structure:

- Three different types of sheet vinyl flooring materials have been identified as an asbestos containing material (ACM).
- Four different surface coatings are considered as lead-based paints.
- Fluorescent lamps, compact fluorescent lamps and thermostats containing mercury were identified in the Site building.
- Some painted surface materials contain PCBs.
- Potentially PCB containing fluorescent lamp ballasts.
- Numerous refrigerating devices that may contain the R-22 refrigerant, a Class 2 Ozone depleting substance.

Table of Contents

Statement of Qualifications and Limitations
Letter of Transmittal
Distribution List
Executive Summary

page

1. Introduction 1
1.1 Terms of Reference 1
1.2 Objective 1
1.3 Applicable Regulations and Guidelines 1
1.4 Site Description 2
1.5 Scope of Work 2
1.6 Safety, Health and the Environment. 3
1.7 Survey and Reporting Limitations 3

2. Methodology 4
2.1 Asbestos Survey and Assessment 4
2.2 Lead Survey 4
2.3 Other Designated Substances and Hazardous Materials 4

3. Designated Substances Survey 5
3.1 Acrylonitrile 5
3.2 Arsenic 5
3.3 Asbestos 5
3.3.1 Asbestos – Details of Findings, Removal, Management and Disposal 6
3.3.1.1 Plaster Wall and Ceiling Materials 6
3.3.1.1 Vermiculite Insulation 6
3.3.1.2 Vinyl Floor Tiles and Mastics 6
3.3.1.3 Sheet Vinyl Flooring Materials 6
3.3.1.4 Textured Finishes 7
3.3.1.5 Transportation and Disposal of ACM 7
3.4 Benzene 7
3.5 Coke Oven Emissions 7
3.6 Ethylene Oxide 8
3.7 Isocyanates 8
3.8 Lead 8
3.8.1 Lead Based Paint Sampling Summary 9
3.8.2 Lead Gasket and Pipe Summary 9
3.8.3 Lead – Removal Management and Disposal 9
3.9 Mercury 10
3.9.1 Fluorescent Lamps and Tubes 10
3.9.2 High Intensity Discharge Lamps 10
3.9.3 Compact Fluorescent Lamps 11
3.9.4 Thermostats 11
3.9.5 Mercury – Removal Management and Disposal 11
3.10 Silica Containing Materials 11
3.10.1 Silica Containing Materials – Removal Management and Disposal 12
3.11 Vinyl Chloride 12

4. Hazardous Materials Survey 12
4.1 Mould 12
4.2 Ozone Depleting Substances 13
4.2.1 ODSs – Removal, Management and Disposal 13
4.3 Polychlorinated Biphenyls 13
4.3.1 Fluorescent Light Fixtures 14
4.3.2 PCB in Paints 14
4.3.3 PCBs – Removal Management and Disposal 14
4.1 Naturally Occurring Radioactive Materials (NORMs) 15

List of Tables

Table A. Summary of Sheet Vinyl Flooring Materials Containing Asbestos
Table B. Summary of Lead-Based Paints

Table 1. Potential ACM Sampling Summary – Room by Room Database
Table 2. Summary of Lead and PCB Sampling Analysis
Table 3. Fluorescent Lamps (Mercury Vapour & PCB Ballasts) & Mercury Switches Summary – Room by Room Database

Figures

Figure 1: Location of Site
Figure 2: Location of Building

Appendices

Appendix A. IATL's Analytical Report
Appendix B. Testmark Laboratories Analytical Reports

Glossary

ACM	Asbestos-Containing Materials
AMP	Asbestos Management Plan
CCA	Canadian Construction Association
CFL	Compact Fluorescent Lamps
EPA	Environmental Protection Agency
HID	High Intensity Discharge Lamps
DS Survey	Designated Substance Survey
MOE	Ministry of the Environment
NORM	Naturally Occurring Radioactive Material
ODS	Ozone Depleting Substance
OHSA	Occupational Health and Safety Act
O. Reg.	Ontario Regulation
PCB	Polychlorinated Biphenyl
ppm	parts per million
PVC	polyvinyl chloride

1. Introduction

1.1 Terms of Reference

AECOM Canada Ltd. (AECOM) was retained by the Parks Canada Agency (PCA) to complete a designated substance survey (DS Survey), for the structure known as the Sault Canal Superintendent's Residential Building, located at civic address 1 Canal Drive in the City of Sault Ste. Marie, Ontario, (herein referred to as the 'Site').

The terms of reference for this project are based on PCA's Request for Proposal (RFP) #10120364, and AECOM's proposal No. 4045.44482.005, dated July 16th, 2012. Authorization to proceed was subsequently acknowledged by an Award Letter dated July 20th, 2012, from PCA.

1.2 Objective

The objective of this DS Survey is to provide a summary of substances that require removal and/or management at the Site, in order to protect occupants of the structure and achieve compliance with applicable regulations. The DS Survey included the collection of building material samples suspected of containing asbestos fibres and paint samples to determine the presence or absence of lead and polychlorinated biphenyls (PCB)s.

Furthermore, the Site was investigated for the potential presence of the 11 designated substances defined in Ontario Regulation 490/09 – *Designated Substances* (O. Reg. 490/09):

- Acrylonitrile
- Ethylene Oxide
- Arsenic
- Lead
- Benzene
- Silica
- Asbestos
- Mercury
- Isocyanates
- Coke Oven Emissions
- Vinyl Chloride

The following potentially hazardous materials were also investigated:

- PCBs
- Radioactive Materials (NORMs)
- Mould
- Ozone Depleting Substances (ODS)

1.3 Applicable Regulations and Guidelines

The DS Survey was completed to address the following applicable regulatory requirements and guidelines for the management of designated substances and hazardous materials;

- Ontario *Occupational Health and Safety Act* (OHSA) – R.S.O. 1990, as amended, including:
  - Designated Substances – O. Reg. 490/09, as amended;
  - Designated Substances – Asbestos on Construction Projects and in Buildings and Repair Operations – O. Reg. 278/05
- *Ontario Environmental Protection Act* – R.S.O. 1990, as amended, including:
  - General – Waste Management R.R.O. 1990, O. Reg. 347, as amended
  - Ozone Depleting Substances and Other Halocarbons – O. Reg. 463/10, as amended

- Waste Management – PCBs, Regulation 362, as amended
- Ministry of Labour Guidelines *"Lead on Construction Projects"*, dated September 2004
- Ministry of Labour Guidelines *"Silica on Construction Projects"*, dated September 2004
- Environment Canada Document *"PCB Identification of Lamp Ballasts Containing PCBs"*, dated August 1991
- Canadian Construction Association (CCA), Standard Construction Document 82-2004, "*Mould Guidelines for the Canadian Construction Industry"*, dated 2004
- Environmental Abatement Council of Ontario *"Mould Abatement Guidelines"*, 2nd Edition, dated 2010

1.4 Site Description

The Site is located in the City of Sault Ste. Marie Ontario, south of Canal Drive and north of Great Lakes Power Generation Station, and is located at Universal Transverse Mercator (UTM) co-ordinates 515 4547 north and 702 884 west. Refer to **Figure 1** attached for the Site location.

The Sault Canal Superintendent's Residential Building was constructed in the late 1800s, includes three levels plus a basement, covering a footprint of approximate 1,940 square feet. The facility includes an area for public gatherings, offices, storage and historic display area. Refer to **Figure 2** attached of the Site plan.

1.5 Scope of Work

The DS Survey included limited intrusive investigations for sampling of potential asbestos containing materials (ACM) and lead, and identification of PCB ballasts.

Based on the scope of work (SOW), and in order to satisfy the objectives for the management, transportation and disposal of designated substances associated with the Site, the SOW included:

1) Review of all existing and available records, drawings and reports previously completed for the Site, to develop a work plan to conduct the DS Survey.

2) A survey of the facility infrastructure to identify and quantify potential ACM. The survey was limited intrusive in nature, and limited to safe accessible areas. Inspection holes advanced into concrete block wall cavities were sealed with plaster/parging materials, and holes advanced into wood, drywall or plaster walls/ceiling or sampling of plaster or drywall joint compound were sealed with drywall joint compound. Sampling areas of pipe insulation materials were sealed with Tuck® Tape. Sampling locations were not re-painted. Suspect ACM samples not identified in previous reports were collected in accordance with O. Reg. 278/05 Table 1, and samples were relinquished to an accredited laboratory for analysis in accordance with methods prescribed by the Ontario Ministry of Labour Regulation 278/05 (EPA – Method for the Determination of Asbestos in Bulk Building Materials. June 1993).

3) A limited intrusive inspection of coating materials to identify suspect lead paint materials. Lead in paint was primarily used up until the late 1970s to increase the glossiness of the painted surface. Therefore, the selection of coatings for sampling was based on inspections for old and glossy surfaces. In addition, at the request of DCC, paint samples were also tested for PCBs. Samples were collected, and relinquished to an accredited laboratory for analyses.

4) An inspection of existing newer florescent fixtures to confirm replacement of older T12 units, and older T12 units for inspection to review the potential of PCB containing ballasts.

5) A survey of the building infrastructure to identify and quantify any other designated substances and/or any potential hazardous materials of concern.

6) A report to summarize, identify and quantify the location and extent of ACM, and lead containing materials, including operating procedures for the proper management of hazardous materials and designated substances

1.6 Safety, Health and the Environment.

Prior to commencing the field component of this DS Survey, AECOM reviewed the safety, health and environmental concerns of the Site, and evaluated the potential risks to workers involved with completing the work tasks, as well as any hazards to the public or the environment. At the time the field work began, AECOM identified health concerns associated with exposure to asbestos fibres during the sampling process; therefore, AECOM implemented safe working practices that included the wearing of a full-face respirator equipped with P100 cartridges during the sampling period.

No other health and safety concerns were identified that would pose unsafe or hazardous working conditions. Safe work practices were implemented throughout the project, and no injuries to personnel or impairments to the environment were recorded.

1.7 Survey and Reporting Limitations

Unexpected environmental conditions may be encountered at the Site in locations not specifically observed or investigated as part of this work plan, including equipment, devices or supplies and products that are not directly associated with the building (i.e. chemicals used in the maintenance garage).

AECOM makes no other evaluations whatsoever, including those concerning the legal significance of designated substances. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with one's own legal counsel.

Laboratories used by AECOM are accredited under the U.S. National Voluntary Laboratory Accreditation Program (NVLAP) to ensure consistent, accurate and defendable results. Samples of potential ACM and lead in dust were relinquished under Chain of Custody to International Asbestos Testing Laboratories (IATL), which is certified under the American Industrial Hygiene Association (AIHA), European Union International Measurement Evaluation Programme, NVLAP through the National Institute for Standards and Technology (NIST) for Bulk Asbestos Fibre Analysis by Polarized Light Microscopy (PLM), and the National Lead Laboratory Accreditation Program (NLLAP). Samples of paint for analysis of lead, mercury, arsenic, chromium and PCBs were relinquished under Chain of Custody to Testmark Laboratories, which is certified under ISO/IEC 17025, and is a member of the Canadian Council of Independent Laboratories (CCIL), and the Canadian Association for Laboratory Accreditation Inc. (CALA).

The services performed and outlined for this project are based, in part, upon visual observations and laboratory analyses. AECOM cannot guarantee the absence of contaminants from the site, but rather identified the sampling results for the potentially hazardous materials and designated substances noted in the scope of services of the proposal, and, where appropriate, indicated that further sampling may be appropriate. Our opinion cannot be extended to portions of the Site that are unavailable for direct observations, reasonably beyond the control of AECOM. Investigations for the interior and exterior of the building were completed from a standard 6-foot ladder and therefore, AECOM did not access high-bay ceiling areas (e.g. via scissors lift). The results are based solely on the

samples taken at specific locations and therefore there is no guarantee or warrantee that other areas of the site are free of contaminants.

AECOM cannot guarantee the results or that every designated or hazardous substance at the site will be identified; however, AECOM applied professional industry standards to perform the services and accurately disclose the results. In addition, AECOM applied professional judgment and conformed to regulatory sampling requirement to determine the actual number and type of samples needed to reach a certain general confidence level based on the known information, including the review of previous reports.

2. Methodology

2.1 Asbestos Survey and Assessment

The review of the Site structure included a limited intrusive investigation in order to document the general composition of building materials and identify any potential ACMs. The survey did not include an assessment for the accessibility and risk of exposure to materials as required by an asbestos management plan.

The limited intrusive investigation means that where applicable, holes were advanced into wall and/or ceiling cavities for localized inspections to identify hidden building materials. ACM surveys generally include the assumption, accepted as industry standard practice that various building materials are known to contain asbestos fibres, and are not sampled if they cannot be accessed and sampled safely.

Bulk samples were collected from building materials suspected to contain asbestos fibres. Sufficient sample was collected for laboratory analytical requirements, which includes multi-layered building materials (plaster on plaster), for which each layer was analyzed separately. The laboratory was instructed to discontinue analysis (stop-positive) on some subsequent samples in the same series when asbestos was identified in one of the samples. Analysis of suspect ACMs was completed in accordance with Ontario Regulation 278/05, U.S. Environmental Protection Agency Test Method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials, June 1993.

2.2 Lead Survey

Surfaces suspected of being coated with old paint were inspected and random samples of old/glossy paints were collected for analysis of lead. Samples were relinquished to Testmark Laboratories for analysis of metals in accordance with the "Determination of Metals in Soils by ICP/MS and BCSALM Method", which is based on reference SW846-6020.

In addition, historically, joints and fittings on cast iron pipes used lead to seal the gasket and solid lead pipes were also used for drainage purposes; therefore, a visual investigation was completed to determine whether cast iron or solid lead drain pipes exist within the structure.

2.3 Other Designated Substances and Hazardous Materials

AECOM reviewed the physical Site structure to visually identify and quantify other designated substances including mercury, PCBs, vinyl chloride, benzene, arsenic, acrylonitrile, isocyanates, coke oven emissions, and/or ethylene oxide. In addition, at the request of PCA, samples of paint materials were analyzed for the presence of PCBs. Paint samples were relinquished to Testmark Laboratories for analysis of PCBs, in accordance with the

"Determination of Polychlorinated Biphenyls in Soils by GC/ECD Method", which is based on reference SW846-8080.

Furthermore devices that may contain ODSs, or being potentially radioactive, were quantified and building materials suspect of containing Urea Formaldehyde Foam Insulation (UFFI), silica or that appeared to support mould or bacteria growth were documented and reported.

3. Designated Substances Survey

3.1 Acrylonitrile

Acrylonitrile is a colorless flammable liquid with a sharp onion/garlic like odour and is generally used as a feedstock or chemical aid for the production of nitrile-butadiene rubber, acrylonitrile-butadiene-styrene and styrene-acrylonitrile polymers. In addition, acrylonitrile is used in the manufacturing of acrylic fibres, blankets, rugged plastics such as computer housings and oil-resistant hoses.

Health hazards associated with exposure to acrylonitrile are generally limited to skin, respiratory and severe eye irritation. Should human skin come in contact with this chemical, the skin will become red and blisters may forms.

Acrylonitrile is primarily released into the environment from the chemical and plastic production industries; therefore, the presence of significant quantities of acrylonitrile is unlikely at the Site.

3.2 Arsenic

Arsenic is a semi-metallic chemical that occurs naturally in the earth's crust in two forms. The stable form is a silver-grey, brittle crystalline solid that tarnishes rapidly in air and when exposed to high temperatures, evaporates into a white cloud of arsenic trioxide. The unstable form is a yellow solid crystal that when exposed to oxygen or hydrogen, generates a deadly poison.

Arsenic is used to manufacture hard, strong and corrosion resistant alloys. Arsenic compounds can also be found in pigments, animal poisons, insecticides, paints, wallpaper, ceramics and poisonous gases manufactured for military purposes. In addition, old preserved wood outdoor items may, depending on the age, be of concern for arsenic.

Health effects associated with exposure to arsenic include diaphoresis, muscle spasms, nausea, vomiting, abdominal pain, diarrhea, anuria, dehydration, cardiovascular collapse and death.

Based on AECOM's DS Survey, the presence of arsenic and/or materials containing significant quantities of arsenic in the Site is unlikely.

3.3 Asbestos

On July 26th 2012, AECOM completed an asbestos survey and identified numerous building materials suspected of containing asbestos fibres. Refer to **Table 1** 'Potential ACM Sampling Summary – Room by Room Database', and **Appendix A** for IATL Analytical Report. Based on AECOM's DS Survey, sheet vinyl flooring materials and mechanical components were identified as an asbestos containing materials (ACM) at the Site.

3.3.1 Asbestos – Details of Findings, Removal, Management and Disposal

3.3.1.1 Plaster Wall and Ceiling Materials

Plaster wall and ceiling materials were observed throughout the structure. During AECOM's survey, one set of seven plaster wall and ceiling materials were collected to conform to O. Reg. 278/05 Table 1. None of the plaster material samples analyzed revealed the presence of asbestos fibres.

3.3.1.1 Vermiculite Insulation

Vermiculite is a silver-gold to gray-brown mineral that is flat and shiny in its natural state. When heated to around 1000 °C, it pops (or puffs up) which creates pockets of air. This expanded form, and the fact that vermiculite does not burn, made the material suitable for use as insulation. Vermiculite itself has not been shown to be a health problem; however, some vermiculite insulation was mined from quarries that had natural deposits of asbestos and therefore became contaminated with asbestos fibres.

Vermiculite insulation was observed in the attic space and various wall cavities, was sampled, and no asbestos was detected. AECOM recognizes that there are limitations in the analytical method (EPA/600/R-93/116), and several other analytical methods have been developed to more accurately identify asbestos content, for which asbestos may be present and concentrations may exceed the 0.5% criterion. However, the fact that asbestos fibres were not identified in the sample, it is concluded that the vermiculite insulation was likely not mined from a quarry that had a natural deposit of asbestos.

Based on the review of laboratory analysis for the suspect sheet vinyl flooring material sample collected from the second floor bathroom for potential ACM, none of the sheet vinyl flooring material samples analyzed revealed the presence of asbestos fibres.

3.3.1.2 Vinyl Floor Tiles and Mastics

One type of vinyl floor tile was observed within the structure in second floor bathroom. AECOM collected one set (3 samples) of white vinyl floor tile. Asbestos was not detected in any of the three samples.

3.3.1.3 Sheet Vinyl Flooring Materials

Five different types of sheet vinyl flooring materials were observed throughout the structure; therefore, AECOM collected five sets (15 samples) of sheet vinyl flooring materials for analysis.

Three of the sheet vinyl flooring materials were found to contain asbestos fibres, summarized in Table A:

Table A. Summary of Sheet Vinyl Flooring Materials Containing Asbestos

Area	Samples collected by AECOM	Colour	Estimated area	Type of Asbestos	Asbestos content (%)
1st Floor Bathroom	PCSC-4A to 4C	Tan/Gold	6 m²	Chrysotile	25
2nd Floor Back Storage Room	PCSC-25A to 25C	Brown	13 m²	Chrysotile	5.2
3rd Floor Attic	PCSC-22A to 22C	Off-white	30 m²	Chrysotile	0.75

Sheet vinyl flooring materials were found to generally be in good condition. *Type 1 Operation* in accordance with O. Reg. 278/05 is required for the removal of non-friable sheet vinyl flooring materials if the vinyl tiles are installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated, or if breaking, cutting, drilling, abrading, grinding, sanding or vibrating vinyl tiles, the material is wetted to control the spread of dust or fibres, and

the work is done only by means of non-powered hand-held tools. Otherwise, removal the removal of non-friable vinyl floor tiles must be completed in accordance with *Type 2 or 3 Operation*.

3.3.1.4 *Textured Finishes*

One type of textured finish (pointing mortar) was observed to have been used to fill voids between exterior wall stone materials. AECOM collected one set (3 samples) of textured finish from the structure. Asbestos was not detected in any of the three samples.

3.3.1.5 *Transportation and Disposal of ACM*

Materials that are greater than 0.5% asbestos by dry weight are considered to be ACM. ACMs must be removed, disposed of and/or managed in accordance with O. Reg. 278/05. Furthermore, the MOE guideline documents listed below should be followed:

- *Guideline C-6 for the Handling, Transportation and Disposal of Asbestos Waste in Bulk*
- *Guideline C-10 for Removal Procedures at Site Containing Substantial Quantities of Asbestos Waste*

Asbestos is listed under Schedule 1 in the Transportation of Dangerous Goods (TDG) Act and consolidated to include *SOR/2011-60.* Transportation of asbestos waste materials must conform to the TDG regulation.

Asbestos waste materials can usually be accepted at non-hazardous waste management sites (municipal landfills); however, the site operator may have special requirements for the packaging of asbestos wastes, notification of delivery, special disposal locations and fees.

If requested, AECOM would be pleased to provide engineering support and/or an asbestos inspector to be present at the Site during the removal of ACMs in order to ensure that work is being conducted in accordance with O. Reg. 278/05, as amended.

3.4 Benzene

Benzene is a highly flammable clear liquid that evaporates very quickly, dissolves slightly into water and has a sweet odour. Benzene is used in industry primarily for the production of other chemicals used in the manufacturing of plastics, resins, nylon, synthetic fibres, rubbers, dyes, detergents, drugs and pesticides. Benzene is naturally occurring in crude oil gasoline and cigarette smoke.

Health effects associated with slight exposure to benzene include headache, nausea, dizziness, drowsiness, rapid heart rate, tremors, confusion and unconsciousness. Significant exposures to benzene can cause vomiting, convulsions and death.

Based on AECOM's DS Survey, the presence of benzene in the workplace is unlikely.

3.5 Coke Oven Emissions

Coke oven emissions are generated in the extraction of metals from ores and are generally associated with the manufacturing of iron and steel. The emissions are a complex mixture of coal, coke particles, various vapours, gases and tars, which include chemicals such as benzene, naphthylamine, cadmium, arsenic, beryllium and chromium.

Based on the information gathered for the Site, and AECOM's survey, presence of coke oven emissions is unlikely.

3.6 Ethylene Oxide

Above 10 degrees Celsius, ethylene oxide is an extremely flammable, colourless gas with a sweet odour. Below 10 degrees Celsius, it becomes a clear liquid. Slightly heavier than air, ethylene oxide gas may spread long distances and can decompose explosively. Cylinders containing compressed ethylene oxide may rupture violently if heated.

Ethylene oxide is produced in large volumes throughout the world and is generally used as a chemical intermediate for the manufacturing of textiles, detergents, polyurethane foams, antifreeze, solvents, medicinal products, adhesives, and is used as a fumigant in agricultural products, and sterilizing agents.

Ethylene oxide is very toxic and may be fatal if inhaled. Acute exposures to the chemical may result in respiratory irritation, lung injury, headaches, nausea, vomiting, diarrhea, shortness of breath and cyanosis. Chronic exposure has been associated with various cancers, reproductive effects, mutagenic changes and neurotoxicity.

Based on the information gathered for the Site, and AECOM's survey, the presence of ethylene oxide in large quantities, is unlikely

3.7 Isocyanates

Isocyanates are a group of low molecular weight aromatic and aliphatic compounds and are a raw material in the production of polyurethanes. They are widely used for the manufacturing of flexible/rigid foams, fibres, elastomers, and coatings such as paints and varnishes.

Health effects generally associated with isocyanates include bronchial sensitivities such as asthma-like symptoms, chest tightness, coughing, wheezing and shortness of breath. Exposure routes include ingestion, dermal contact, eye contact and inhalation.

Based on the information gathered for the Site, and AECOM's survey, the presence of isocyanates, in large quantities, is unlikely.

3.8 Lead

The OHSA and the Hazardous Products Act presently regulate the control of lead and lead containing materials; whereas worker exposure to lead is regulated by O. Reg. 490/09.

Lead is typically found in various materials on industrial sites constructed prior to the late 1970s or 1980s, including paints, piping, solder, and other organic lead compounds. Until the late 1970s lead was often added to paints to increase the glossiness of the painted surface. Neither Federal nor Provincial statutes provide a definition for lead based paint; therefore, the United States (US) Environmental Protection Agency (EPA) definition of lead-based paints stating *"in order for it to be considered lead-based paint, the paint must have greater than or equal to 0.5% (which is the same as 5,000 µg/g or 5,000 mg/kg or 5,000 ppm) lead"*[1] is adopted. The use of lead containing pipes was phased out in Ontario in the late 1940s, and lead solder for use in potable water distribution pipes was banned in the late 1980s.

1. *US EPA Document "Testing your home for Lead, paint, dust and soil", EPA 747-K-00-001, July 2000*

Organic lead compounds, the most commonly known of which are tetramethyl lead and tetraethyl lead, were historically used as anti-knocking additives to gasoline. Leaded gasoline was used until the late 1980s, when its use was phased out in North America. Historically, lead was often used as a control joint in building section to compensate the expansion and contraction of building materials. In addition, Millwrights used lead as filler materials to surround bases and anchorage bolts.

About 550 years ago, the first cast iron pipes were made with flanged joints, using lead or leather gaskets. The bell and spigot joint, which was assembled by caulking yarn or braided hemp into the base of the annular bell cavity and then pouring molten lead into the remaining space inside the bell, was developed in 1785 and extensively used until the late 1950s. The roll-on joint was developed in 1937 and was used for roughly 20 years before its manufacture was discontinued. Furthermore, solid lead pipes were historically used for sanitary drainage

3.8.1 Lead Based Paint Sampling Summary

A total of five paint samples were collected from the Site, for which lead concentrations of up to 57700 ppm were reported. A total of four samples were identified to contain greater than 5,000 ppm of lead, which is summarized as follows:

Table B. Summary of Lead-Based Paints

Location Description	Building Component	Surface Color	Bulk Sample Result (ppm by weight)
1st Floor Kitchen	Wall	Green	57,700
2nd Floor Bedroom without fireplace	Drain pipe	White	54,300
Exterior paint on wood siding of enclosed veranda	Wall	White	8,210
Exterior Collected from various areas	Window and door frames	White	55,000

Refer to **Table 2**, 'Summary of Lead and PCB Sampling Analysis' attached herein. Refer to **Appendix D** for Testmark Laboratories Analytical Reports.

3.8.2 Lead Gasket and Pipe Summary

During the course of AECOM's DS Survey, cast iron pipes were observed throughout the structure and appear to have been used for sanitary and roof drainage purposes. Sampling of cast iron pipe joints is not practical since sampling would damage the gasket and breach the seal; therefore, AECOM recommends that all cast iron pipe fittings and joints be managed as potentially containing lead.

3.8.3 Lead – Removal Management and Disposal

On November 10th, 2010, the Government of Canada published "Regulation Amending The Surface Coating Regulations" (SOR-/2010-224), which lowered the allowable lead content in materials from 600 ppm to 90 ppm; however, the United States (US) Environmental Protection Act (EPA), a common industry standard, defines existing lead-based paints as paints with concentrations of lead greater than 1 mg/cm² or 0.5 % (5,000 ppm) by dry weight. Generally, the removal of lead paint is not economically feasible; moreover, the total lead concentration is generally

considered insignificant relative to total demolition material waste quantities. However, if the removal of paints is required, all paints containing even a trace amount of lead should be removed without chemical stripping, torching or grinding.

Removal of building materials confirmed or assumed to contain lead (i.e., lead paint, solder, wiring connections, copper pipes, cast iron piping, paint, etc.) should be completed in accordance with the Ministry of Labour document *"Guideline – Lead on Construction Projects"* (September 2004).

Prior to the disposal of lead wastes, the materials must be analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) per O. Reg. 347 (as amended). If the TCLP analytical results reveal that lead exceeds the Leachate Quality Criteria of 5 ppm, the waste material is considered a 'lead hazardous waste' and must be transported and disposed of at a licensed facility. In addition, materials containing solid lead, such as lead/oakum gaskets within cast iron sanitary sewer pipes, wheel weights and fishing sinkers must be separated and disposed of at a lead or metal foundry, or a metals recycler. Lead is listed in the *"Transportation of Dangerous Goods Act"*; therefore, specific protocols are required for the transportation of materials containing lead.

3.9 Mercury

Mercury is used primarily for the manufacture of industrial chemicals or for electrical and electronic applications. It is used in thermometers, electrical switches, thermostats, fluorescent lamps, and medicines. Mercury can also be found in the natural environment; however, the naturally occurring concentrations are relatively low and the occurrence is rare. Due to the adverse effects to human health and the ecological environment caused by mercury exposure, industrial and commercial uses are regulated in many countries. During the course of AECOM's DS Survey, four different types of building components were known or suspected to contain mercury, as described in the following sections.

3.9.1 Fluorescent Lamps and Tubes

Fluorescent lamps or tubes are gas-discharge lamps that use electricity to excite mercury vapour. The excited mercury atoms produce short-wave ultraviolet light that then causes a phosphor to fluoresce, producing visible light. During the course of AECOM's DS Survey, approximately 175 fluorescent tubes that contain mercury vapour were identified, consisting of T12, T8 and T5 lamp tubes in four foot lengths.

For detailed information, refer to **Table 3**, 'Fluorescent Lamps (Mercury Vapour & PCB Ballasts) & Mercury Switches Summary – Room by Room Database' attached herein.

3.9.2 High Intensity Discharge Lamps

High Intensity Discharge (HID) lamps should be managed as a potentially hazardous waste. In addition to lead that is found in the base of the lamps, they also contain mercury. HID lamps are used for outdoor lighting; interior lighting in stores or warehouses, and some specialty uses, and include: mercury vapour, metal halide and high-pressure sodium.

Other types of specialized HID bulbs are used in a wide variety of settings, including photography and medical instrument lighting. Large mercury vapour and metal halide lamps can contain more than 250 mg of mercury.

During the course of AECOM's DS Survey, HID lamps were not observed within the structure.

3.9.3 Compact Fluorescent Lamps

Compact Fluorescent Lamps (CFLs) are fluorescent lamps designed to replace incandescent lamps. Some types fit into light fixtures formerly used for incandescent lamps. The lamps contain mercury vapour, and use a tube which is curved or folded to fit into the space of an incandescent bulb, and a compact electronic ballast in the base of the lamp. During the course of AECOM's DS Survey, two CFLs were observed within the structure. For detailed information, refer to **Table 3**, 'Fluorescent Lamps (Mercury Vapour & PCB Ballasts) & Mercury Switches Summary – Room by Room Database' attached herein.

3.9.4 Thermostats

Two wall mounted thermostats were observed in the structure. Thermostats were not dismantled for inspection; however, based on the review of type and manufacture, thermostats may contain a mercury switch. For detailed information, refer to **Table 3,** 'Fluorescent Lamps (Mercury Vapour & PCB Ballasts) & Mercury Switches Summary – Room by Room Database' attached herein.

3.9.5 Mercury – Removal Management and Disposal

Materials consisting of elemental, inorganic or organic forms of mercury that exceed the Leachate Quality Criteria of 0.1 ppm, as established by Regulation 347 (as amended) Toxicity Characteristic Leaching Procedure, cannot be disposed of at a solid non-hazardous waste (i.e. municipal landfill), and therefore, a hazardous waste contractor should be retained and responsible for finding a source for disposal. Mercury is also listed in the *"Transportation of Dangerous Goods Act*"; therefore, specific requirements apply for the transportation of materials containing mercury.

All fluorescent lamps or high-intensity discharge lamps scheduled for disposal should be placed in airtight containers and disposed of at a facility that can extract the mercury vapours from tubes and lamps, and then properly dispose of waste materials.

Management, handling and disposal of mercury containing equipment such as thermostats and switches should be completed in accordance with O. Reg. 347 (as amended), classified as a 'common mercury waste' and disposed of at a common mercury waste recovery facility.

3.10 Silica Containing Materials

Silica, or silicon dioxide, is a naturally occurring mineral and its physical structure may exist in either crystal or amorphous forms. It is the crystal form of silica that poses the greatest health hazard to workers. The crystal form of silica is also called crystalline silica, and exists as: quartz, cristobalite, tripoli, and tridymite. Quartz is the most common form of crystalline silica found in nature and in industrial use. Because crystalline silica is a major component of sand, granite, and other rock materials, it is common in the work environment. Occupational exposure to silica occurs in abrasive sand blasting, foundry work, stonecutting, rock drilling, quarry work, tunneling, and other construction related jobs.

Inhalation of silica can lead to silicosis, a debilitating lung disease. Silicosis creates inflammation and scar tissue formation in the lungs, reducing the body's ability to extract oxygen from the lungs. As the disease progresses, pulmonary and cardiac impairment may occur to the point where oxygen must be supplied continuously to sustain life. Once silicosis has developed there is no cure for the disease; however, silicosis is preventable if one can reduce silica dust exposure

Renovation activities may disturb masonry, mortar and concrete materials, which have the potential of containing silica.

3.10.1 Silica Containing Materials – Removal Management and Disposal

Materials including bricks, mortars, plaster, stone and sandstone foundations, and concrete products are likely to contain silica, since silicon dioxide is the basic component of sand, sandstone, slate, flint, quartz and granite rock. Exposure to fine dust containing airborne silica becomes a health issue when inhaled. Engineering control, such as wetting materials during demolition/construction activities should be used in order to limit the accumulation of dust. O. Reg. 490/09 and the Ministry of Labour document *"Guideline – Silica on Construction Projects"* (September 2004), should be referred to when demolishing materials that may contain silica.

There are no special requirements for the disposal of building materials containing silica; however, the Waste Diversion Act, O. Reg. 102/94, specifies that materials containing silica or that have the potential of containing silica should not be disposed at a landfill.

3.11 Vinyl Chloride

At room temperature, vinyl chloride is a colourless flammable gas with a mild to sweet odour. Vinyl chloride is associated with the production of polyvinyl chloride, which is a plastic resin produced from the manufacturing of numerous consumer and industrial products, including, but not limited to plastic containers, wrapping films, battery cell separators, refrigerant gas, electrical insulations, plumbing components, flooring, windows and latex paints.

Exposure to vinyl chloride occurs primarily in the workplace environment where gases may be inhaled as a result of the manufacturing process. Health effects associated with acute exposures included dizziness, sleepiness and unconsciousness. Exposure at high levels can result in permanent liver damage, immune reactions, nerve damage and liver cancer.

Since vinyl chloride is primarily released into the environment as gas emissions or in wastewater from the production of polyvinyl chloride (PVC), the presence of vinyl chloride is unlikely; however, due to the release of vinyl chloride gas from the burning of electrical wiring or PVC pipes, the use of high heat or burning methods to dismantle electrical components or PVC pipes is not recommended.

Following AECOM's DS Survey, the potential of being exposed to vinyl chloride at the Site is unlikely.

4. Hazardous Materials Survey

At the time of AECOM's HM/DS Survey, the following products, substances or building materials were identified as potentially hazardous materials:

- ODSs
- Radioactive Materials
- Mould
- PCBs

4.1 Mould

Mould tends to grow in warm, dark, and damp environments. Mould is not a regulated substance in Ontario; however, it can pose concerns for exposure by individuals who are hypersensitive or immuno-compromised.

Exposure to elevated concentrations of mould spores can pose health concerns to the healthiest of individuals, so efforts to mitigate exposure to mould growth should be considered. Based on AECOM survey, visible mould was limited to sparse growth on various window frames and sills, where evidence suggests that water damage was present.

4.2 Ozone Depleting Substances

ODSs include substances containing chlorofluorocarbon (CFC), hydrochlorofluorocarbon (HCFC), halon or any other material capable of destroying ozone in the atmosphere. ODSs deplete the stratospheric ozone shield that screens the earth from some of the sun's harmful ultraviolet rays. Increased radiation could result in an increase in skin cancers, suppression of the human immune system and decreased productivity of terrestrial and aquatic organisms, including some commercially important crops. ODSs have been used as refrigerants, solvents, foam blowing agents, aerosol propellants and as firefighting agents. The manufacturing of Halon and CFC were phased out by 1994 and 1995, respectively. Ontario Regulation 463/10 (O. Reg. 463/10) 'Ozone Depleting Substances and Other Halocarbons', as amended HCFCs classifies R-22 as a 'Class 2 Ozone Depleting Substance'; whereas R-134a, R-404a and R-410a are classified as 'Halocarbons' and/or mixtures thereof.

During the course of AECOM's DS Survey and review of Site, air conditioning units, pop dispensing machines, and refrigerating appliances and were identified within the structure, which may contain a CFC or HCFC refrigerant.

4.2.1 ODSs – Removal, Management and Disposal

ODS can generally be managed through the development of an ODS Management Plan to ensure compliance with Federal and Provincial Regulations. The current objective of regulations in Ontario is to eliminate the use and possession of Class 1 ODS, and regulate the use and disposal of Class 2 ODS, Halocarbons and mixtures thereof. Federally, there is a mandate to completely phase-out the use of CFCs (Class 1 ODS) starting in 2010, and the production and consumption of HCFCs (Class 2 ODS) by 75% in 2010, by 90% in 2015, and complete this accelerated phase-out by 2020, while allowing for the continued use of 0.5% for servicing until 2030. The objective of the ODS Management Plan would be to track types of refrigerants used and to phase-out the use of the R-22 refrigerant within devices and units located within the structure.

Units and appliances containing a refrigerant, scheduled for disposal must be decommissioned in accordance with the "*Ozone Depleting Substances and Other Halocarbons*" O. Reg. 463/10, as amended, and tagged prior to disposal. Thereafter, the devices can be disposed of at a steel recycler or landfill site.

Maintenance or repair of units and appliances containing a refrigerant must be completing by a person certified in accordance with Section 34 of O. Reg. 463/10.

4.3 Polychlorinated Biphenyls

PCBs are a class of organic compounds, which due to their toxicity and classification as a persistent organic pollutant, were banned for production in North America by 1977. PCBs are most commonly used in capacitors, transformers, circuit breakers, switch gears and lamp ballasts as synthetic coolant materials. Although PCB production has ceased, they may still be present in older hydraulic and electrical equipment still in use after the 1977 ban (i.e. production cut-off point).

4.3.1 Fluorescent Light Fixtures

The handling and storage of PCB containing wastes must follow Ontario Regulation 362, as amended, and the management of PCB ballasts must be conducted in accordance with the Canadian Protection Act *"Storage of PCB Materials Regulations".* Fluorescent lights fixtures use an electronic component called a ballast, which contains a small capacitor. Ballasts manufactured prior to 1978 commonly contain PCBs. In addition, mercury-vapour HID lamps also contain PCB capacitors. The PCBs are found in the capacitor oil and in the tar-like potting compound that surrounds the capacitor.

Ballasts made after 1978 are usually marked "No PCBs." Ballasts without the "No PCB" label, should be classified as potentially containing PCBs. Leaking ballasts pose special risks and must be handled very carefully to avoid exposure.

Based on AECOM's DS Survey, 7 fluorescent light fixtures were observed within the building. The observed fluorescent light fixtures consisted of the newer 'T8' style, which do not contain PCBs. All fixtures should be treated as potentially containing PCB ballasts unless confirmed otherwise. For detailed information, refer to **Table 3**, 'Fluorescent Lamps (Mercury Vapour & PCB Ballasts) & Mercury Switches Summary – Room by Room Database' attached herein

4.3.2 PCB in Paints

At the request of PCA, paint samples collected by AECOM for lead analysis, were also analyzed for concentrations of PCBs. Review of the laboratory analytical report for three paint samples revealed PCB concentrations ranging between <0.0094 and 0.67 ppm. Refer to **Table 2**, 'Summary of Lead and PCB Sampling Analysis' attached herein. Refer to **Appendix B** for Testmark Laboratories Analytical Reports.

There are no regulations or guidelines that provide standards for PCBs in historic paint materials. However, AECOM recommends that the removal of paints containing PCBs be completed without the use of sanding, grinding, or sandblasting methods, in a manner as to limit any generation of particulate.

In addition, prior to the disposal of paint waste materials containing PCBs, the materials must be analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) per O. Reg. 347 (as amended). If the TCLP analytical results reveal that PCBs exceeds the Leachate Quality Criteria of 0.3 ppm, the waste material is considered a PCB hazardous waste and must be transported and disposed of at a licensed facility.

4.3.3 PCBs – Removal Management and Disposal

The handling and storage of PCB containing wastes must follow Ontario Regulation 362, as amended, and the management of PCB ballasts must be conducted in accordance with the Canadian Protection Act *"Storage of PCB Materials Regulations – SOR/92-507"* and the Environmental Protection Act *"Guidelines for the Management of PCB Wastes".*

During the course of rehabilitation/demolition activities, a licensed electrician should dismantle fluorescent fixtures and determine whether individual ballasts contain PCBs. Environment Canada's document entitled "Identification of lamp ballasts containing PCBs", August 1991, can be used to assist with the identification of PCB ballasts. If a ballast cannot be confirmed to be non-PCB containing, it should be handled and disposed of as potentially PCB-containing.

4.1 Naturally Occurring Radioactive Materials (NORMs)

NORMs usually consist of industrial wastes or by-products enriched with radioactive elements found in the environment, such as uranium, thorium and potassium and any of their decay products, such as radium and radon. These natural radioactive elements are present in very low concentrations in earth's crust and are brought to the surface through industrial activities such as oil and gas exploration or mining and through natural processes like leakage of radon gas to the atmosphere or through dilution in groundwater.

Based on the information gathered for the Site, and AECOM's survey, the presence of radon gas has been confirmed. It is the understanding of AECOM that recently, a radon mitigation system was installed in the basement of the building to divert and vent gases to the outdoor environment.

Figures

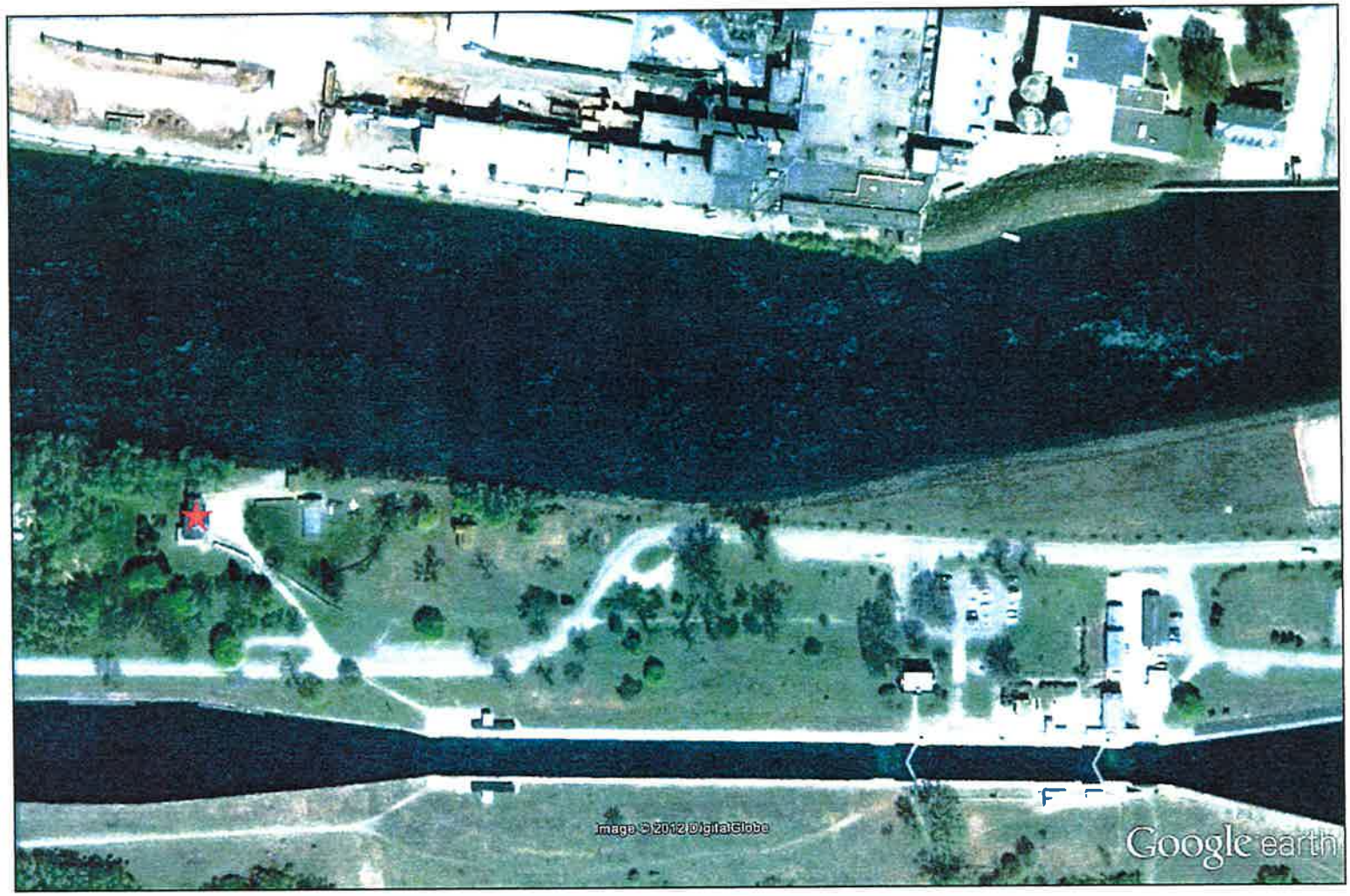
Figure 1: Location of Site

Figure 2: Location of Building

★ Location of Site
Scale: NTS
Source: Google Maps

Figure 1
Site Location

N



★ Location of Building
Scale: NA
Source: Google Earth Pro

Figure 2
Site Plan

N

Tables

Table 1: Potential ACM Sampling Summary – Room by Room Database

Table 2: Summary of Lead and PCB Sampling Analysis

Table 3: Fluorescent Lamps (Mercury Vapour & PCB Ballasts) & Mercury Switches Summary – Room by Room Database

TABLE 1
SAULT CANAL SUPERINTENDENT'S RESIDENTIAL BUILDING
POTENTIAL ACM SAMPLING SUMMARY - ROOM BY ROOM DATABASE

Room ID [1]	Floor Level	Potential ACM	Colour-pattern	Component	Friability	Condition	Quantity [2]	Sample ID	Asbestos - Results of Analysis	%	Comments
Throughout	Throughout	PL	Off-White	WL	FR	G	Unknown	PCSC-R1A to R1D & PCSC-1E to 1G	non-detect	-	
Kitchen	1st	Sheet vinyl flooring	Tan/Green	FL	NFR	G	36m^2	PCSC-3A to 3C	non-detect	-	
Bathroom		Sheet vinyl flooring	Tan/Gold	FL	NFR	G	6m^2	PCSC-4A to 4C	Chrysotile	25	
Storage Room	2nd	Sheet vinyl flooring	Green	FL	NFR	G	4m^2	PCSC-5A to 5C	non-detect	-	
Bathroom		12x12 Tile	White	FL	NFR	G	12m^2	PCSC-6A to 6C	non-detect	-	
Back Storage Room		Sheet vinyl flooring	Brown	FL	NFR	G	13m^2	PCSC-25A to 25C	Chrysotile	5.2	
Attic	3rd	Sheet vinyl flooring	Off-White	FL	NFR	G	30m^2	PCSC-22A to 22C	Chrysotile	0.75	
Attic Walls		VI	Tan	WL/CL	FR	G	Unknown	PCSC-23A to 23C	non-detect	-	
Exterior Walls	Exterior	PT Moulding	Red	WL	NFR	G	Unknown	PCSC-24A to 24C	non-detect	-	

Component		***Terminology***				
B/J: Beams and/or Joists	FNDN: Foundation	ACPI: Air-Cell Pipe Insulation	FI: Fireproofing Insulation	PL: Plaster	VI: Vermiculite Insulation	
BL: Boiler	WL: Wall	ACM: Asbestos Containing Material	IM: Insulation Material	RAR: Rolled Asphalt Roofing	VSW: Vinyl Sheet Wrap (post 2000)	
CAV: Cavity	WN: Window	ASH: Ashpalt Shingle	KACM: Known asbestos containing material	RB: Refactory Brick	VWFB: Vinyl Wrap with Foil Backing	
CL: Ceiling	PST: Pipe straights	ASI: Ashpalt Siding	LF: Linear Feet	RT: Roofing Tar	***Condition***	***Previously Sampled By***
DK: Deck	PFTG: Pipe fittings	BRM: Built-up Roofing Membrane	MB: Magnesia Block Insulation	TB: Transite Board	G: Good	CRA- Conestoga-Rovers and Ass.
DR: Door	OT: Other	CLK: Caulking	NA: Not Applicable	TF: Textured Finish	F: Fair	MRW - M.R. Wright & Ass.
DT: Duct work	RF: Roof	CLW: Cloth Wrapping	ND: Not Detected above 0.5%	TP: Transite Pipe	P: Poor	
FL: Floor	Domestic Cold Water; Steam supply & return	CT: Ceiling Tile	NT: Not Tested	SC: Stucco	***Footnotes***	
Frability		DJC: Drywall Joint Compound	PCPI: Parging cement pipe insulation	SFI: Spayed Fireproofing Insulation	[1] Refer to Figures for Room and Area Locations	
FR: Friable	NFR: Non-Friable	FGI: Fibreglass Insulation	PS: Previously sampled	SST: Suspended Ceiling Tile	[2] Quanity is estimated only - not exact	

TABLE 2
SAULT CANAL SUPERINTENDENT'S RESIDENTIAL BUILDING
LEAD AND PCB SAMPLING ANALSIS

Sample ID	EPA Lead-Paint Criteria (ppm)	PCSC-L1A	PCSC-L2A	PCSC-L3A	PCSC-L8A	PCSC-L9A
Sample Location		Residence - 1st Floor Kitchen	Residence - 1st Floor Bedroom w/o Fireplace	Residence - 2nd Floor Hallway, righ of stairs	Residence - Exterior paint on wood siding of enclosed veranda	Residence - Exterior Collected from various areas
Sample Description		Green	White	Beige	White	White
Sample Matrix		Paint	Paint	Paint	Paint	Paint
Sampling Date		01-Aug-12	01-Aug-12	01-Aug-12	01-Aug-12	01-Aug-12
Parameters						
Lead	5000	57,700	54,300	93.4	8,210	55,000
PCBs	[a]N/A	0.13	[c]<0.02	0.67	0.12	<0.0094

All results expressed in µg/L

a N/A means not applicable

b NT means not tested

[c] <0.005 - Less than laboratory Reportable Detection Limit (RDL)

6982 numbers in red mean results exceeded EPA Lead and TCLP criteria

TABLE 3
FLUROESCENT LAMPS (Mercury Vapour PCB Ballasts), MERCURY SWITCHES
SUMMARY - ROOM BY ROOM DATABASE

Room ID [1]	Floor Level	# T8 Fixture - 1 Lamp	# T8 Fixture - 2 Lamp	# T8 Fixtures - 4 Lamp	# Compact Fluroescent Lamps	# T12 Fixtures - 2 Lamp	# T12 Fixtures - 4 Lamp	# High Intensity Discharge Lamps	# of Potential T12 PBC Ballast	Total # of Fluroescent Tubes	# Potential Mercury Thermostat	Comments
Room left at bottom of stairs	Basement				1					0		
Room at bottom of stairs	Basement				1					0	1	
Room under stairs	Basement				1					0		
tm first right after subsequent n	Basement				1					0	1	
Main furnace room w/storage	Basement				9					0		
Heating room off of main room	Basement		1		4					2		
Kitchen	1st Floor		1							2		
Kitchen storage room	1st Floor				1					0		
st Bedroom along main entranc	1st Floor		2							4		
Hallway	2nd Floor		2							4		
Bathroom	2nd Floor	1								1		
										0		
										0		
										0		
	RUNNING TOTALS	1	6	0	18	0	0	0	0	13	2	

Appendix A

ITAL Analytical Report

iATL INTERNATIONAL
Asbestos Testing Laboratories

9000 Commerce Parkway, Ste B
Mount Laurel, NJ 08054
Toll Free 877-428-4285
Local: 856-231-9449
Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: AECOM Canada Inc
523 Wellington Street East
Sault Ste. Marie ON P6A 2M4

Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742230
Client No.: PCSC-3A
Description / Location: Tan/Green Vinyl Sheet Flooring
Kitchen

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	30	Cellulose	70

Lab No.: 4742230
Client No.: PCSC-3A
Description / Location: Yellow Mastic
Kitchen
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Approved By:

Date: 8/6/2012

Frank E. Ehrenfeld, III
Laboratory Director

ATL INTERNATIONAL
Asbestos Testing Laboratories

9000 Commerce Parkway, Ste B
Mount Laurel, NJ 08054
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Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742231
Client No.: PCSC-3B
Description / Location: Tan/Green Vinyl Sheet Flooring, Kitchen

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	30	Cellulose	70

Lab No.: 4742231
Client No.: PCSC-3B
Description / Location: Tan/Black Fibrous, Kitchen
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	Trace	Hair	10
		90	Cellulose	

Lab No.: 4742231
Client No.: PCSC-3B
Description / Location: Yellow Mastic, Kitchen
Layer No.: 3

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742232
Client No.: PCSC-3C
Description / Location: Tan/Green Vinyl Sheet Flooring, Kitchen

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	25	Cellulose	75

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 8/6/2012

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Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742233 **Description / Location:** Tan Vinyl Sheet Flooring
Client No.: PCSC-4A Bathrm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
25	Chrysotile	Trace	Cellulose	75

Lab No.: 4742234 **Description / Location:** Sample Not Analyzed
Client No.: PCSC-4B

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
	Sample Not Analyzed		Sample Not Analyzed	

Lab No.: 4742235 **Description / Location:** Sample Not Analyzed
Client No.: PCSC-4C

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
	Sample Not Analyzed		Sample Not Analyzed	

Lab No.: 4742236 **Description / Location:** Green Vinyl Sheet Flooring
Client No.: PCSC-5A St.Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 8/6/2012

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CERTIFICATE OF ANALYSIS

Client: AECOM Canada Inc
523 Wellington Street East
Sault Ste. Marie ON P6A 2M4

Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742237
Client No.: PCSC-5B
Description / Location: Green Vinyl Sheet Flooring
St.Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Lab No.: 4742238
Client No.: PCSC-5C
Description / Location: Green Vinyl Sheet Flooring
St.Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Lab No.: 4742239
Client No.: PCSC-6A
Description / Location: White Floor Tile; 12x12
Bathrm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742239
Client No.: PCSC-6A
Description / Location: Brown Mastic
Bathrm
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

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Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742240
Client No.: PCSC-6B
Description / Location: White Floor Tile; 12x12
Bathrm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742240
Client No.: PCSC-6B
Description / Location: White Caulk
Bathrm
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742241
Client No.: PCSC-6C
Description / Location: White Floor Tile; 12x12
Bathrm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742242
Client No.: PCSC-8A
Description / Location: White/Tan Ceiling Tile
Furnace Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	35	Cellulose	30
		35	Fibrous Glass	

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

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Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742243
Client No.: PCSC-8B
Description / Location: White/Tan Ceiling Tile, Furnace Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	35	Cellulose	30
		35	Fibrous Glass	

Lab No.: 4742244
Client No.: PCSC-8C
Description / Location: White/Tan Ceiling Tile, Furnace Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	35	Cellulose	30
		35	Fibrous Glass	

Lab No.: 4742245
Client No.: PCSC-9A
Description / Location: White/Tan Ceiling Tile, Btm Of Strs

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	35	Cellulose	30
		35	Fibrous Glass	

Lab No.: 4742246
Client No.: PCSC-9B
Description / Location: White/Tan Ceiling Tile, Btm Of Strs

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	35	Cellulose	30
		35	Fibrous Glass	

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

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Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742247 **Description / Location:** White/Tan Ceiling Tile
Client No.: PCSC-9C Btm Of Strs

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	35	Cellulose	30
		35	Fibrous Glass	

Lab No.: 4742248 **Description / Location:** White/Tan Ceiling Tile
Client No.: PCSC-10A Btm Of Strs

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	90	Cellulose	10

Lab No.: 4742249 **Description / Location:** White/Tan Ceiling Tile
Client No.: PCSC-10B Btm Of Strs

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	90	Cellulose	10

Lab No.: 4742250 **Description / Location:** White/Tan Ceiling Tile
Client No.: PCSC-10C Btm Of Strs

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	90	Cellulose	10

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

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Report Date: 8/6/2012
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Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742251
Client No.: PCSC-11A
Description / Location: Off-White/Tan Vinyl Sheet Flooring
Storage Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
40	Chrysotile	Trace	Cellulose	60

Lab No.: 4742252
Client No.: PCSC-11B
Description / Location: Sample Not Analyzed

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed			Sample Not Analyzed	

Lab No.: 4742253
Client No.: PCSC-11C
Description / Location: Sample Not Analyzed

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed			Sample Not Analyzed	

Lab No.: 4742254
Client No.: PCSC-12A
Description / Location: Off-White Joint Compound
Storage Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

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Report Date: 8/6/2012
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Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742255
Client No.: PCSC-12B
Description / Location: Off-White Joint Compound, Storage Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742256
Client No.: PCSC-12C
Description / Location: Off-White Joint Compound, Storage Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742257
Client No.: PCSC-14A
Description / Location: Grey Insulation, Pipe; Back Ent.

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
70	Chrysotile	None Detected	None Detected	30

Lab No.: 4742257
Client No.: PCSC-14A
Description / Location: White Wrap, Pipe; Back Ent.
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Accreditation NIST-NVLAP No. 101165-0 NY-DOH No. 11021 AIHA-LAP, LLC No. 100188

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

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Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742258
Client No.: PCSC-14B
Description / Location: White Wrap
Pipe; Back Ent.

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Lab No.: 4742259
Client No.: PCSC-14C
Description / Location: Sample Not Analyzed

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed			Sample Not Analyzed	

Lab No.: 4742260
Client No.: PCSC-15A
Description / Location: Off-White Joint Compound
Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742261
Client No.: PCSC-15B
Description / Location: Off-White Joint Compound
Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

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BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742262
Client No.: PCSC-15C
Description / Location: Off-White Joint Compound
Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742263
Client No.: PCSC-16A
Description / Location: Yellow Vinyl Sheet Flooring
Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Lab No.: 4742263
Client No.: PCSC-16A
Description / Location: Lt.Grey Fibrous
Attic
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	95	Cellulose	5

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

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Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742264 **Description / Location:** Yellow Vinyl Sheet Flooring
Client No.: PCSC-16B Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Lab No.: 4742264 **Description / Location:** Lt.Grey Fibrous **Layer No.:** 2
Client No.: PCSC-16B Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	95	Cellulose	5

Lab No.: 4742265 **Description / Location:** Yellow Vinyl Sheet Flooring
Client No.: PCSC-16C Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	40

Lab No.: 4742265 **Description / Location:** Black Tar Paper **Layer No.:** 2
Client No.: PCSC-16C Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	90	Cellulose	10

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742266
Client No.: PCSC-17A
Description / Location: Lt.Grey Vinyl Sheet Flooring
Bathrm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	15	Fibrous Glass	85

Lab No.: 4742266
Client No.: PCSC-17A
Description / Location: Yellow Mastic
Bathrm
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742267
Client No.: PCSC-17B
Description / Location: Lt.Grey Vinyl Sheet Flooring
Bathrm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	15	Fibrous Glass	85

Lab No.: 4742267
Client No.: PCSC-17B
Description / Location: Yellow Mastic
Bathrm
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742268
Client No.: PCSC-17C
Description / Location: Lt.Grey Vinyl Sheet Flooring
Bathrm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	15	Fibrous Glass	85

Lab No.: 4742268
Client No.: PCSC-17C
Description / Location: Yellow Mastic
Bathrm
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742269
Client No.: PCSC-18A
Description / Location: Red Cementitious
Ext. WL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742270
Client No.: PCSC-18B
Description / Location: Red Cementitious
Ext. WL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 8/6/2012

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Toll Free 877-428-4285
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CERTIFICATE OF ANALYSIS

Client: AECOM Canada Inc
523 Wellington Street East
Sault Ste. Marie ON P6A 2M4

Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742271
Client No.: PCSC-18C
Description / Location: Red Cementitious Ext. WL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742272
Client No.: PCSC-19A
Description / Location: Tan Caulk Ext. WN

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742273
Client No.: PCSC-19B
Description / Location: Tan Caulk Ext. WN

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742274
Client No.: PCSC-19C
Description / Location: Tan Caulk Ext. WN

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC Trace	Chrysotile	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

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Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742275
Client No.: PCSC-22A
Description / Location: Off-White Floor Tile, Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 0.75	Chrysotile	None Detected	None Detected	PC 99.25

Lab No.: 4742275
Client No.: PCSC-22A
Description / Location: White Mastic, Attic
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742276
Client No.: PCSC-22B
Description / Location: White Mastic, Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742277
Client No.: PCSC-22C
Description / Location: White Mastic, Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 8/6/2012

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Report Date: 8/6/2012
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Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742278
Client No.: PCSC-23A
Description / Location: Tan Vermiculite Insulation
Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).

IATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of the vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004). Please call for more information and pricing.

Lab No.: 4742279
Client No.: PCSC-23B
Description / Location: Tan Vermiculite Insulation
Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).

IATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of the vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004). Please call for more information and pricing.

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 8/6/2012

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Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742280 **Description / Location:** Tan Vermiculite Insulation
Client No.: PCSC-23C Attic

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).

IATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of the vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004). Please call for more information and pricing.

Lab No.: 4742281 **Description / Location:** Red Cementitious
Client No.: PCSC-24A Ext. WL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742282 **Description / Location:** Red Cementitious
Client No.: PCSC-24B Ext. WL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 8/6/2012

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CERTIFICATE OF ANALYSIS

Client: AECOM Canada Inc
523 Wellington Street East
Sault Ste. Marie ON P6A 2M4

Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742283
Client No.: PCSC-24C
Description / Location: Red Cementitious Ext. WL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4742284
Client No.: PCSC-25A
Description / Location: Lt.Brown Floor Tile Back Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 5.2	Chrysotile	None Detected	None Detected	PC 94.8

Lab No.: 4742285
Client No.: PCSC-25B
Description / Location: Sample Not Analyzed

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
	Sample Not Analyzed		Sample Not Analyzed	

Lab No.: 4742286
Client No.: PCSC-25C
Description / Location: Sample Not Analyzed

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
	Sample Not Analyzed		Sample Not Analyzed	

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: L. Solebello

Date: 8/6/2012

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Report Date: 8/6/2012
Report No: 281533
Project: Parks Canada-Soo Canal DSS
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4742287
Client No.: PCSC-26A
Description / Location: Grey Insulation Pipe; Back Ent.

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
40	Chrysotile	40	Cellulose	20

Lab No.: 4742288
Client No.: PCSC-26B
Description / Location: Sample Not Analyzed

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
	Sample Not Analyzed		Sample Not Analyzed	

Lab No.: 4742289
Client No.: PCSC-26C
Description / Location: Sample Not Analyzed

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
	Sample Not Analyzed		Sample Not Analyzed	

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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Analysis Performed By: L. Solebello

Date: 8/6/2012

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CERTIFICATE OF ANALYSIS

Client: AECOM Canada Inc
523 Wellington Street East
Sault Ste. Marie ON P6A 2M4

Report Date: 9/5/2012
Report No.: 284737
Project: Park's Canad DSS 7-26-12
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 124738336
Client No.: PCSC-1E
Description / Location: Grey Plaster Res.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	3	Hair	97

Lab No.: 124738337
Client No.: PCSC-1F
Description / Location: Grey Plaster Res.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	3	Hair	97

Lab No.: 124738338
Client No.: PCSC-1G
Description / Location: Grey Plaster Res.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	3	Hair	97

Lab No.: 124738339
Client No.: PCSC-7A
Description / Location: Grey Concrete Admin.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

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Analysis Performed By: R. Shumate

Approved By:

Date: 9/5/2012

Frank E. Ehrenfeld, III
Laboratory Director

IATL International Asbestos Testing Laboratories

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523 Wellington Street East
Sault Ste. Marie ON P6A 2M4

Report Date: 9/5/2012
Report No.: 284737
Project: Park's Canad DSS 7-26-12
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 124738340
Client No.: PCSC-7B
Description / Location: Grey Concrete Admin.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 124738341
Client No.: PCSC-7F
Description / Location: Off-White Wall Coating Admin.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 124738342
Client No.: PCSC-20A
Description / Location: Grey Plaster P.H.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	3	Hair	97

Lab No.: 124738343
Client No.: PCSC-20B
Description / Location: Grey Plaster P.H.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	3	Hair	97

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

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Analysis Performed By: R. Shumate

Date: 9/5/2012

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Report Date: 9/5/2012
Report No.: 284737
Project: Park's Canad DSS 7-26-12
Project No.: 60273267

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 124738344
Client No.: PCSC-20C
Description / Location: Grey Plaster P.H.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 124738345
Client No.: PCSC-20D
Description / Location: Grey Plaster P.H.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	3	Hair	95
		2	Cellulose	

Lab No.: 124738345
Client No.: PCSC-20D
Description / Location: Off-White Joint Compound P.H.PL
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 124738346
Client No.: PCSC-20E
Description / Location: Grey Plaster P.H.PL

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	3	Hair	97

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

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Analysis Performed By: R. Shumate

Date: 9/5/2012

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Report Date: 9/6/2012
Report No: 284796
Project: Parks Canada DSS
Project No.:

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4778733
Client No.: PCSC-R1A
Description / Location: White Plaster, Res. Kitchen

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4778733
Client No.: PCSC-R1A
Description / Location: Grey Plaster, Res. Kitchen
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	Trace	Hair	100

Lab No.: 4778734
Client No.: PCSC-R1B
Description / Location: White Plaster, Res. Back Storage

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4778734
Client No.: PCSC-R1B
Description / Location: Grey Plaster, Res. Back Storage
Layer No.: 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

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Analysis Performed By: B. Hargrove

Approved By:

Date: 9/6/2012

Frank E. Ehrenfeld, III
Laboratory Director

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523 Wellington Street East
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Report Date: 9/6/2012
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Project: Parks Canada DSS
Project No.:

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4778735
Client No.: PCSC-R1C
Description / Location: Grey Plaster, Res. Furnace Room

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4778736
Client No.: PCSC-R1D
Description / Location: Grey Plaster, Res. Oil Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	Trace	Cellulose	100

Lab No.: 4778737
Client No.: PCSC-R7C
Description / Location: Grey Plaster, Bottom Of Stairs

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4778738
Client No.: PCSC-R7D
Description / Location: Brown Plaster, Furance Room

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Accreditation **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method: EPA 600/R-93/116, by Polarized Light Microscopy

Comments: Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analysis Performed By: B. Hargrove

Date: 9/6/2012

Appendix B

Testmark Laboratories Analytical Report

TESTMARK Laboratories Ltd.

Committed to Quality and Service

Analytical Report

Client: Colin Liddiard
Company: AECOM - Sault Ste. Marie
Address: 523 Wellington St East
Sault Ste. Marie, ON, P6A 2M4
Phone: (705) 942-2612
Fax: (705) 942-3642
Email: colin.liddiard@aecom.com

Work Order Number: 161427
Date Order Received: 8/03/12
Regulation: Information not provided
PO #:
Project #: 60273267

Analyses were performed on the following samples submitted with your order.
The results relate only to the items tested.

Sample Name	Lab #	Matrix	Type	Comments	Date Collected	Time Collected
PCSC-L1A	431923	Other	None		8/01/12	11:00
PCSC-L2A	431924	Other	None		8/01/12	11:00
PCSC-L3A	431925	Other	None		8/01/12	11:00
PCSC-L8A	431926	Other	None		8/01/12	11:00
PCSC-L9A	431927	Other	None		8/01/12	11:00
PCSC-L7A	431928	Other	None		8/01/12	11:00
PCSC-L6A	431929	Other	None		8/01/12	11:00
PCSC-L10A	431930	Other	None		8/01/12	11:00

The following instrumentation and reference methods were used for your sample(s)

Method Name	Description	Reference
ICPMS Soil	Determination of Metals in Soil by ICP/MS and BCSALM Method **Instrument group:** Perkin Elmer ICPMS	Based on SW846-6020
PCB Articles	Determination of Polychlorinated Biphenyls in Articles by GC/ECD **Instrument group:** HP GC/ECD	Based on SW846-8080

This report has been approved by:

Rita Rienguette, Chem. Eng. Tech.
Organic Section Head

Dan-Yi Yang, Ph.D.
Metals Section Head

Sample Data:

Sample Name: PCSC-L1A **Date: 8/01/12** **Matrix: Other** **Lab #: 431923**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	10	57700	µg/g	20120809.R13nrr

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	100	% Rec	20120808.R19pcbpc
Total PCBs	0.0097	0.13	µg/g	20120808.R19pcbpc

Sample Name: PCSC-L2A **Date: 8/01/12** **Matrix: Other** **Lab #: 431924**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	10	54300	µg/g	20120809.R13nrr

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	97	% Rec	20120808.R19pcbpc
Total PCBs	0.02	<0.02	µg/g	20120808.R19pcbpc

Sample Name: PCSC-L3A **Date: 8/01/12** **Matrix: Other** **Lab #: 431925**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	0.1	93.4	µg/g	20120808.R13na17

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	94	% Rec	20120808.R19pcbpc
Total PCBs	0.032	0.67	µg/g	20120808.R19pcbpc

Sample Name: PCSC-L8A **Date: 8/01/12** **Matrix: Other** **Lab #: 431926**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	10	8210	µg/g	20120809.R13nrr

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	90	% Rec	20120808.R19pcbpc
Total PCBs	0.01	0.12	µg/g	20120808.R19pcbpc

Sample Name: PCSC-L9A **Date: 8/01/12** **Matrix: Other** **Lab #: 431927**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	10	55000	µg/g	20120809.R13nrr

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	91	% Rec	20120808.R19pcbpc

Sample Name: PCSC-L9A **Date: 8/01/12** **Matrix: Other** **Lab #: 431927**

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Total PCBs	0.0094	<0.0094	µg/g	20120808.R19pcbpc

Sample Name: PCSC-L7A **Date: 8/01/12** **Matrix: Other** **Lab #: 431928**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	1	367	µg/g	20120808.R13na17

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	87	% Rec	20120808.R19pcbpc
Total PCBs	0.076	<0.076	µg/g	20120808.R19pcbpc

Sample Name: PCSC-L6A **Date: 8/01/12** **Matrix: Other** **Lab #: 431929**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	1	655	µg/g	20120808.R13na17

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	105	% Rec	20120808.R19pcbpc
Total PCBs	0.027	1.62	µg/g	20120808.R19pcbpc

Sample Name: PCSC-L10A **Date: 8/01/12** **Matrix: Other** **Lab #: 431930**

ICPMS Soil				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Lead	1	172	µg/g	20120808.R13na17

PCB Articles				
Parameter	**MDL**	**Result**	**Units**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	96	% Rec	20120808.R19pcbpc
Total PCBs	0.06	<0.06	µg/g	20120808.R19pcbpc

MDL	*Method detection limit or minimum reporting limit.*
% Rec	*Surrogate compounds are added to the sample in some cases and the recovery is reported as a percent recovered.*
QAQCID	*This is a unique reference to the quality control data set used to generate the reported value.*
Data reported for organic analysis in soil samples are corrected for moisture content	
Matrix	*If the matrix is a leachate, the sample was extracted according to regulation 558.*
INT	*Interferences*
TNTC	*Too numerous to count*
ND	*Not detected*

Quality Control Data:

ICPMS Soil

CRM-PC-A						
Parameter	**MDL**	**Units**	**LCL**	**Result**	**UCL**	**QAQCID**
Lead	0.1	%	80	80.3	120	20120808.R13na17
Parameter	**MDL**	**Units**	**LCL**	**Result**	**UCL**	**QAQCID**
Lead	1	%	80	80	110	20120809.R13nrr

Method Blank						
Parameter	**MDL**	**Units**	**LCL**	**Result**	**UCL**	**QAQCID**
Lead	0.01	µg/g	<0.01	<0.01	0.5	20120808.R13na17
Parameter	**MDL**	**Units**	**LCL**	**Result**	**UCL**	**QAQCID**
Lead	0.1	µg/g	<0.1	<0.1	0.5	20120809.R13nrr

PCBs Soil

Lab Control Sample						
Parameter	**MDL**	**Units**	**LCL**	**Result**	**UCL**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	% Rec	60	100	130	20120808.R19pcbpc
Total PCBs	0.01	µg/g	0.6	0.70	1.4	20120808.R19pcbpc

Method Blank						
Parameter	**MDL**	**Units**	**LCL**	**Result**	**UCL**	**QAQCID**
Decachlorobiphenyl (Surr.)	N/A	% Rec	60	85	130	20120808.R19pcbpc
Total PCBs	0.01	µg/g	<0.01	<0.01	0.03	20120808.R19pcbpc

UCL Upper Control Limit
LCL Lower Control Limit

Appendix C

PWGSC Window Condition Assessment Report 2013

Sault Ste. Marie Canal NHSC
Sault Ste. Marie, Ontario

Sault Ste. Marie Canal
Windows Condition Assessment

Date: August 2013
Project Number: R.059922.001
Team Leader: Ian Cameron

This *final* report titled:

Sault Ste. Marie Canal
Windows Condition Assessment Report

Prepared for:
Parks Canada Agency
Northern Ontario Field Unit

Prepared by:
Conservation and Landscape Architecture
Architecture and Engineering Resources – Atlantic Region
Real Property - Professional and Technical Services
Public Works and Government Services Canada

Dated: August 2013

Project Number: R.059922.001

has been reviewed by the Team Leader and Senior Review Team Members in accordance with the following criteria:

Criteria	Reviewer Signature	Date
☑ Meets scope of work as described in the Proposal for Services. ☑ Meets the conservation approach as described in the Proposal for Services. ☑ Meets quality for technical content and methodology.	Ian Cameron *Resource Team Leader*	28 August 2013 Date
	R Casagrande Rebecca Casagrande *Senior Quality Reviewer*	August 28, 2013 Date

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

1.0 INTRODUCTION 4
1.1 Scope of Work 4
1.2 Background and Heritage Values 6
1.3 Project Team 7
1.4 Conservation Approach 7

2.0 METHODOLOGY 9
2.1 Background Research 9
2.2 Field Investigation and Documentation 9

3.0 OBSERVATIONS 10
3.1 Power House 10
3.2 Workshop 12
3.3 Office Building 14
3.4 Superintendent's House 17

4.0 RECOMMENDATIONS 27
4.1 Power House 27
4.2 Workshop 28
4.3 Office Building 28
4.4 Superintendent's House 28

APPENDIX A: Heritage Character Statement A-1
APPENDIX B: As Found Conditions (Field Notes) B-1
APPENDIX C: Recommended Repairs C-1
APPENDIX D: Cost Estimates D-1

1.0 INTRODUCTION

Parks Canada Agency's Northern Ontario Field Unit has requested professional and technical services to carry out the inspection of the condition of the windows of four designated buildings at the Sault Ste. Marie Canal NHSC in Sault Ste. Marie, Ontario. The work also includes the preparation of an options analysis with associated cost estimates for repair/replacement of the windows.

Figure 1: The west elevation of the Power House. [CLA-PWGSC/November 2012]

Figure 2: The east elevation of the Workshop. [CLA-PWGSC/November 2012]

Figure 3: The south elevation of the Office Building. [CLA-PWGSC/November 2012]

Figure 4: The south elevation of the Superintendent's House. [CLA-PWGSC/November 2012]

1.1 Scope of Work

The intent of this project is to assess the existing condition of the windows at each of the four designated buildings (Power House, Workshop, Office Building and the Superintendent's House) at the Sault Ste. Marie Canal NHSC and provide the client with a record of the condition assessment that will prioritize the windows in terms of repair/replacement and provide repair designs, basic cost estimates and specifications for as many windows as permitted within the project budget. The scope of work for this project included the following tasks:

1. Document review. A brief search and review of existing background documentation was conducted regarding the windows. This review was used by the project team to become familiar with the various window types and configurations as part of the preparation for the field investigation.
2. Field investigation. A site visit was conducted to assess and document the existing conditions of all windows (including storm windows). The investigation reviewed both the interior and exterior conditions of all windows. The investigation was carried out using non-invasive techniques that included visual and tactile inspection of the windows and components. The observed conditions were documented on drawings prepared prior to the site visit and sketched in the field. The field investigation also included brief interview information with the site staff regarding any recent maintenance history that has been carried out on the windows. The conversations also served to identify known problems relating to the existing windows.
3. Analysis. An analysis of the findings resulting from the document review and the field investigation was carried out to identify the possible cause and significance of the observed deterioration, and to develop recommendations for conservation and maintenance work necessary to ensure protection of the historic fabric. The analysis includes a prioritization for the recommended work so that the client may better plan to implement the recommend repairs as capital and maintenance budgets will allow.
4. Condition Assessment Report. Preparation of a condition assessment report that summarizes the findings of the field investigation and analysis in order to provide recommendations and prioritization for the conservation of the windows. The report includes a cost estimate for the repair/replacement work recommended to address the existing deteriorated conditions. The report includes photographs from the field investigation to illustrate typical conditions and also includes drawings that capture the recommended repairs resulting from the findings of the field investigation.
5. Contract Documents (drawings and specifications). To be submitted based on the conditions identified at each window during the site inspection.

1.2 Background and Heritage Values

The Sault Ste. Marie Canal NHSC is a man-made waterway that passes between the city of Sault Ste. Marie and Whitefish Island on the shipping channel joining Lake Huron and Lake Superior at Sault Ste. Marie, Ontario. Of particular note are the canal's Powerhouse built into the slope of the hill at the downstream end of the lock, and the Emergency Swing Dam located west of the Superintendent's Residence. The construction of the canal was completed in 1895 as part of Canada's national canal system. Administration of the canal was transferred to the St. Lawrence Seaway Authority (1959 to 1979) and then to Parks Canada to continue canal operation as a recreational facility. The Sault Ste. Marie Canal was designated a national historic site of Canada in 1987.

The Powerhouse was built in 1894 as part of the construction of the canal that commenced in 1889 with most of the buildings being completed by 1896. The Powerhouse is an eclectic, classically inspired building constructed of red sandstone with limestone quoins and window and door surrounds. The building is composed of one and three storey sections with each façade differing in height. In 1986, the Powerhouse was formally designated a 'Classified' federal heritage building by the Federal Heritage Building Review Office (FHBRO).

The Workshop was constructed between 1895 and 1896. It has a two-storey gable roofed structure constructed of red sandstone and a one-storey addition that abuts the main structure. Unlike the other stone buildings on the site, the Workshop is not trimmed in limestone, perhaps indicating its utilitarian function. In 1986, the Workshop was formally designated a 'Recognized' federal heritage building by the Federal Heritage Building Review Office (FHBRO).

The Office Building was constructed between 1895 and 1896. It is a late example of the Second Empire style and has a mansard roof and central pavilion typical of that style. The building is constructed of red sandstone with limestone quoins and window and door surrounds. Its style and location indicated that it played and continues to play a prominent role associated with the canal. In 1986, the Office Building was formally designated a 'Recognized' federal heritage building by the Federal Heritage Building Review Office (FHBRO).

The Superintendent's House was built in 1896. It is a two and a half storey house with a gable roof that is finished with decorative bargeboard. It is constructed of red sandstone with limestone quoins and window and door surrounds. Its design is a late example that was inspired by the Gothic Revival style. Its style reflects the important social position of the Canal Superintendent in the local Sault Ste. Marie society at the time. In 1986, the Superintendent's House was formally designated a 'Recognized' federal heritage building by the Federal Heritage Building Review Office (FHBRO).

All of the buildings derive their heritage values from their historical, architectural and environmental values. Historically, they are associated with the construction of the canal and illustrate the period when Sault Ste. Marie was transformed from a small community into a modern industrial center. The integrity of the relationship between the complex of buildings at

the canal and its associated landscape has remained virtually unchanged since the buildings were constructed.

The Heritage Character Statement (HCS) produced by the FHBRO identifies the heritage value and character-defining elements that are important in planning any work that is carried out on these buildings. These character-defining elements must be conserved in order to protect the building's heritage values. In the case of the four designated buildings the windows play an important role in the definition of the heritage character and should be protected, conserved and where these aspects have been obscured or lost the original design should be recovered or restored.

A copy of the HCS can be found in Appendix A.

1.3 Project Team

The project disciplinary team consisted of the following:

- Team Leader – Ian Cameron, Conservation Technologist (CLA, PWGSC Atlantic)
- Team Member – Paul Amaral, Conservation Technologist (HCD)
- Quality Reviewer – Rebecca Casagrande, Conservation Technologist (HCD)
- Program Manager – Myles McDevitt & Gerry van Rijn, Conservation Engineers (HCD)

1.4 Conservation Approach

The conservation approach followed during preparation of this report was based on the principles of Parks Canada's Cultural Resource Management Policy as well as the *Standards and Guidelines for the Conservation of Historic Places in Canada* (Second Edition).

The completion of the condition assessment of the windows, coupled with the development of the recommendations, conforms directly to Standards 7, 8, 10 and 11:

Standard 7 states: "Evaluate the existing condition of *character-defining elements* to determine the appropriate *intervention* needed. Use the gentlest means possible for any intervention. Respect *heritage value* when undertaking any intervention."

Standard 8 states: "Maintain *character-defining elements* on an ongoing basis. Repair character-defining elements by reinforcing their materials using recognized conservation methods. Replace in kind any extensively deteriorated or missing parts of character defining elements, where there are surviving *prototypes*."

Standard 10 states: "Repair rather than replace *character-defining elements*. Where character-defining elements are too severely deteriorated to repair, and where sufficient physical evidence exists, replace them with new elements that match the forms, materials and detailing of sound

versions of the same elements. Where there is insufficient physical evidence, make the form, material and detailing of the new elements compatible with the character of the *historic place*."

Standard 11 states: "Conserve the *heritage value* and *character-defining elements* when creating any new additions to an *historic place* or any related new construction. Make the new work physically and visually compatible with, subordinate to and distinguishable from the historic place."

All recommendations have been based on a minimal intervention approach.

2.0 METHODOLOGY

This section is a summary of the methodology followed in developing the project team's understanding of the building, (i.e. its heritage value and character-defining elements) and in carrying out the fieldwork.

2.1 Background Research

The following documents were reviewed as part of the background research completed on the building:

- FHBRO Heritage Character Statements (85-07 Sault Ste. Marie NHSC Canal Buildings)
- Heritage record drawings (produced by Client Service Team for Parks Canada PWGSC Cornwall Office – March 2004/March 2006) ;
- Comparative Analysis Report for Power House (portion of report provided by Client – produced by Chris Tossell Architect – April 1997/March 2011); and
- Stores Building Condition Report (Workshop Building produced by the Hertiage Conservation Directorate PWGSC – December 2010).

2.2 Field Investigation and Documentation

The field investigation was carried out between the 5th and 9th of November 2012.

The field investigation was carried out using visual and tactile inspection on site. No detailed dismantling or destructive inspections were performed as part of the work. Observations were recorded on prepared drawings as well as sketches made in the field. Photos were taken of overall views as well as specific elements and conditions. The detailed observations were recorded to form the basis of this report.

3.4 Superintendent's House

The Superintendent's House has a total of thirty-seven (37) windows over four (4) floor levels (basement to attic). There are five (5) windows in the basement and they are interior swinging awning type wood windows. There are no storm sashes on the basement windows.

The ground floor level has eighteen (18) wood windows of four types. There are thirteen (13) single hung windows, three (3) fixed windows, one (1) awing window and one (1) slider type. It should be noted that the fixed window are recorded as three in total but actually have twelve (12) individual sash/glazing units. Eight (8) of the single hung windows have segmental arched heads and a two over two glazing configuration. The remainder of the single hung windows have rectangular heads. Thirteen (13) of the window have storm sashes and all but one of those thirteen sashes appears to be original.

The second floor has ten (10) single hung wood windows that all have segmental arched heads and a two over two glazing configuration. Nine (9) of the windows have storm sashes and of those only three (3) appear to be original.

The attic (third floor) has three (3) single hung wood windows, two of which have semi-circular arched windows with the third window having a rectangular head. All three windows have a two over two glazing configuration but have been outfitted with a wood louver unit to replace the lower sash. This has been done to provide year round ventilation to the third floor space of the house that now acts as an attic instead of occupied space. The lower sashes of the three windows sit on top (in an open position) of each of the installed louver units. There are not storm sashes on these windows.

The conditions observed for the windows located at the Superintendent's House range from good to poor. Typical defect conditions include:

- Decayed portions of sash, frame and storm sash components
- Inoperable sashes
- Missing hardware
- Missing storm sashes
- Ad hoc storm sashes that detract from the heritage character of building
- Failed finishes and failed glazing compounds
- Cracked glazing
- Inappropriate window unit replacement

In terms of repair priorities there are a number of windows in poor condition that require immediate attention. The existing defect conditions have resulted from a lack of regular maintenance and exposure to the elements. In general all of the windows, storm sashes and frames are repairable or salvageable with varying degrees of effort.

Detailed as found conditions can be found in Appendix B - As Found Conditions (Field Notes).

Figure 20: Exterior elevation of basement window type (W001) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 21: Interior elevation of basement window type (W001) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 22: Exterior elevation of ground floor window type (W101) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 23: Interior elevation of ground floor window type (W101) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 24: Exterior elevation of ground floor window type (W104) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 25: Interior elevation of ground floor window type (W104) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 26: Exterior elevation of ground floor window type (W105) at the sun room of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 27: Interior elevation of ground floor window type (W105) at the sun room of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 28: Exterior elevation of ground floor window type (W106) at the sun room of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 29: Interior elevation of ground floor window type (W106) at the sun room of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 30: Exterior elevation of ground floor window type (W113) at rear addition of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 31: Interior elevation of ground floor window type (W113) at rear addition of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 32: Exterior elevation of second floor window type (W201) at the of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 33: Interior elevation of second floor window type (W201) at the of the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 34: Exterior elevation of second floor window type (W205) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 35: Interior elevation of second floor window (W205) type at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 36: Exterior elevation of second floor window type (W207) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 37: Interior elevation of second floor window type (W207) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 38: Exterior elevation of second floor window type (W209) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 39: Interior elevation of second floor window type (W209) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 40: Exterior elevation of third floor window type (W303) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 41: Interior elevation of third floor window type (W303) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 42: Exterior elevation of third floor window type (W302) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 43: Interior elevation of third floor window type (W302) at the Superintendent's House. [CLA-PWGSC/November 2012]

Figure 44: Exterior elevation of second floor window type (W211) at the of the Superintendent's House. [CLA-PWGSC/November 2012]

4.2 Workshop

Owing to the fact that extensive work was carried out on the windows of the two-storey portion of the Workshop there are fewer repair recommendations for the building and the recommendations are not as urgent. Typical recommendations for repairs include:

- Removal of paint from metal T tracks.
- Repairs or replacement of damaged metal T tracks.
- Install sash handles on single hung windows of two storey portion of building.
- Preparing, priming and painting of storm sashes and any failed or unfinished wood components.
- Splice and epoxy repairs at decayed portions of sash and frame components.
- Replacement of cracked or broken glazing panes.
- Replacement of any failed glazing compound.
- Replacement/installation of new sealant around exterior perimeter of frame.

4.3 Office Building

The Office Building windows appear of have benefitted from more rigorous maintenance probably due to the occupancy and usage of the building. Despite this fact there are still areas that require immediate attention. Typical recommendations for repairs include:

- Replacement of existing ad hoc storm sashes or fabrication of new storm sashes that are sympathetic to the heritage character of the building.
- Replacement or repairs to sills, lower frame jambs and lower wood sash components.
- Replacement of failed/deteriorated glazing compound.
- Replacement of cracked or broken glazing panes.
- Repairs to cracks or gaps in wood sash and frame components.
- Stripping and refinishing of wood sash and frame components.
- Refinishing of existing hardware (sash pulls and locks).
- Replacement of missing/damaged sash cords to reinstate operability.
- Replacement/installation of new sealant around exterior perimeter of frame.

4.4 Superintendent's House

The windows at the Superintendent's House are the most diverse in terms of sizes and styles and require the second-most attention out of the four buildings. Typical recommendations for repairs include:

- Replacement of existing ad hoc storm sashes or fabrication of new storm sashes that are sympathetic to the heritage character of the building.
- Replacement or repairs to sills, lower frame jambs and lower wood sash components.
- Replacement of failed/deteriorated glazing compound.
- Replacement of cracked or broken glazing panes.
- Repairs to cracks or gaps in wood sash and frame components.
- Stripping and refinishing of wood sash and frame components.

- Refinishing of existing hardware (sash pulls and locks).
- Replacement of missing/damaged sash cords to reinstate operability.
- Replacement/installation of new sealant around exterior perimeter of frame.

APPENDIX A

Heritage Character Statement

Sault Ste. Marie, Ontario FHBRO 85-06
Canal Bldgs, Superintendent's House
Sault Ste. Marie

HERITAGE CHARACTER STATEMENT

SUMMARY

The Superintendent's House was built in 1896 by J. and R. Miller, contractors from Ingersoll, Ontario to designs prepared by the Department of Railways and Canals signed by J.B. Spence, Chief Draftsman. It was Recognized because of its good design, its very good craftsmanship and its reinforcing influence on the present character of the area.

HISTORICAL ASSOCIATIONS

Since the days of the fur trade, Canada's transportation system has operated on an east-west axis. The St. Lawrence River and the Great Lakes provided Canada's original "highway" stretching from the Atlantic into the heart of the continent. Later, canals and railroads were built to improve communication and travel but the basic east- west axis was maintained. The development of the transportation network across the country is one of the dominant themes of Canadian history. Construction of the Sault Ste. Marie Canal did not begin until 1889. The first ship passed through the locks at the Sault in September 1895, and most of the canal buildings were completed by 1896.

The complex of buildings illustrates the crucial years when Sault Ste. Marie was transformed from a small community into a modern industrial centre.

ARCHITECTURE

The superintendent's House is a one-and-a-half cross gable roofed structure of red sandstone quarried from the canal during its construction. The building appears to have a small wooden addition, but the original plans indicate that both portions of the building were constructed at the same time. The house originally had a large verandah located across the south facade but his has been removed. The quoins, window and door surrounds are limestone from Picton, Ontario. The gable ends of the building feature bargeboard trim of a type produced in factories and widely distributed in the 1890s. The design of the Superintendent's House is inspired by the Gothic Revival Style although by 1896, the year of construction, this style's popularity was on the wane. The massing, design and interior arrangement of the Superintendent's House reflects the important social position of the Superintendent in Sault Ste. Marie society.

ENVIRONMENT The integrity of the relationship between the complex of buildings at the Sault Ste. Marie Canal and its associated landscape has remained virtually unchanged since the buildings were constructed. Located on St. Mary's Island, which the canal bisects, they are set apart from the town of Sault Ste. Marie. The present use of the Sault Ste. Marie Canal for recreational purposes contributes to the character of the shore line across the bay, just as its former use as a busy commercial canal complimented use of the shore as a centre of transportation.

September 23, 1986

APPENDIX B

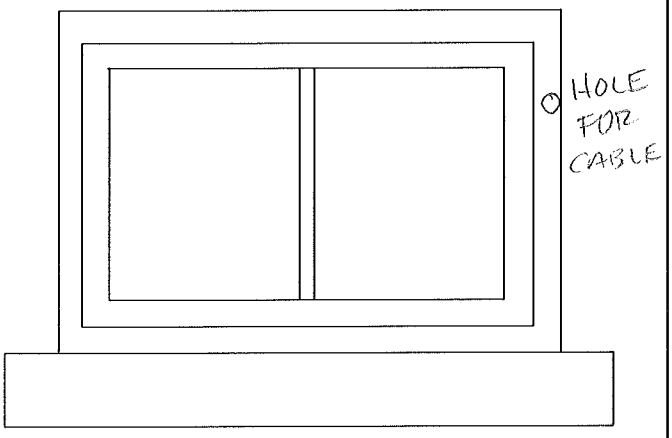
As Found Conditions (Field Notes)

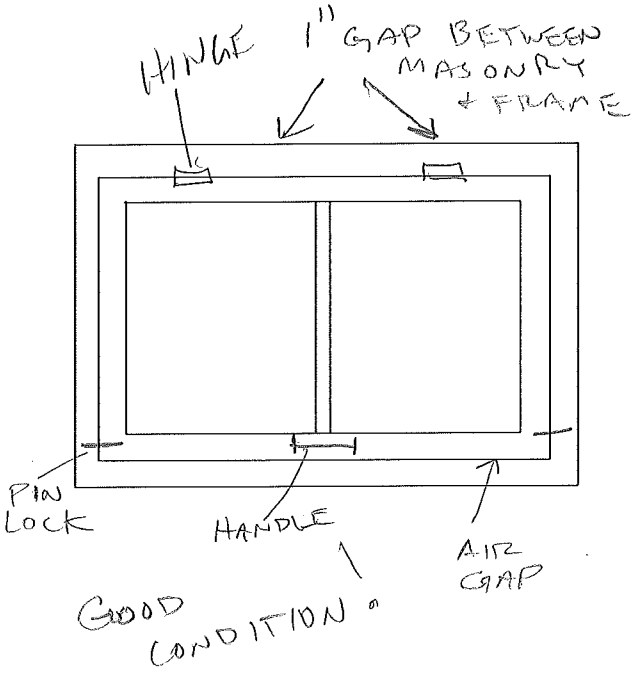
Conservation & Landscape Architecture
A&ER / RPB / P&TS / PWGSC

Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	1 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W001	Scale / Échelle	NTS	

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: WOOD SASH & FRAME. (FIXED

ARE WINDOWS OPERABLE? Y - INT AWNING

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED?

ARE COMPONENTS INTACT, LOOSE OR MISSING? ✓

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? SILL HAS PARGED CANT - HAS DRIP EDGE

SEALANT / CAULKING / PUTTY AROUND UNITS? MORTAR @ PERIM OF WOOD FRAME

GAPS PRESENT AROUND PERIMETER OF OPENINGS? N

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? N

(DIRT) / (DEBRIS) / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS? N

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT) FEW SPLITS ON SILL

Conservation & Landscape Architecture
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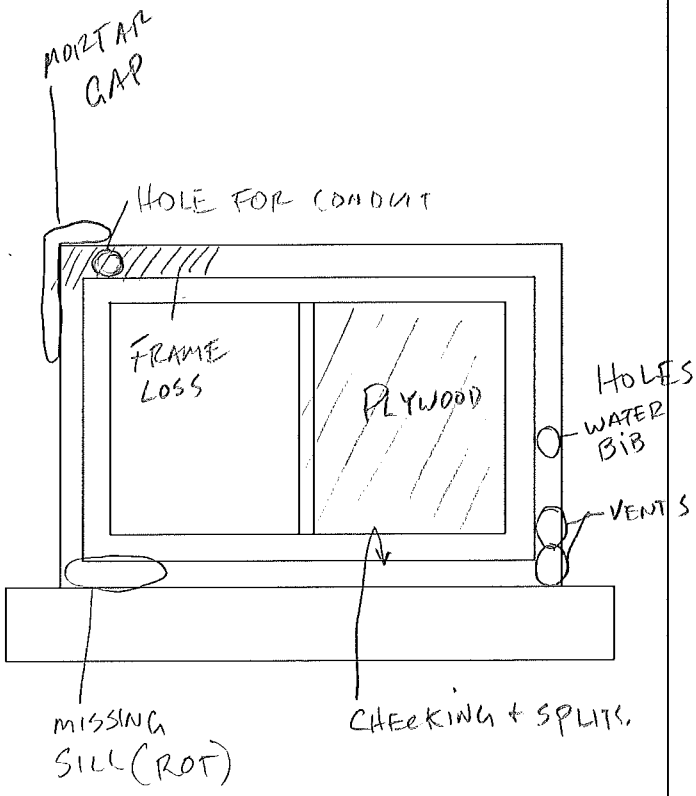
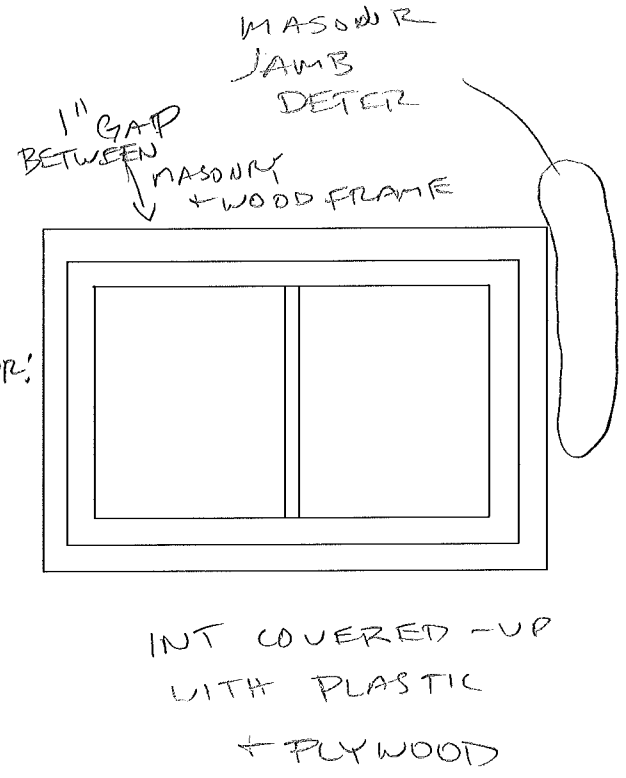
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	2 / 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL.	W002	Scale / Échelle NTS		

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W001

ARE WINDOWS OPERABLE? Y)

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N/A

ARE COMPONENTS INTACT, LOOSE OR MISSING? ✓

BROKEN GLASS PRESENT? N - ONE PANE REPLACED W OSB

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓ YES

SEALANT / CAULKING / PUTTY AROUND UNITS? SAME AS W001

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / (AIR LEAKAGE) / CONDENSATION?

(DIRT) / (DEBRIS) / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS? SILL - SEE DWG

(PAINT FAILURE / (WEATHERING) / (SPLITS) / (CHECKS) / ROT) ON SILL

Conservation & Landscape Architecture
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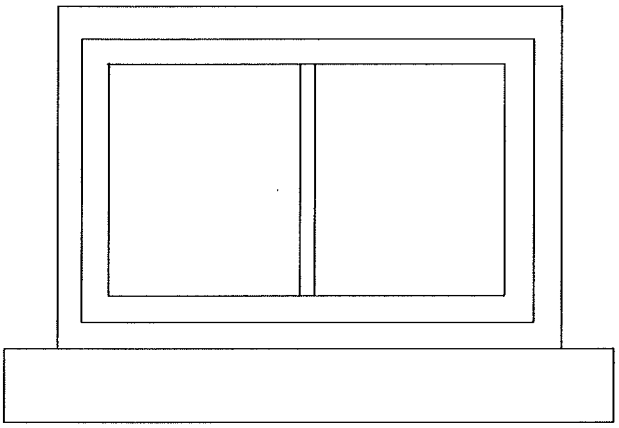
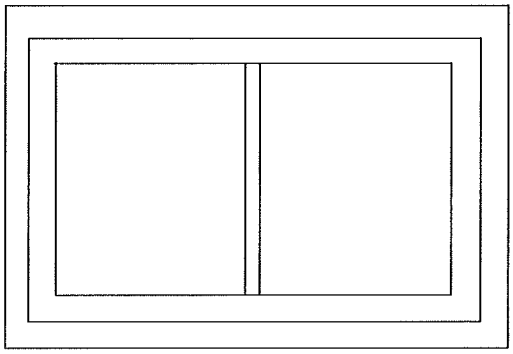
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	3 / 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W003	Scale / Échelle NTS		

Sault Canal Superintendent's Residence





- NO WINDOW
  FRAME
  EXITS
- OPENING USED AS CHASE

EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE UNDER PORCH - NOT ACCESSABLE FROM EXT

ARE WINDOWS OPERABLE?

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED?

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT?

STRAIGHT AND SQUARE OPENINGS?

ARE THE SILLS SLOPED / DRIP EDGES PRESENT?

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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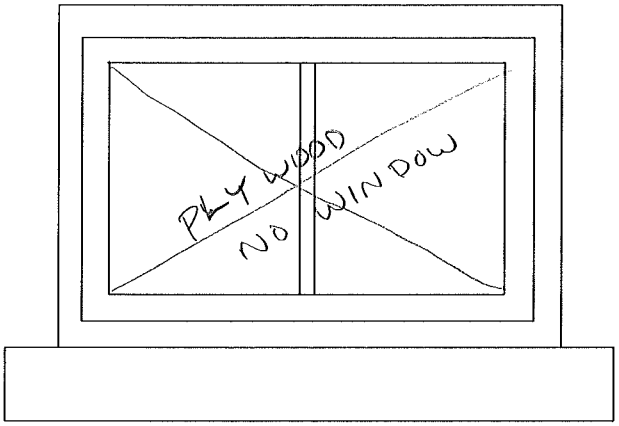
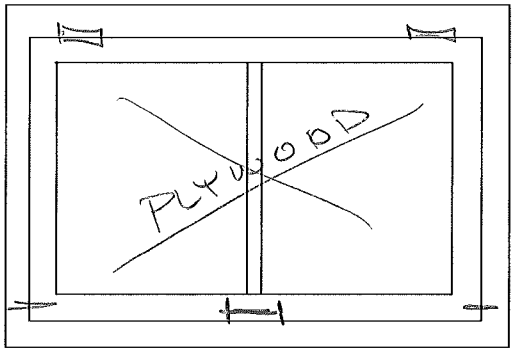
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8Nov '12	Page	4 / 34
Measured by: / Mesures par	Rec. by: / Noté par P.AMARAL	W004	Scale / Échelle NTS		

Sault Canal Superintendent's Residence





PLYWOOD COVERED HINGED, AT TOP (AWNING OPERATION)

EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS WOOL - SEE PICS - REPLACE ALL!

ARE WINDOWS OPERABLE? NO WINDOWS / SASH

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N/A

ARE COMPONENTS INTACT, LOOSE OR MISSING? SILL IN PIECES

BROKEN GLASS PRESENT? NO GLASS

STRAIGHT AND SQUARE OPENINGS? Y

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y

SEALANT / CAULKING / PUTTY AROUND UNITS? MORTAR PERIM OF FRAME - FAILED!

GAPS PRESENT AROUND PERIMETER OF OPENINGS? Y - BIG ONES

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? SILL

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS? YES!

PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT

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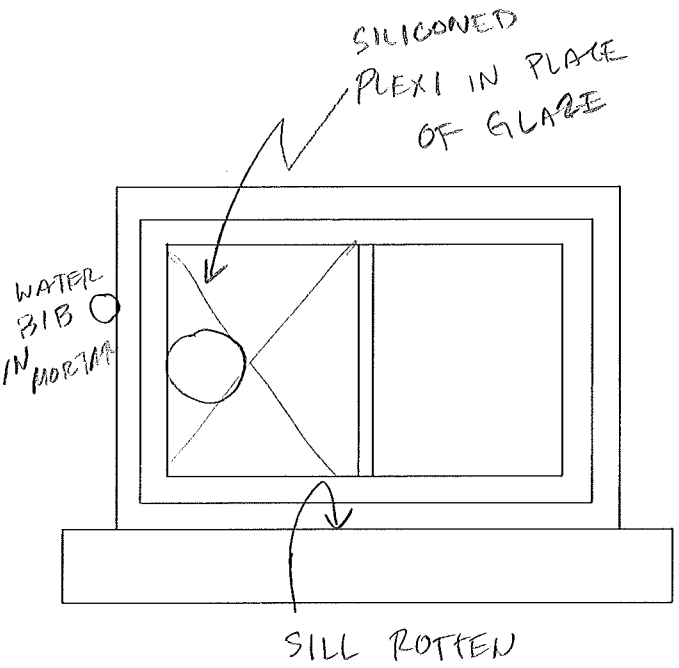
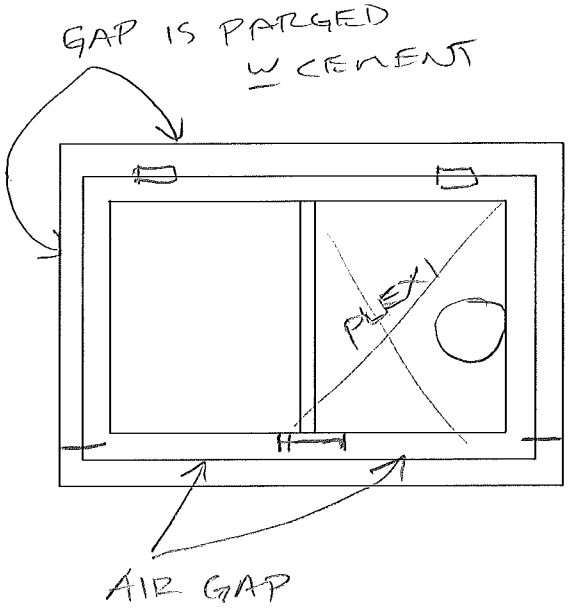
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 5 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W005	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W001

ARE WINDOWS OPERABLE? N - FIXED

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N/A

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT? N - PLEXI IN PLACE OF ONE PANE

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? MORTAR PERIM - FAILED!

GAPS PRESENT AROUND PERIMETER OF OPENINGS? MORTAR HOLES + GAPS

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? SILL

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS? SILL IS ROTTEN

PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT ROTTEN SILL BUT FRAME + WALL JUST PF

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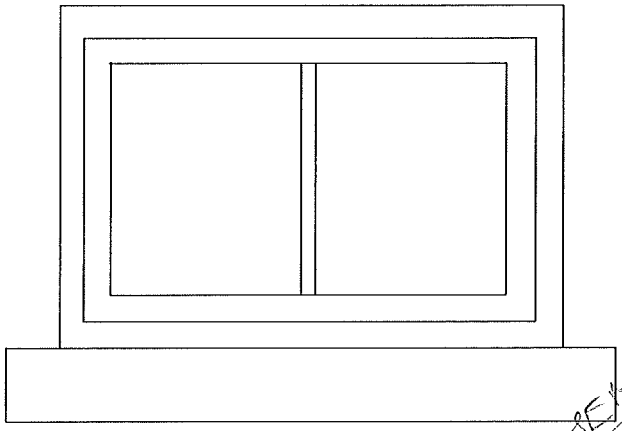
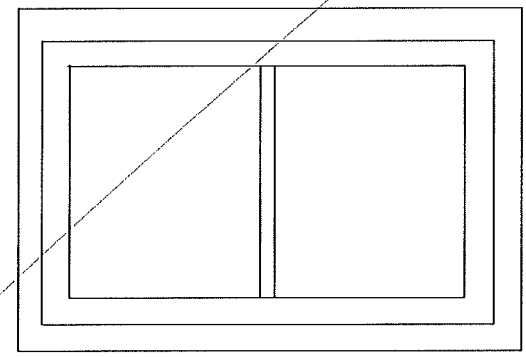
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	6 / 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W006	Scale / Échelle NTS		

Sault Canal Superintendent's Residence





STAIRS TO BASEMENT?

EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE _____

ARE WINDOWS OPERABLE? _____

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? _____

ARE COMPONENTS INTACT, LOOSE OR MISSING? _____

BROKEN GLASS PRESENT? _____

STRAIGHT AND SQUARE OPENINGS? _____

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? _____

SEALANT / CAULKING / PUTTY AROUND UNITS? _____

GAPS PRESENT AROUND PERIMETER OF OPENINGS? _____

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? _____

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP? _____

DETERIORATION OF FRAME AROUND OPENINGS? _____

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT) _____

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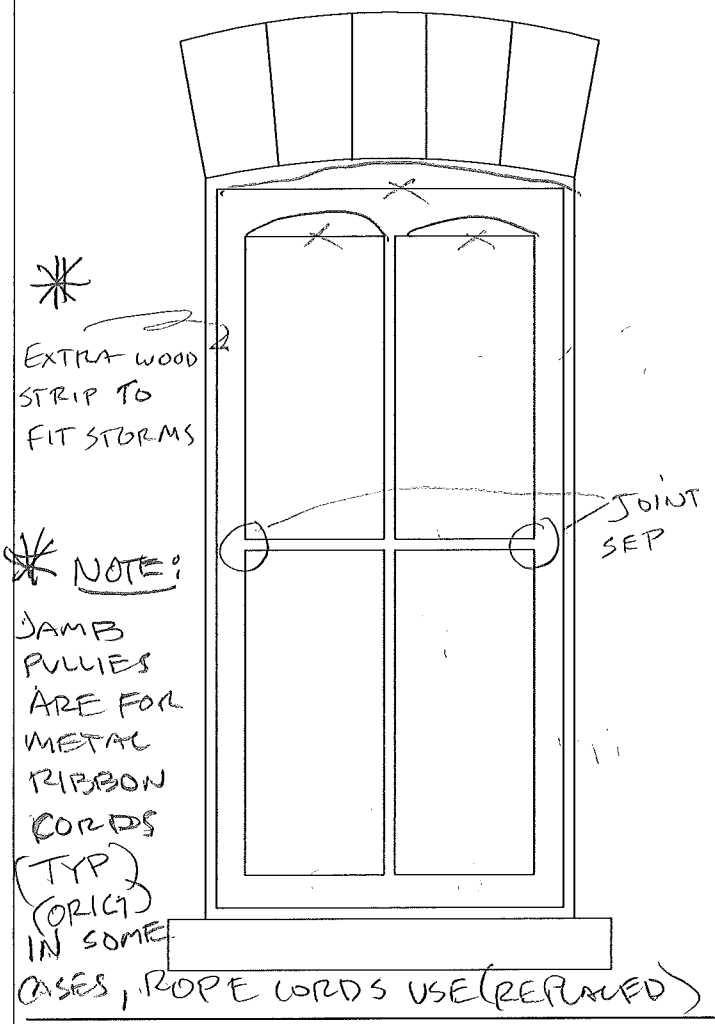
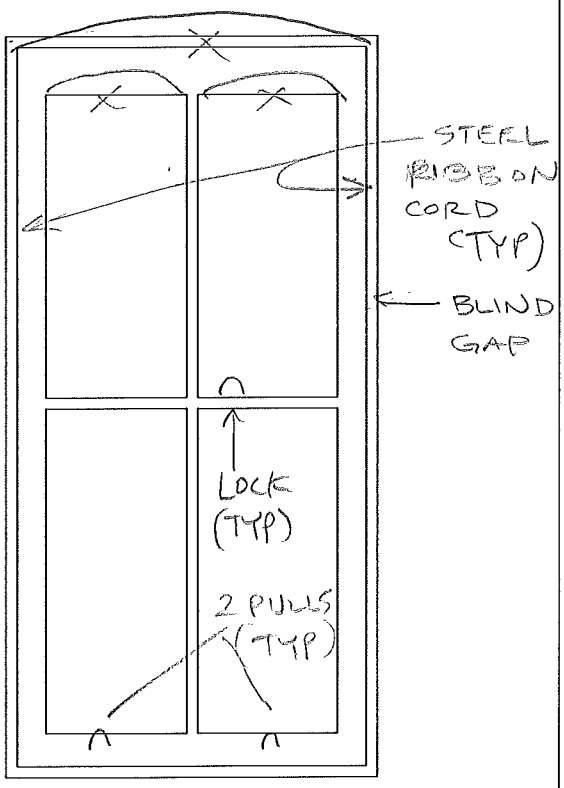
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	7 of 24
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W101	Scale / Échelle	NTS	

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION — Sit-2/2 - ARCHED HEAD — INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: WOOD SASH + FRAME w 2/2 STORMS (LOOK NEWER)

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? FAILED PUTTY (TYP.

GAPS PRESENT AROUND PERIMETER OF OPENINGS? GAPS - SEALANT FAILURE

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

(DIRT) / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE) / (WEATHERING) / SPLITS / (CHECKS) / ROT) SILL HAS MINOR CHECK

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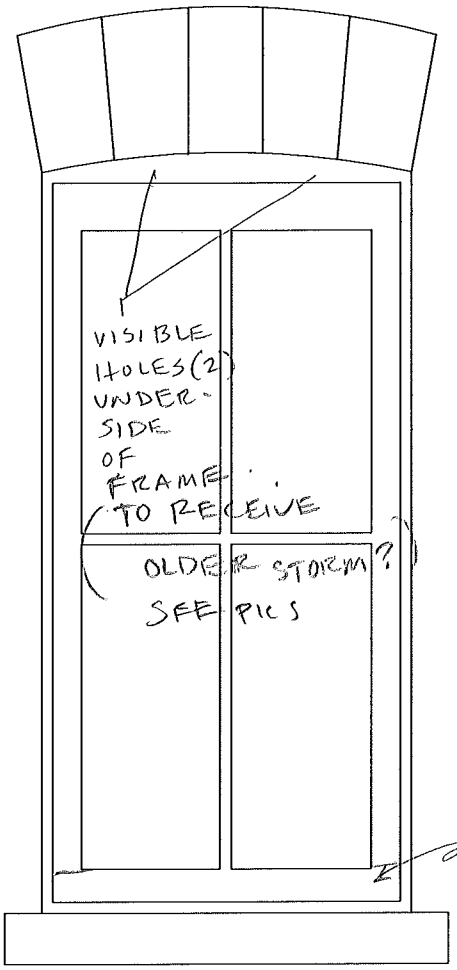
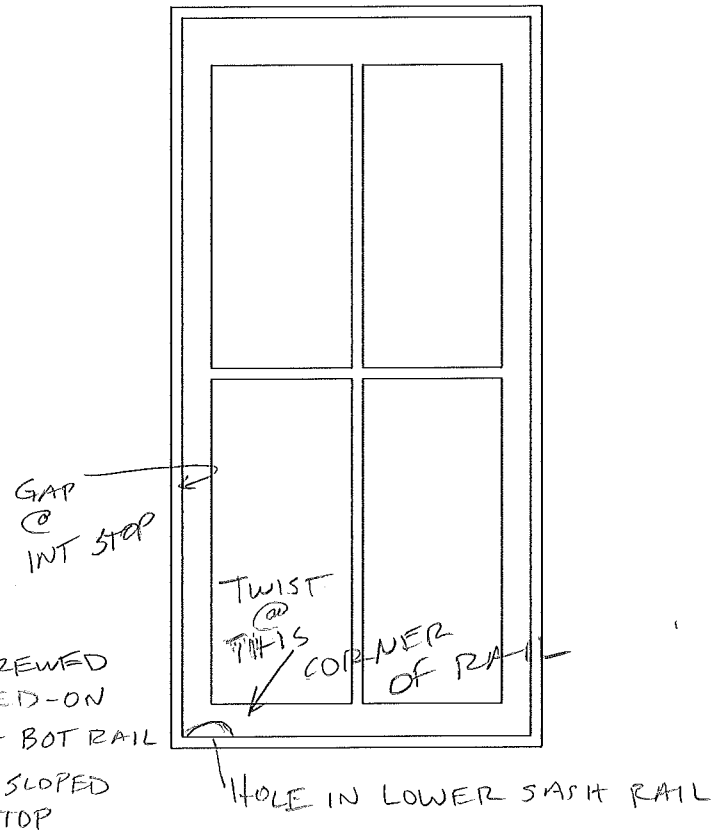
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 8 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W102	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION



INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W101

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N

ARE COMPONENTS INTACT, LOOSE OR MISSING? ✓

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? Y - ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? YES - PERIM IS MORTAR = FAILING

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

(DIRT) / (DEBRIS) / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS? N

(PAINT FAILURE) / (WEATHERING) / SPLITS / CHECKS / ROT)

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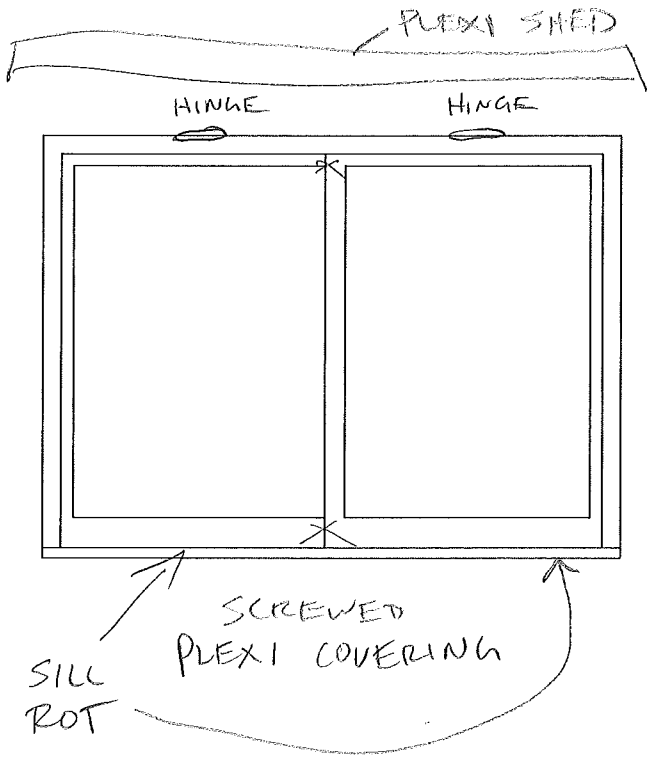
Project # R.059922.001

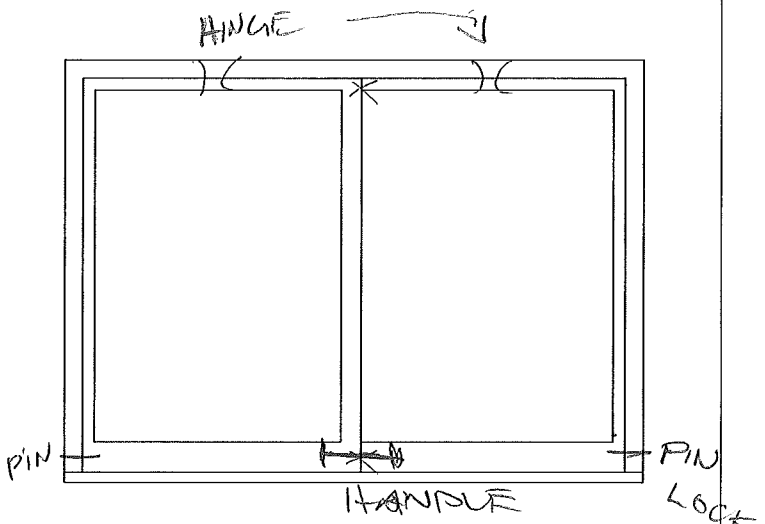
Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	9 / 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W106	Scale / Échelle	NTS	

Sault Canal Superintendent's Residence

W 103 – 105 – PHOTOS ONLY
– CLOSED-IN PORCH



SCREEN INT



SEE PHOTOS!

EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE NOT ORIG - WOOD SASH + FRAME - AWN

ARE WINDOWS OPERABLE?

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED?

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT?

STRAIGHT AND SQUARE OPENINGS?

ARE THE SILLS SLOPED / DRIP EDGES PRESENT?

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

Conservation & Landscape Architecture
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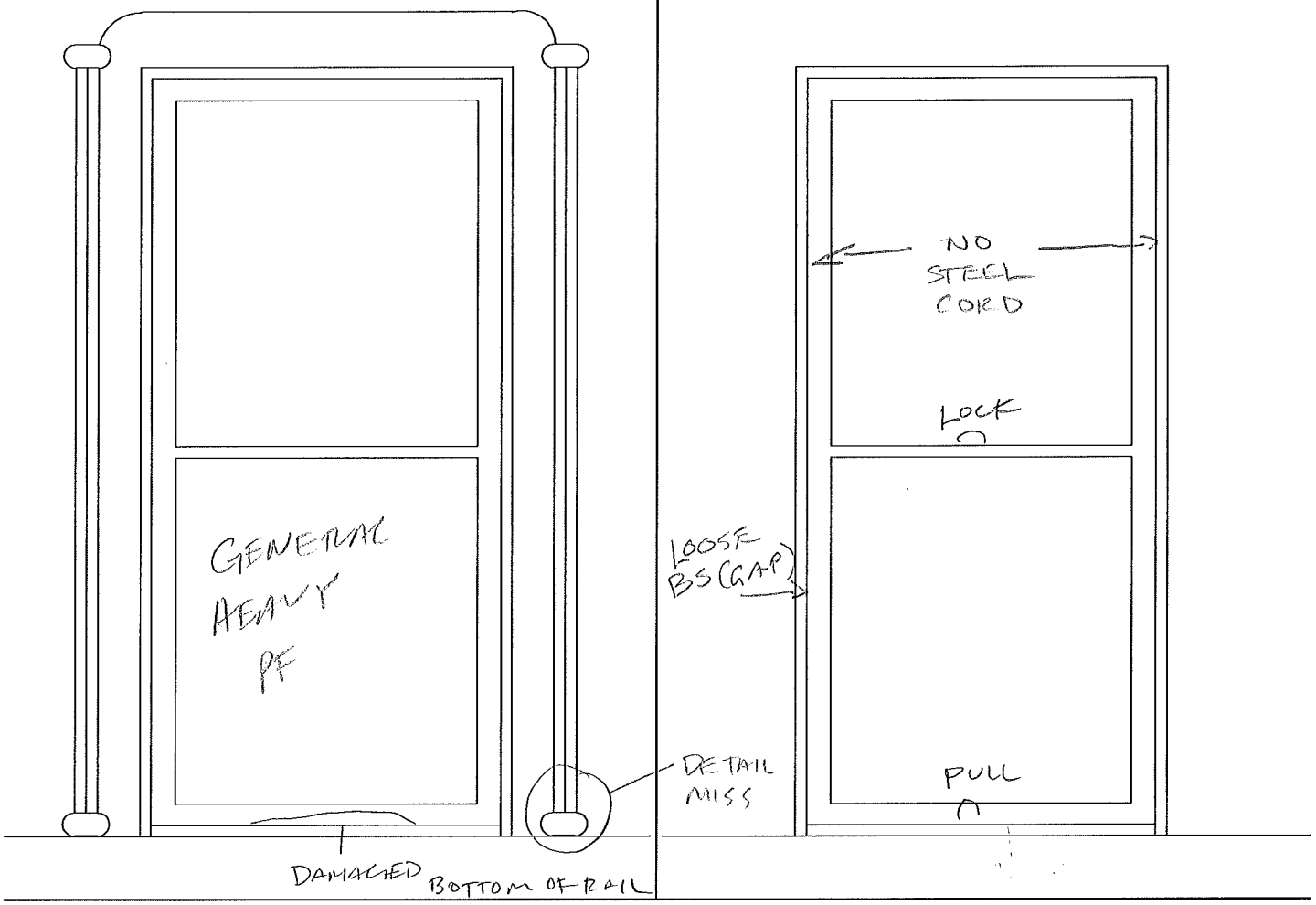
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	Page
		8 Nov '12	10 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W107	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION — SH-1/1 W WOOD STORM (ORIG) — INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: WOOD SASH + FRAME — PART OF BAY WINDOW

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? BOTH RIBBON CORDS GONE

ARE COMPONENTS INTACT, LOOSE OR MISSING? INTACT

BROKEN GLASS PRESENT?

STRAIGHT AND SQUARE OPENINGS? Y

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? STORM BASE EXHIBITS ROT + CHECKING

(DIRT) / (DEBRIS) / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE) / (WEATHERING) / SPLITS / (CHECKS) / ROT)

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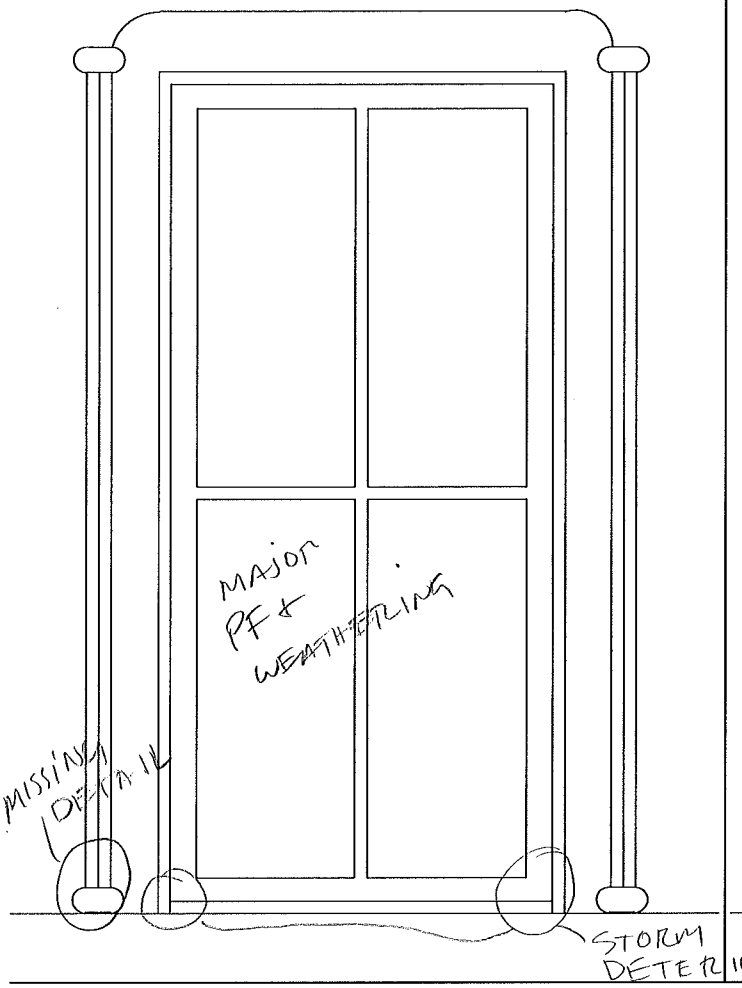
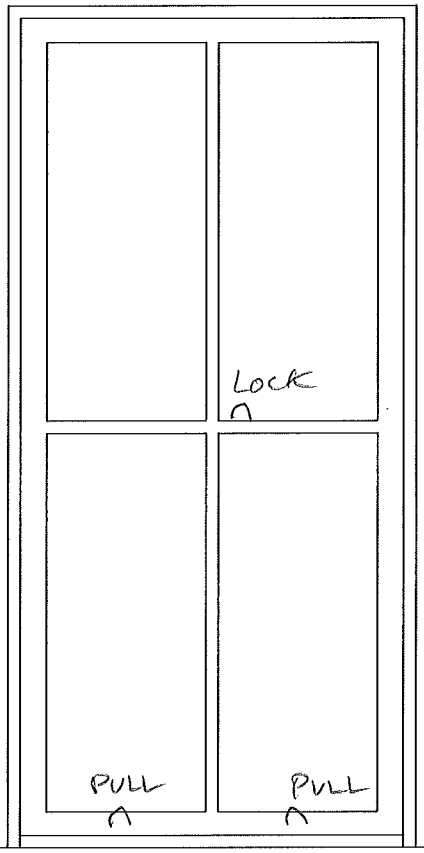
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 11 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W108	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION



INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W107 (SEE PICS)

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? LOCK SEIZED (PAINTED)

ARE COMPONENTS INTACT, LOOSE OR MISSING? ✓

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? Y

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? —

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

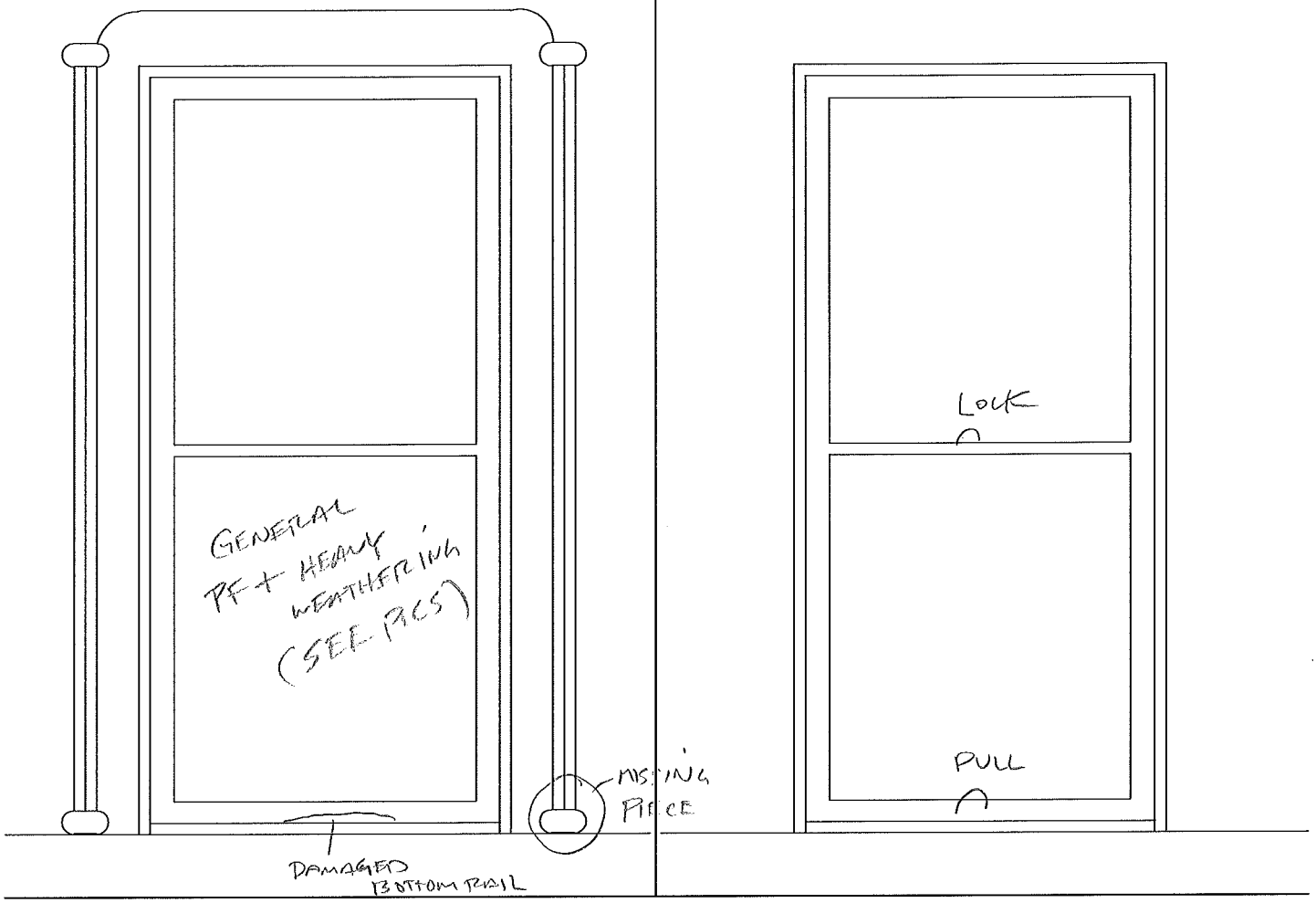
(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

Conservation & Landscape Architecture
A&ER / RPB / P&TS / PWGSC

Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	12 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W109	Scale / Échelle NTS		

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W107

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N

ARE COMPONENTS INTACT, LOOSE OR MISSING? Y

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? Y

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

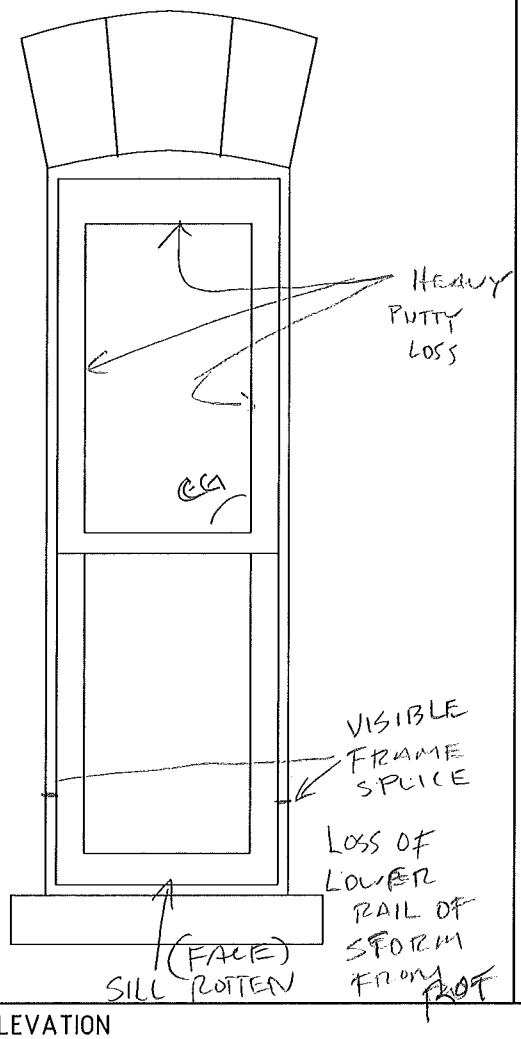
(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

Conservation & Landscape Architecture
A&ER / RPB / P&TS / PWGSC

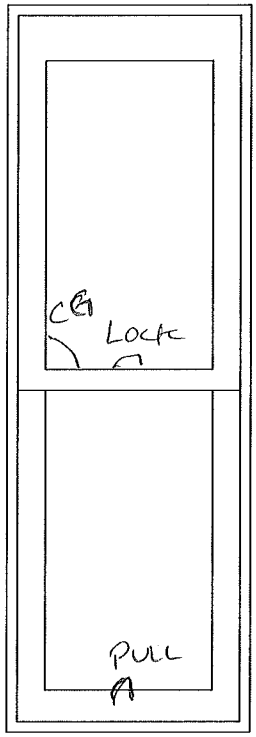
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 13 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W110	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION



INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W101

ARE WINDOWS OPERABLE? Y

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N

ARE COMPONENTS INTACT, LOOSE OR MISSING? Y

BROKEN GLASS PRESENT? Y - SEE DWG

STRAIGHT AND SQUARE OPENINGS? Y

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? —

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

Conservation & Landscape Architecture
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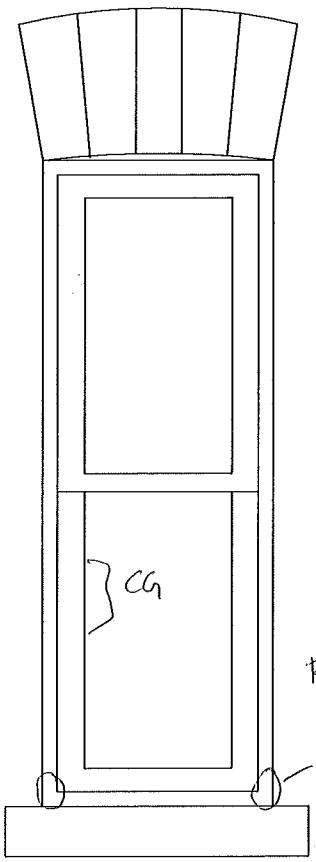
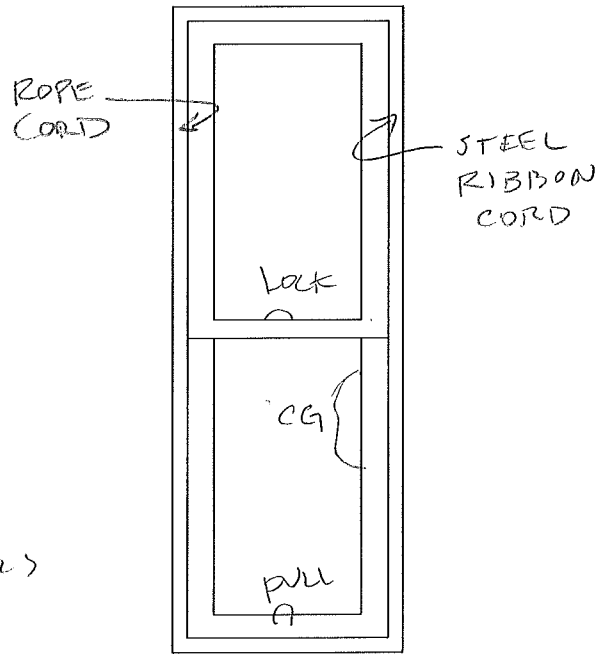
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 14 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL.	W111	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W110

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO

ARE COMPONENTS INTACT, LOOSE OR MISSING? ✓

BROKEN GLASS PRESENT? YES

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? N

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP? (TYP) ON TOP OF SILL BETWEEN STORM + SASH

DETERIORATION OF FRAME AROUND OPENINGS? EXT @ BASE

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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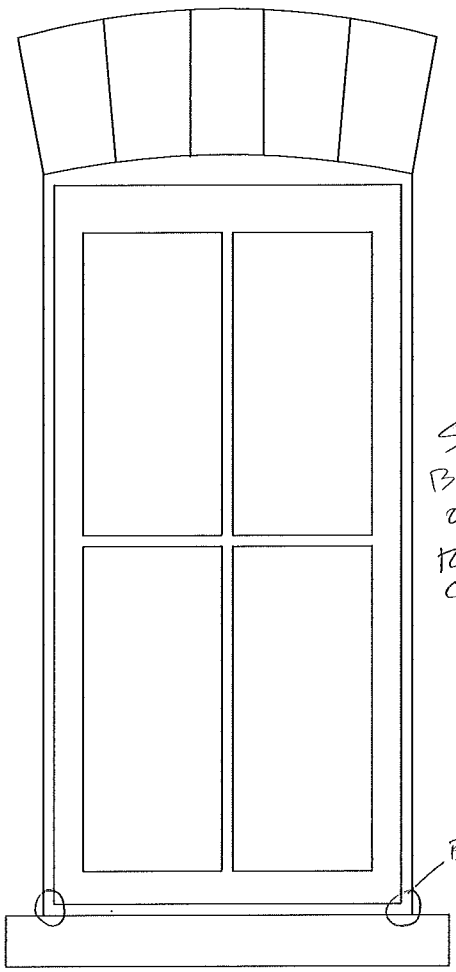
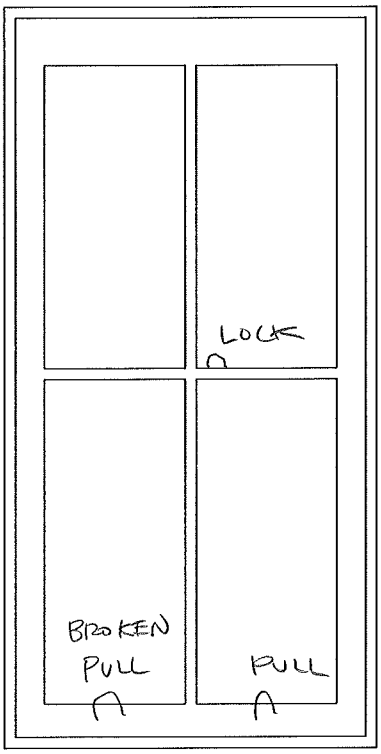
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 15 / 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL.	W112	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION



INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W111

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? ONE PULL TAB BROKEN.

ARE COMPONENTS INTACT, LOOSE OR MISSING? INT BS SEPAR FROM JAMB

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? PERIM MORTAR FAILING

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE) / (WEATHERING) / SPLITS / CHECKS / (ROT) @ BASE OF FRAME

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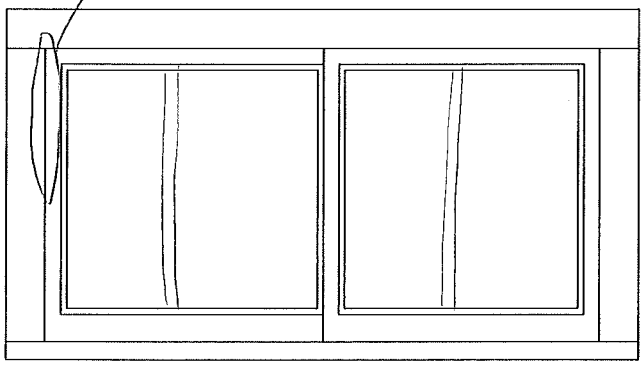
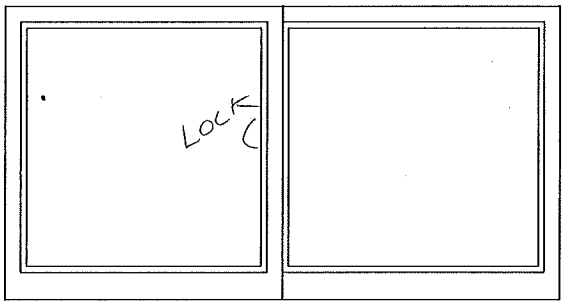
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	16 / 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W113	Scale / Échelle NTS		

Sault Canal Superintendent's Residence



SEE (PICS)



EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE WOOD WIN - FRAME - FIXED SLIDER

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED?

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT?

STRAIGHT AND SQUARE OPENINGS?

ARE THE SILLS SLOPED / DRIP EDGES PRESENT?

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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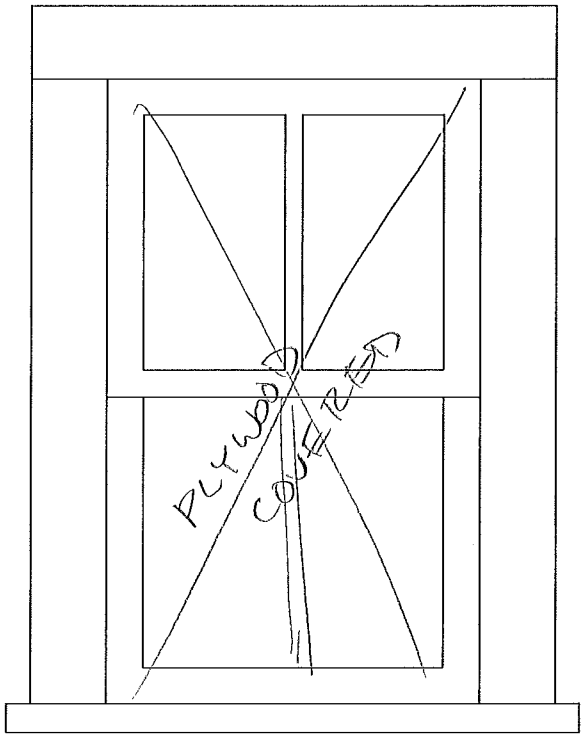
Project # R.059922.001

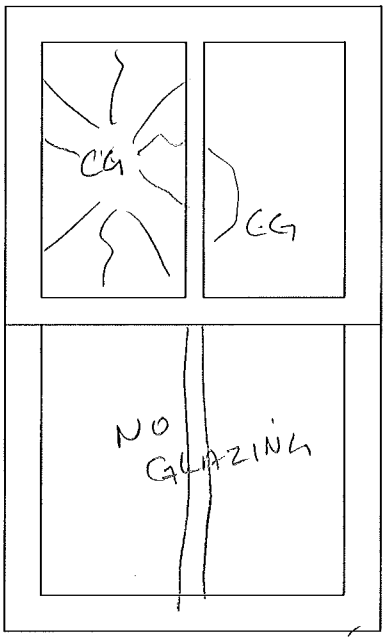
Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 17 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL.	W114	Scale / Échelle NTS

Sault Canal Superintendent's Residence



(SEE PICS)

EXTERIOR ELEVATION



NO HARDWARE

SEE PICS

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE WOOD WIN + FRAME

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO HARDWARE

ARE COMPONENTS INTACT, LOOSE OR MISSING? N

BROKEN GLASS PRESENT? YES!

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT ~~/ CAULKING / PUTTY~~ AROUND UNITS? ✓

GAPS PRESENT AROUND PERIMETER OF OPENINGS? N

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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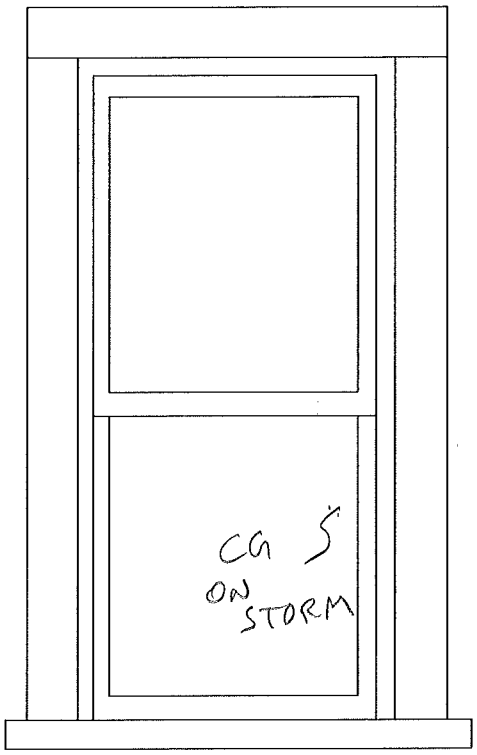
Project # R.059922.001

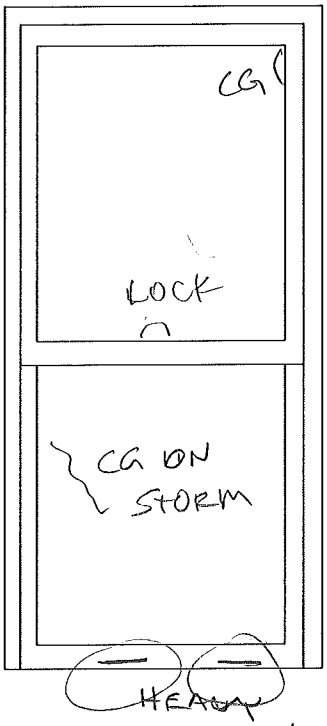
Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 18 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	~~W115~~	Scale / Échelle NTS

Sault Canal Superintendent's Residence

* PHOTOS INDICATE W116 *



(SEE PICS)



EXTERIOR ELEVATION SH - 1/1 INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: WOOD WIN + FRAME / W WOOD STORM

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO PULLIES, NO CORDS, NO PULL

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT? Y

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y / Y

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? —

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP? BETWEEN STORM + SASH ON SILL (TYP)

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

W116

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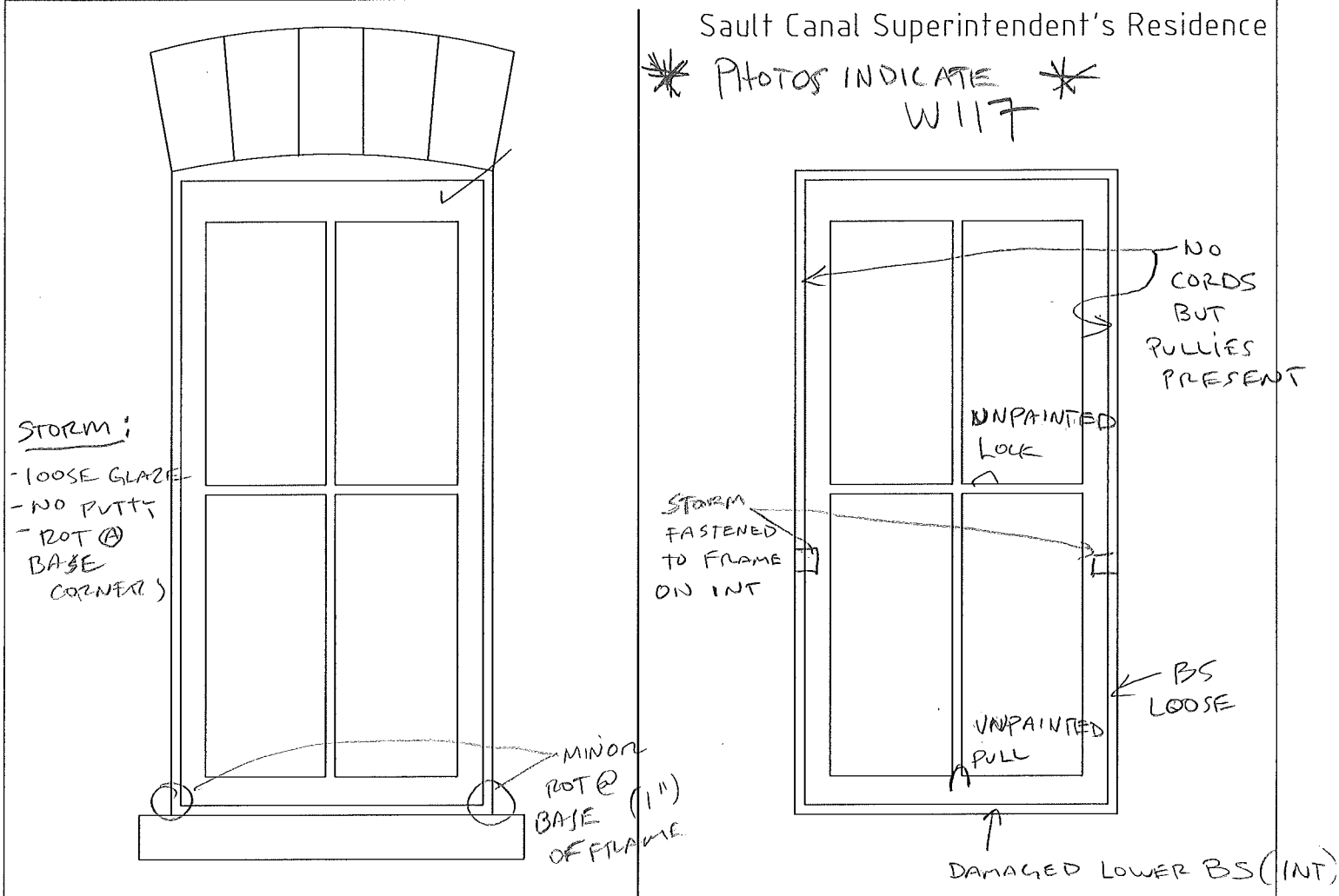
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 19 of 34
Measured by: / Mesures par	Rec. by: / Noté par P.AMARAL ~~W116~~	Scale / Échelle NTS	

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W101 W STORM

ARE WINDOWS OPERABLE? Y

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO CORDS

ARE COMPONENTS INTACT, LOOSE OR MISSING? BS LOOSE

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? SAME AS ALL

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP? YES!

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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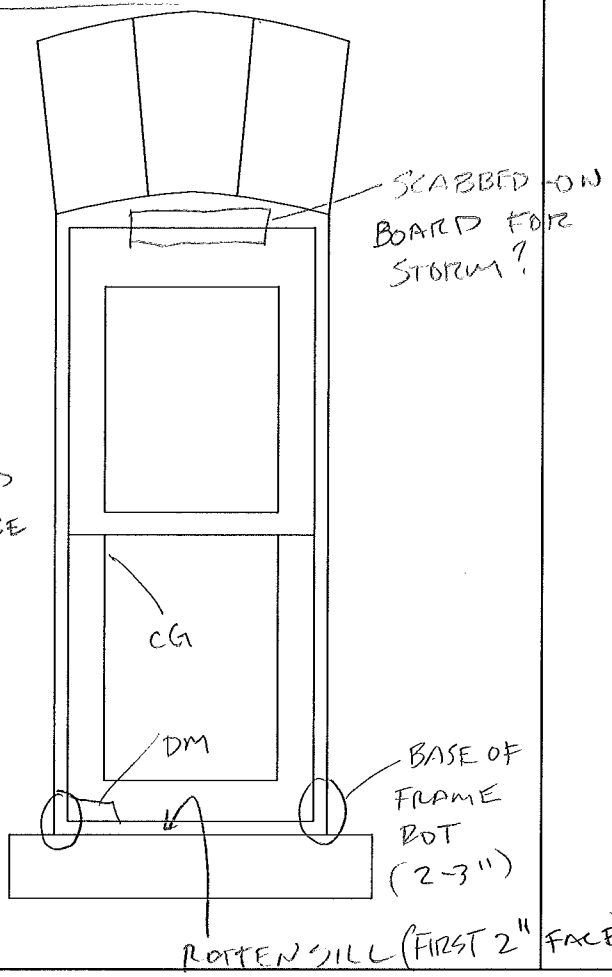
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 20/34
Measured by: / Mesures par	Rec. by: / Noté par P.AMARAL	W117	Scale / Échelle NTS

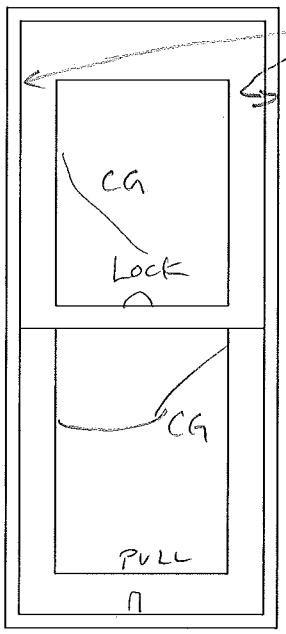
Sault Canal Superintendent's Residence

PHOTOS ARE TRUE TO THIS NUMBER

WASHROOM WINDOW



STORM:
- UPPER GLAZE CRACKED
- ROT @ BASE CORNERS



EXTERIOR ELEVATION | INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: SAME AS W101 SH-11/1 W STORM

ARE WINDOWS OPERABLE? Y

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO CORDS OR PULLIES - HOLES @ JAMBS

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT? Y

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS? MORTAR

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT @ BASE

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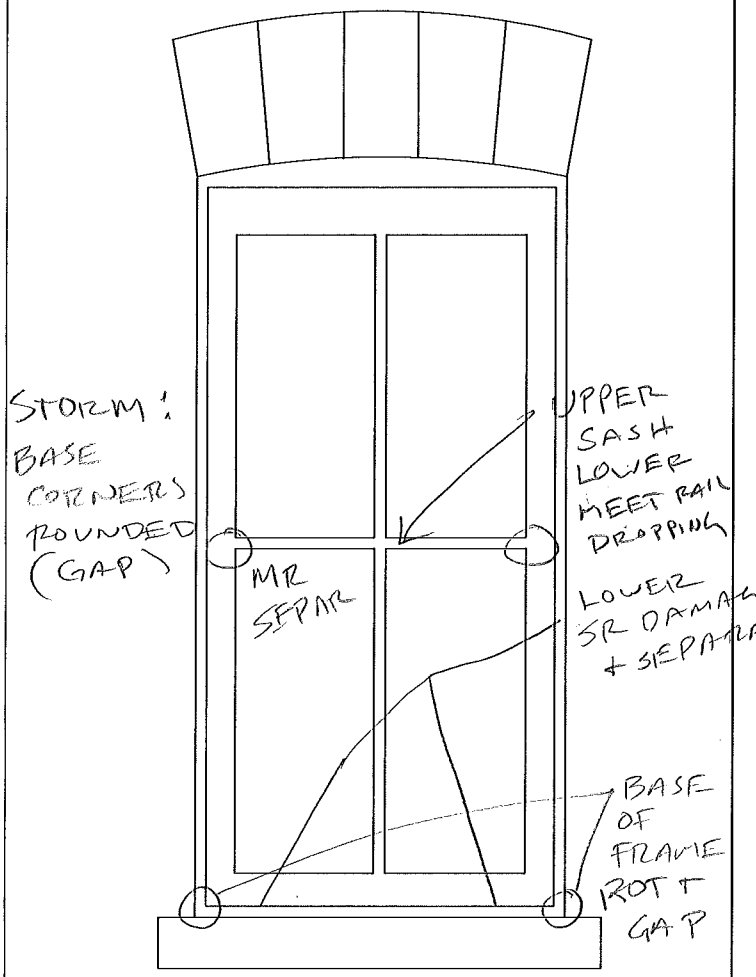
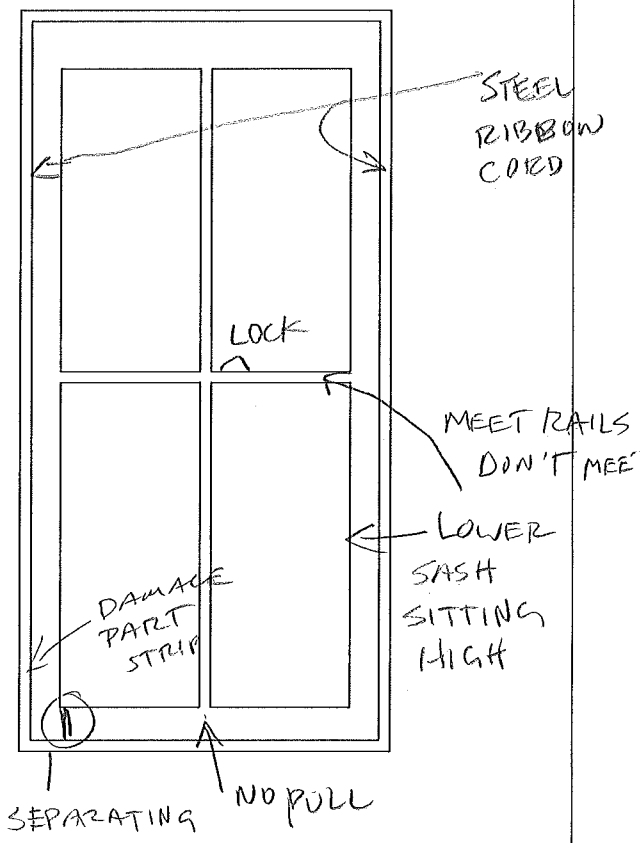
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 21 of 34
Measured by: / Mesures par	Rec. by: / Noté par P.AMARAL	W118	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION



INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: SAME AS W101 ✓ STORM

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO PULL / SEIZED LOCK ⇨ NO VENT SLOT ON STORM

ARE COMPONENTS INTACT, LOOSE OR MISSING? LOWER SASH RAIL SEPARATING

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? ✓

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS? @ BASE OF FRAME

PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT @ BASE OF FRAME

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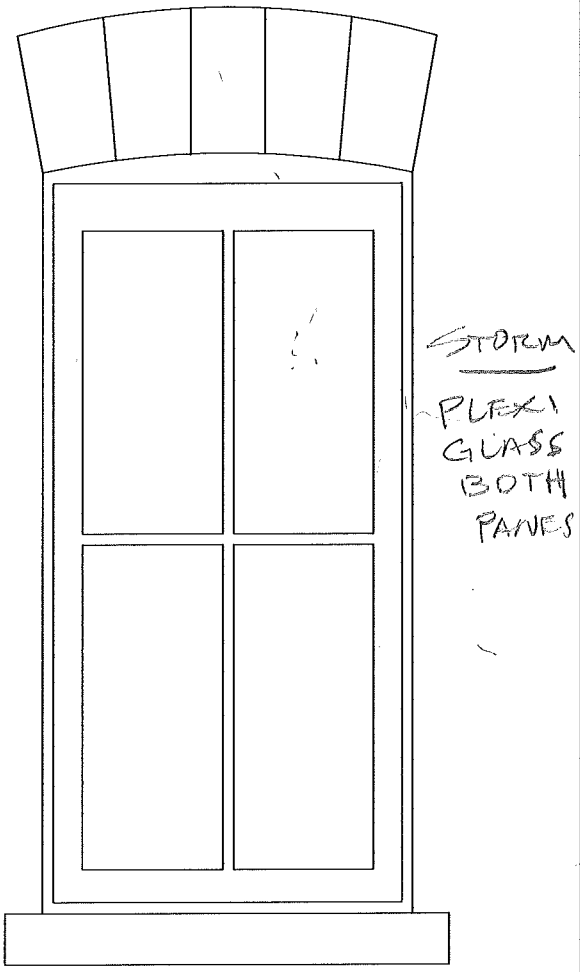
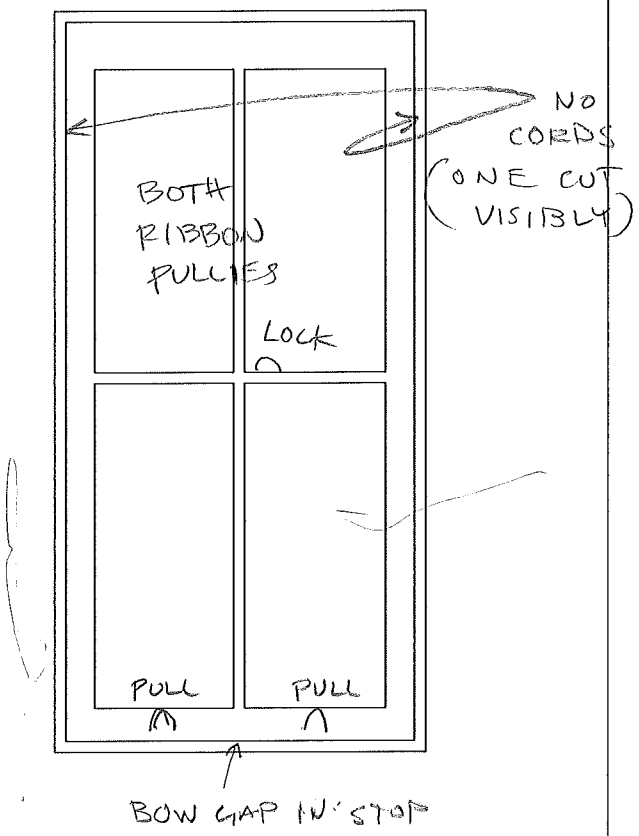
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 22 of 34
Measured by: / Mesures par	Rec. by: / Noté par P.AMARAL	W201	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS 204 - ARCHED HEAD

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? CORDS CUT AND MISSING

ARE COMPONENTS INTACT, LOOSE OR MISSING? N

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? Y - ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? —TYP COND MS

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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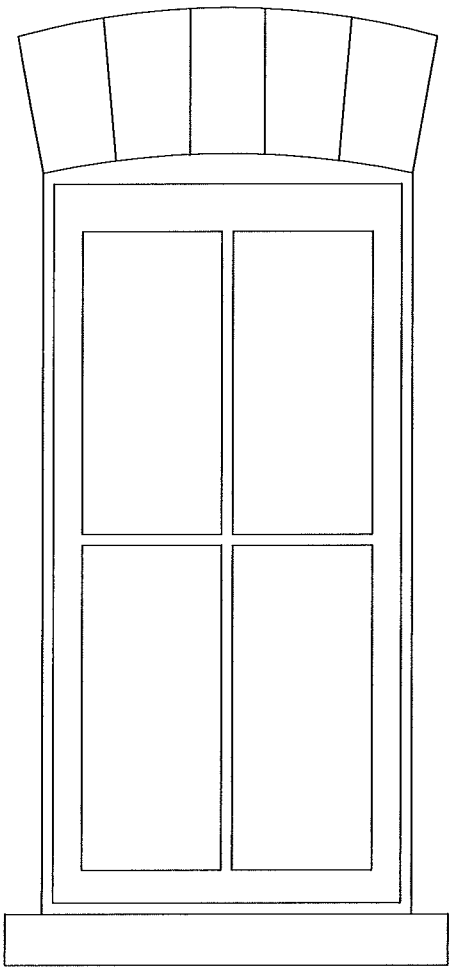
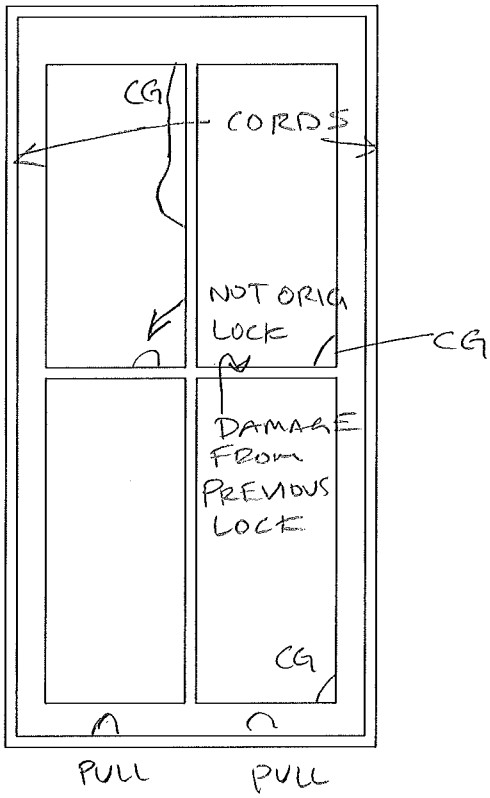
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 23/34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W2012	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS 203 ARCHED HEAD

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N

ARE COMPONENTS INTACT, LOOSE OR MISSING? GOOD

BROKEN GLASS PRESENT? Y

STRAIGHT AND SQUARE OPENINGS? ✓ - ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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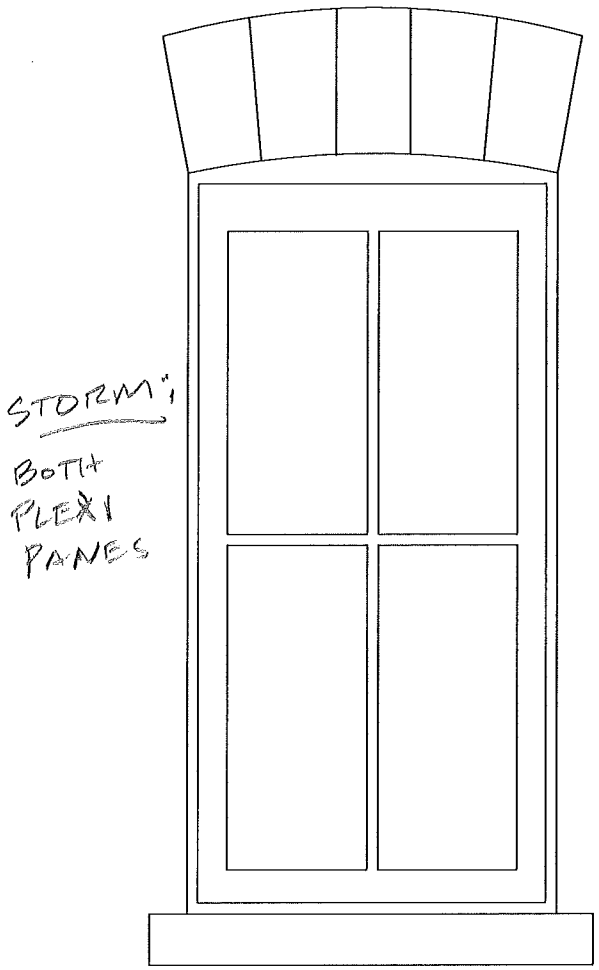
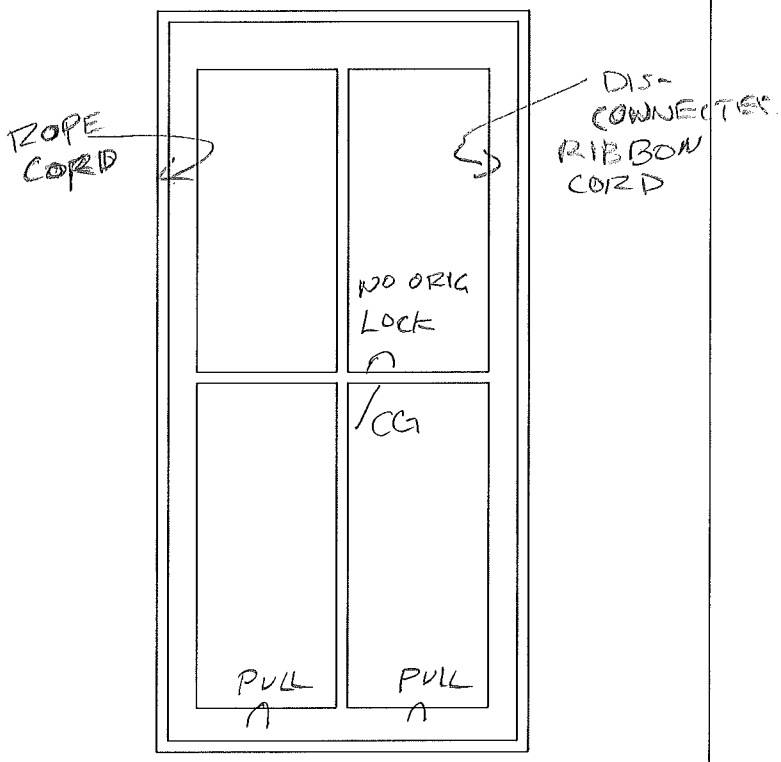
Project # R.059922.001

Project & Location / Nom et lieu du relevé: Sault Ste. Marie NHSC - Window Condition Assessment			Date: 8 Nov '12	Page 24/34 of
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W203	Scale / Échelle NTS	

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: SAME AS W204 - ARCHED HEAD

ARE WINDOWS OPERABLE? Y

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? LOCK NOT ORIG, RIBBON CORD DISCONNECTED

ARE COMPONENTS INTACT, LOOSE OR MISSING? —

BROKEN GLASS PRESENT? Y

STRAIGHT AND SQUARE OPENINGS? Y - ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP? ON SILL BETWEEN SASH + STORM

DETERIORATION OF FRAME AROUND OPENINGS? —

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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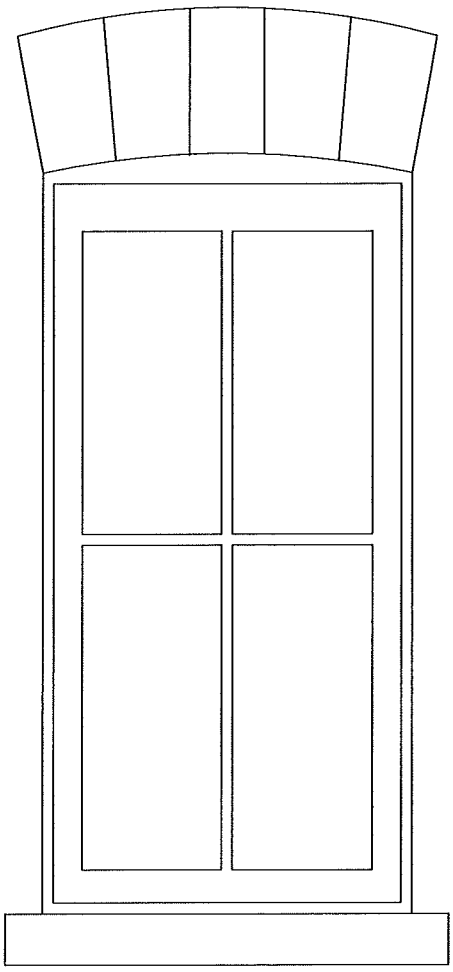
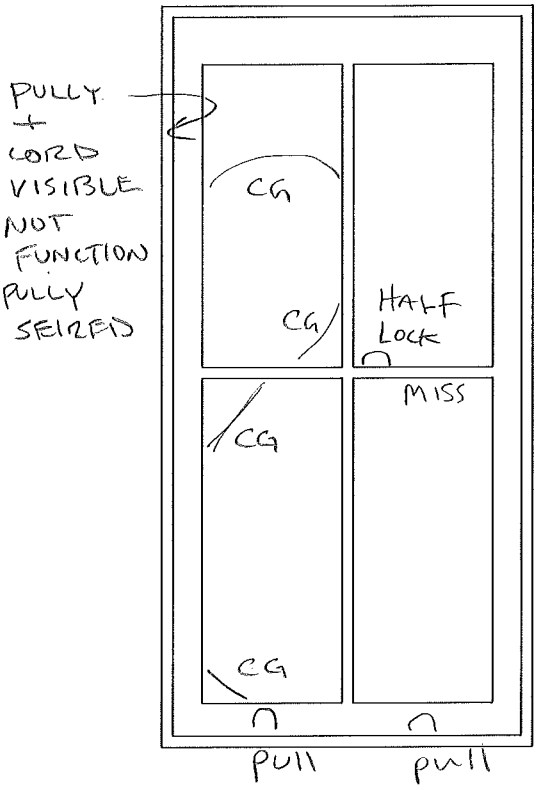
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 25 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W204	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE PAINTED WOOD SASH & FRAME SH 2/2 – ARCHED HEAD

ARE WINDOWS OPERABLE? Y

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? MISS HALF SASH LOCK

ARE COMPONENTS INTACT, LOOSE OR MISSING? N

BROKEN GLASS PRESENT? Y

STRAIGHT AND SQUARE OPENINGS? Y – ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y/Y

SEALANT / CAULKING / PUTTY AROUND UNITS? –

GAPS PRESENT AROUND PERIMETER OF OPENINGS? –

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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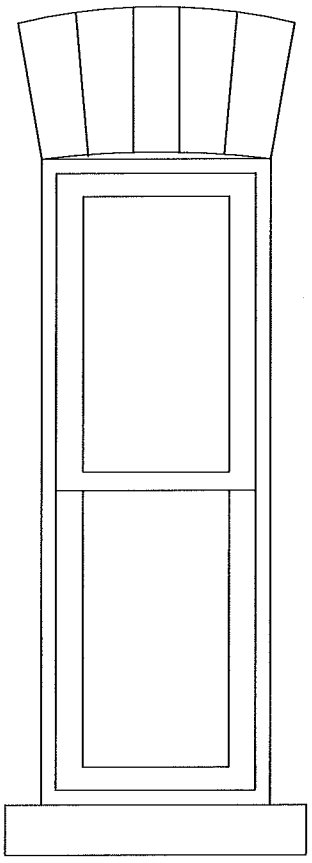
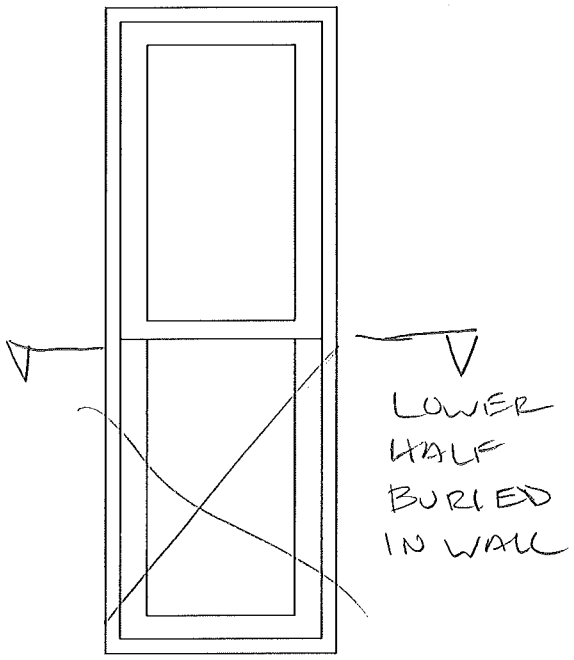
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 26 / 34
Measured by: / Mesures par	Rec. by: / Noté par P.AMARAL	W205	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION



SEE PHOTOS

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE MODIFIED ORIGINAL TO FIT WASHROOM

ARE WINDOWS OPERABLE? NO - FIXED

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO HARDWARE

ARE COMPONENTS INTACT, LOOSE OR MISSING? —

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT?

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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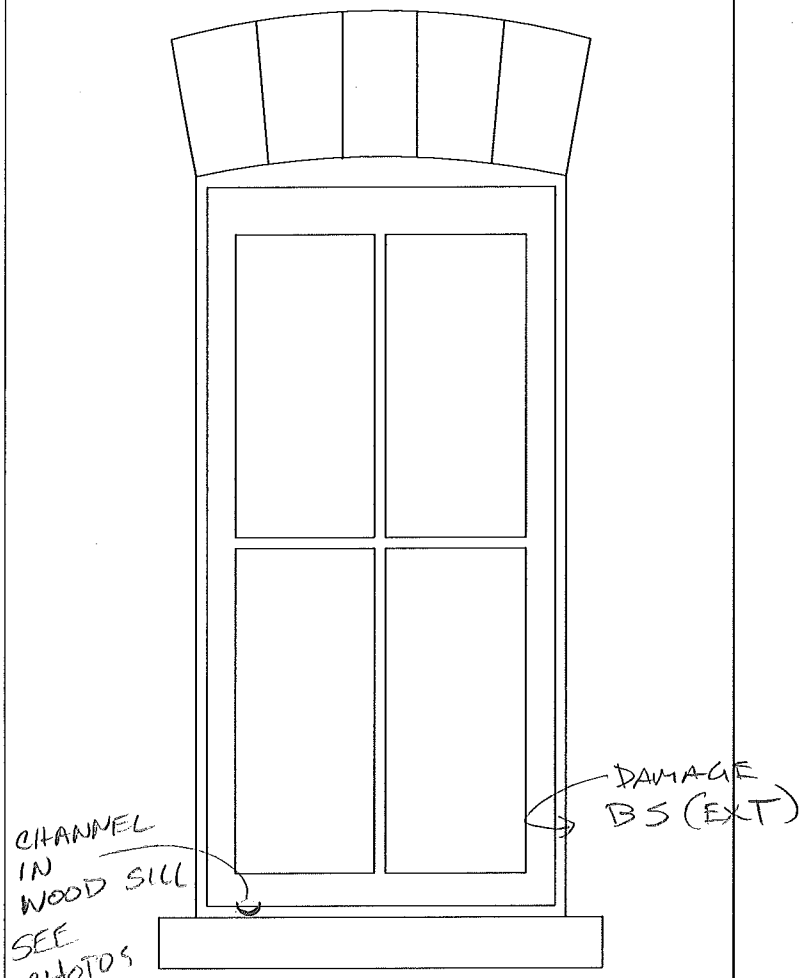
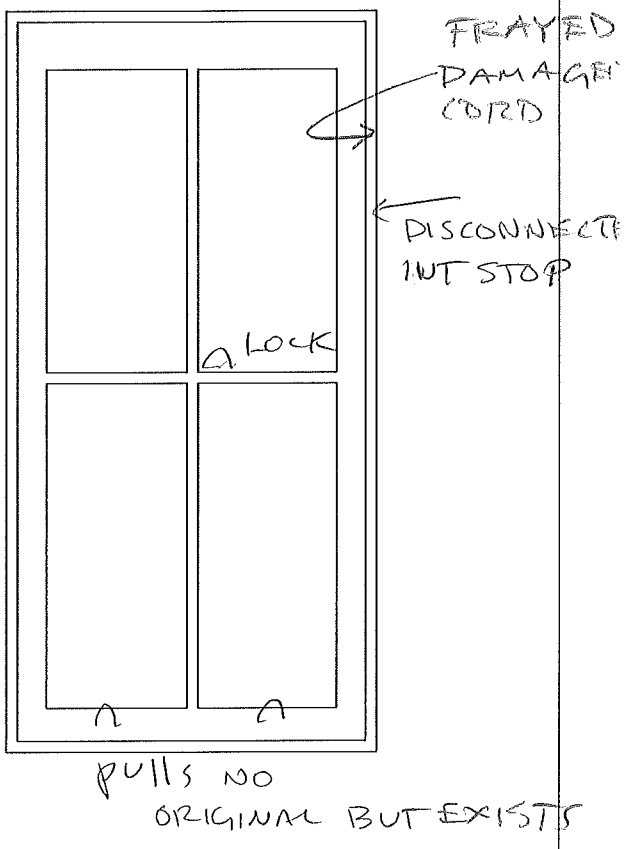
Project # R.059922.001

Project & Location / Nom et lieu du relevé: Sault Ste. Marie NHSC - Window Condition Assessment		Date: 8 Nov '12	Page: 27 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W206	Scale / Échelle: NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE: SAME AS 204 — NO STORM

ARE WINDOWS OPERABLE? Y

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? PULLS NOT ORIGINAL

ARE COMPONENTS INTACT, LOOSE OR MISSING? INT BS SEE DWG

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? ✓

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? NO FLAT (VISIBLY

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

(DIRT) / (DEBRIS) / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE) / (WEATHERING) / SPLITS / (CHECKS) / ROT)

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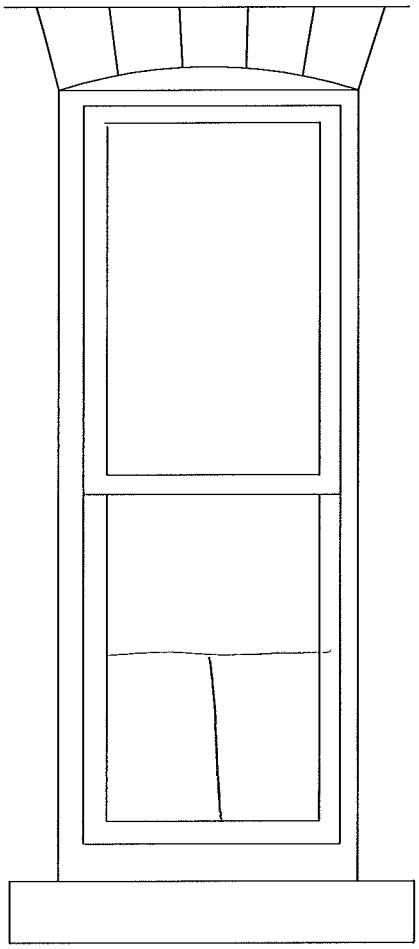
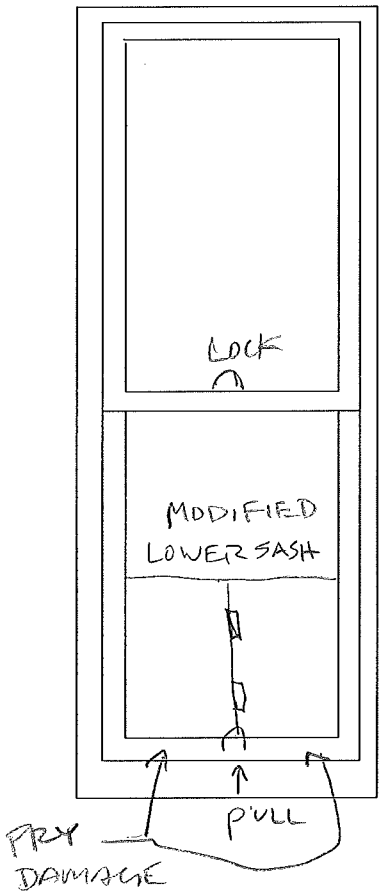
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 28 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W207	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS 204 – STEEL RIBBON CORD

ARE WINDOWS OPERABLE? Y

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? N

ARE COMPONENTS INTACT, LOOSE OR MISSING? Y

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? LOWER SASH CLOSES ASKEW

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y/Y

SEALANT / CAULKING / PUTTY AROUND UNITS? –

GAPS PRESENT AROUND PERIMETER OF OPENINGS? –

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(~~PAINT FAILURE~~ / WEATHERING / SPLITS / CHECKS / ROT) HEAVY SILL WEATHERING

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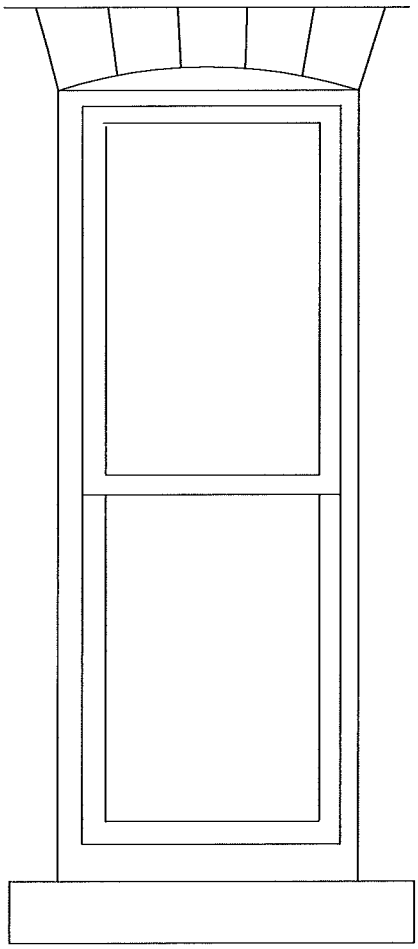
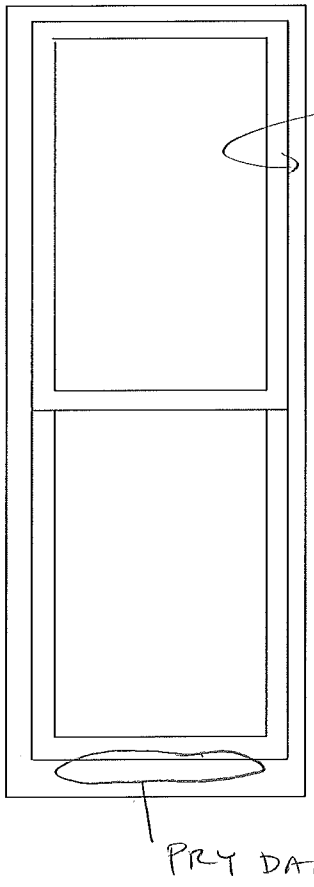
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 29/34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W208	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS W204

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? MISS METAL RIBBON CORD - LOCK DEFORMED

ARE COMPONENTS INTACT, LOOSE OR MISSING? Y

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? Y

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? —

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT) TYP.

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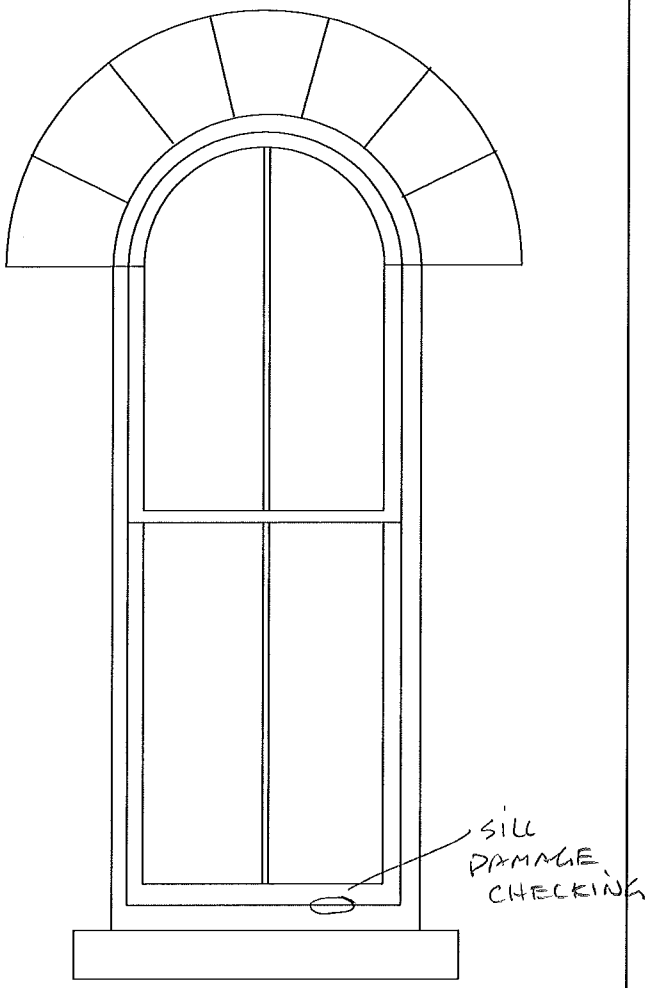
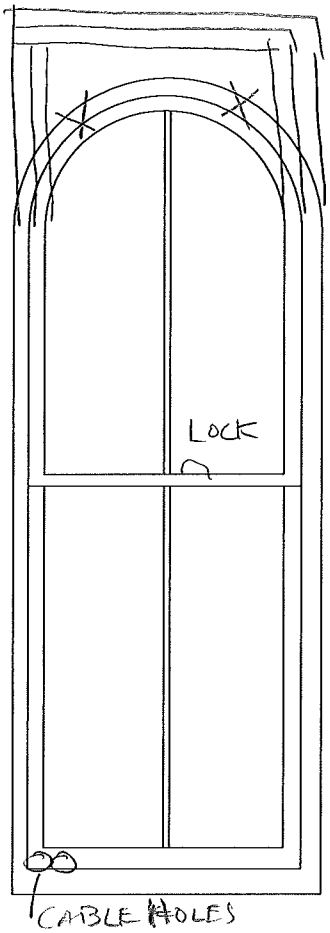
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 30/34 of
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL.	W209	Scale / Échelle NTS

Sault Canal Superintendent's Residence



EXTERIOR ELEVATION



INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE WOOD WIN + FRAME + STORM

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? NO PULLS, NO CORDS, PULLIES PRESENT

ARE COMPONENTS INTACT, LOOSE OR MISSING? GOOD

BROKEN GLASS PRESENT? N

STRAIGHT AND SQUARE OPENINGS? UNIQUE ARCHED HEAD, ONLY ONE LIKE TAIS

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? —

(DIRT) / (DEBRIS) / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE) / (WEATHERING) / SPLITS / (CHECKS) / ROT) MINOR

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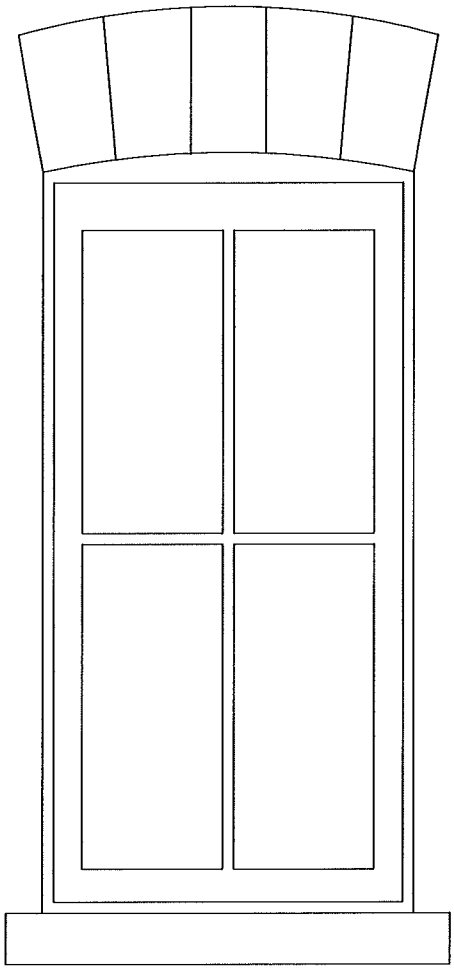
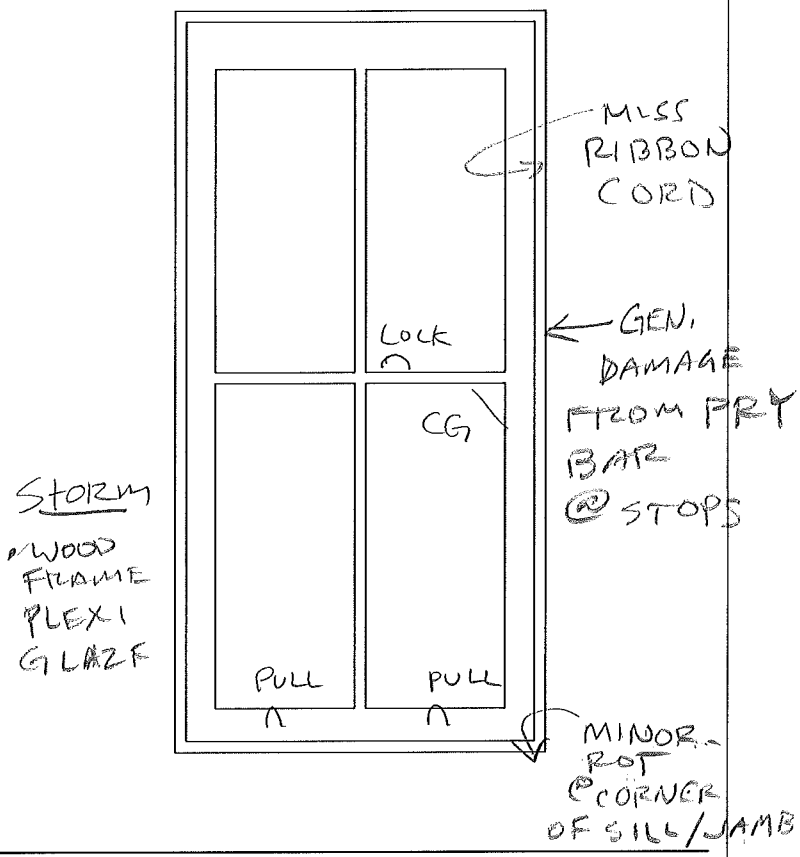
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 31 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W210	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION ~~ART~~ INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS 204 - STEEL RIBBON CORD

ARE WINDOWS OPERABLE?

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? LOCK CATCH DEFORMED - MISS ON RIBBON

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT?

STRAIGHT AND SQUARE OPENINGS? Y - ARCHED HEAD

ARE THE SILLS SLOPED / DRIP EDGES PRESENT? Y / Y

SEALANT / CAULKING / PUTTY AROUND UNITS? —

GAPS PRESENT AROUND PERIMETER OF OPENINGS? —

WATER DAMAGE / AIR LEAKAGE / CONDENSATION? —

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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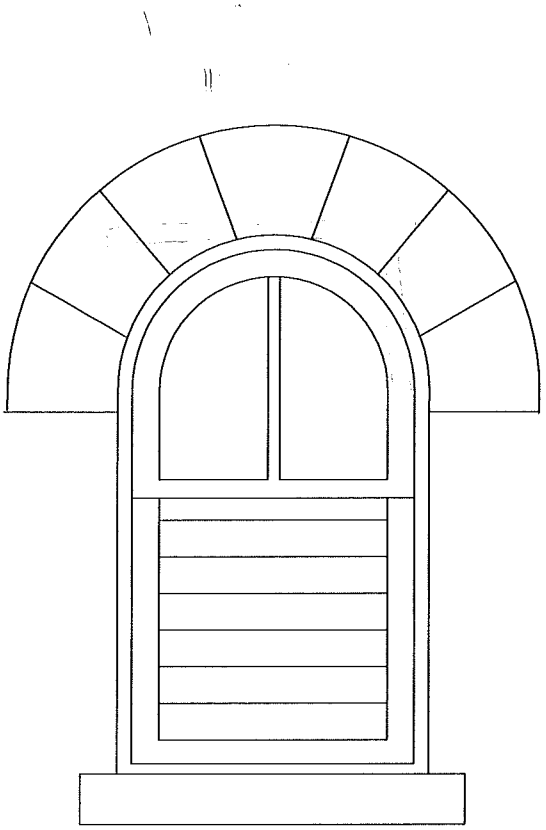
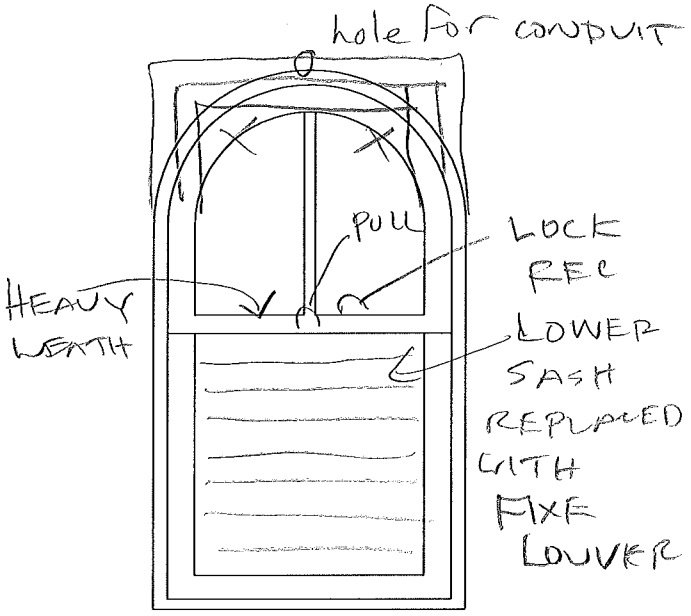
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 32 of 34
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W301	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE WOOD SASH W WOOD FRAME - LOUVER BOTTOM SASH

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? HALF OF LOCK

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT?

STRAIGHT AND SQUARE OPENINGS?

ARE THE SILLS SLOPED / DRIP EDGES PRESENT?

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP? MOUSE DROPPINGS

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

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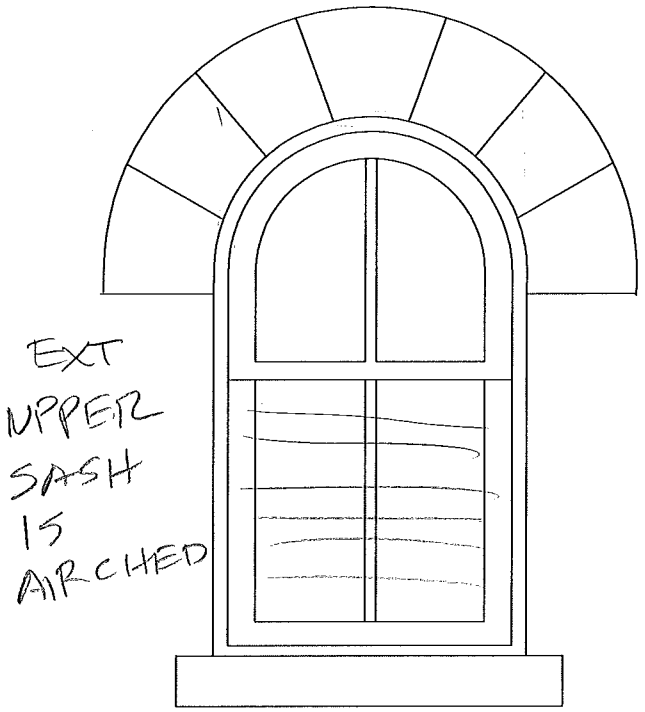
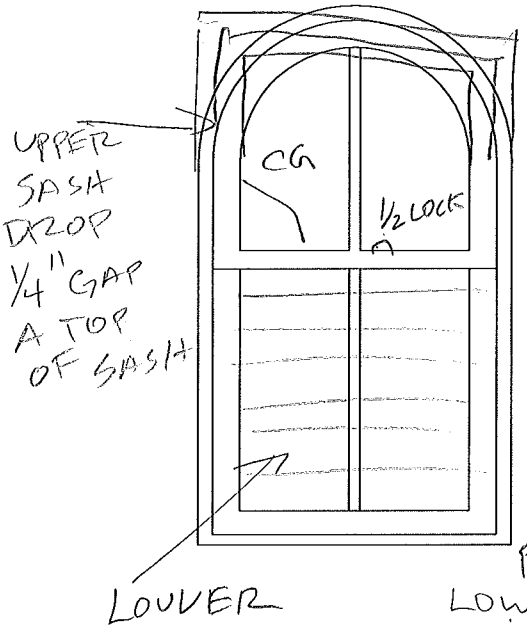
Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date 8 Nov '12	Page 33/34 of
Measured by: / Mesures par	Rec. by: / Noté par P. AMARAL	W303	Scale / Échelle NTS

Sault Canal Superintendent's Residence





EXTERIOR ELEVATION

INTERIOR ELEVATION

CONSTRUCTION MATERIAL / TYPE SAME AS 301

ARE WINDOWS OPERABLE? N

HARDWARE MISSING, LOOSE, SEIZED, DEFORMED? HALF OF LOCK

ARE COMPONENTS INTACT, LOOSE OR MISSING?

BROKEN GLASS PRESENT?

STRAIGHT AND SQUARE OPENINGS?

ARE THE SILLS SLOPED / DRIP EDGES PRESENT?

SEALANT / CAULKING / PUTTY AROUND UNITS?

GAPS PRESENT AROUND PERIMETER OF OPENINGS?

WATER DAMAGE / AIR LEAKAGE / CONDENSATION?

DIRT / DEBRIS / ORGANIC MATERIAL BUILD-UP?

DETERIORATION OF FRAME AROUND OPENINGS?

(PAINT FAILURE / WEATHERING / SPLITS / CHECKS / ROT)

Conservation & Landscape Architecture
A&ER / RPB / P&TS / PWGSC

Project # R.059922.001

Project & Location / Nom et lieu du relevé	Sault Ste. Marie NHSC - Window Condition Assessment	Date	8 Nov '12	Page	34 / 34
Measured by: / Mesures par	Rec. by: / Noté par P. Amaral	W302	Scale / Échelle NTS		

Sault Canal Superintendent's Residence

W 302

- WOOD SASH + FRAME
- LOWER SASH IS LOUVER
- INT FIXED STORM
- ORIG EXT SASH W LOCK RECEIVER
- DIRTY BUT GOOD COND FROM INT
  NEEDS PAINT

APPENDIX C

Recommended Repairs

Superintendent's House

Window	Priority	Description of Recommended Repairs
001	2	• Refinish sash interior • Replace corroded barrel locks with new • Prepare, prime & paint exterior sill – including filling joint cracks and gaps with epoxy
002	1	• Replace exterior sill with new in kind • Splice in new pieces to exterior frame jamb & head • Repair missing mortar at exterior between masonry & frame • Replace missing glazing pane • Refinish sash interior • Replace corroded hardware with new • Fabricate new exterior storm
003	-	*No action required – window opening blocked over*
004	1	• Replace window frame • Fabricate & install new window sash & storm sash to match existing sash examples (e.g. W001)
005	1	• Replace exterior sill & refinish frame • Repair deteriorated mortar between exterior frame & masonry • Refinish interior & exterior of sash including replacement of glazing compound • Fabricate new storm sash (accommodate radon ventilation conduit) • Replace corroded hardware with new
101	2	• Remove lower sash & refinish to reinstate operability • Replace glazing compound for both upper & lower sashes • Strip & refinish hardware (sash handles & lock) • Prepare, prime & paint exterior sill – including filling joint cracks and gaps with epoxy
102	2	• Remove lower sash & refinish to reinstate operability • Repair bottom rail & lower portion of stile (splice in new piece or epoxy) • Replace glazing compound for both upper & lower sashes • Strip & refinish hardware (sash handles & lock) • Refinish storm sash • Prepare, prime & paint exterior sill – including filling joint cracks and gaps with epoxy
103	1	• Replace decayed portions frame & reinstate existing glazing
104	1	• Replace decayed portions frame & reinstate existing glazing

Window	Priority	Description of Recommended Repairs
105	1	• Replace decayed portions of frame & reinstate existing glazing
106	1	• Remove polycarbonate panel at the exterior • Replace decayed framing at exterior (siding, rough framing, jambs & sill) • Repair decayed portions of storm sash (bottom rail & stiles) with splice or epoxy
107	1	• Remove lower sash & refinish to reinstate operability • Refinish interior sashes, storm sash & exterior frame • Replace glazing compound at interior sashes & storm sash • Splice in new piece to repair bottom rail of lower sash • Repair bottom rail & lower stiles of storm sash with epoxy • Replace missing sash ribbons • Strip & refinish hardware (sash pulleys, handles & lock)
108	1	• Remove lower sash & refinish to reinstate operability • Refinish interior sashes, storm sash & exterior frame • Replace glazing compound at interior sashes & storm sash • Repair bottom rail & lower stiles of storm sash with epoxy • Strip & refinish hardware (sash pulleys, handles & lock)
109	1	• Remove lower sash & refinish to reinstate operability • Refinish interior sashes, storm sash & exterior frame • Splice in new piece to repair bottom rail of lower sash • Repair bottom rail & lower stiles of storm sash with epoxy • Strip & refinish hardware (sash pulleys, handles & lock) • Replace cracked glazing pane at storm sash • Replace glazing compound at interior sashes & storm sash
110	1	• Replace exterior sill with new in kind • Splice in new pieces at exterior lower frame jambs • Repair bottom rail & lower stiles of storm sash with epoxy • Refinish interior sashes, storm sash & exterior frame • Replace cracked glazing pane at upper sash • Replace glazing compound at interior sashes & storm sash • Strip & refinish hardware (sash pulleys, handles & lock)
111	1	• Remove lower sash & refinish to reinstate operability • Refinish interior sashes, storm sash & exterior frame • Splice in new pieces at exterior lower frame jambs • Repair bottom rail & lower stiles of storm sash with epoxy • Replace cracked glazing pane at upper sash • Replace glazing compound at interior sashes & storm sash • Strip & refinish hardware (sash pulleys, handles & lock)

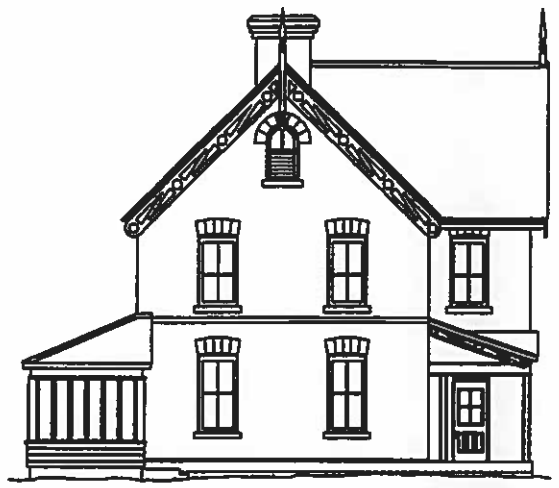
Window	Priority	Description of Recommended Repairs
112	1	• Remove lower sash & refinish to reinstate operability • Refinish interior sashes, storm sash & exterior frame • Splice in new pieces at exterior lower frame jambs • Replace glazing compound at interior sashes & storm sash • Strip & refinish hardware (sash pulleys, handles & lock) – replace broken sash handle • Replace perimeter sealant (between exterior frame and surrounding masonry)
113	2	• Remove sashes & refinish to reinstate operability • Replace glazing compound at interior sashes & storm sash • Replace missing portion of interior sash stop • Clean sash lock hardware & introduce new sash handle
114	1	• Remove plywood blocking from exterior • Strip & refinish sashes • Replace glazing in both sashes & finish with new glazing compound • Install new sash lock & handles • Fabricate new storm sash to match details of existing examples
115	3	• Remove lower sash & refinish to reinstate operability • Strip & refinish exterior frame & sill • Refinish interior face of storm sash • Replace glazing pane at lower storm sash • Replace glazing compound at interior sashes & storm sash • Strip & refinish hardware (sash lock)
116	1	• Strip & refinish exterior frame & sill, storm sash & interior sashes • Slice in new piece at exterior lower frame, bottom rail & stiles of storm sash • Replace glazing compound at all sashes • Strip & refinish sash pulleys & reinstate sash ribbons • Remove hinges used to attach storm sash & repair fastener holes
117	1	• Strip & refinish exterior frame & sill & storm sash • Repair exterior sill (splice in new face piece approx. 50mm depth) • Splice in new piece at exterior lower frame, bottom rail & stiles of storm sash • Repair bottom rail of interior sash with epoxy • Replace glazing at both panes of storm sash & lower interior sash • Replace glazing compound on all sashes • Strip & refinish hardware (sash handle & lock) • Reinstate sash pulleys to reinstate operability
118	1	• Strip & refinish exterior frame & sill & storm sash • Dismantle lower interior sash to repair connections • Splice in new piece at exterior lower frame, bottom rail & stiles of storm sash

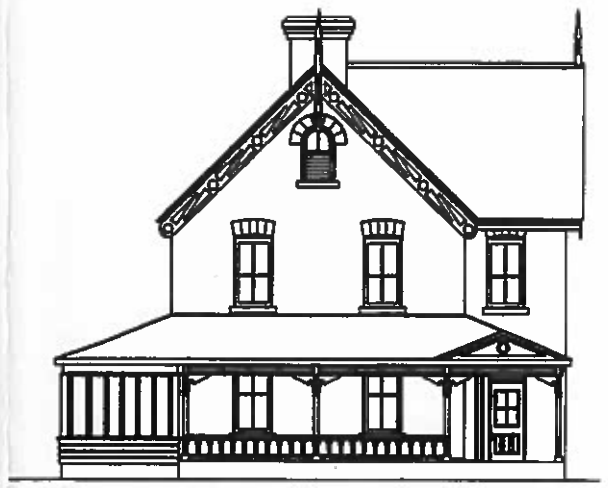
Window	Priority	Description of Recommended Repairs
		• Repair lower parting strip • Replace glazing compound on all sashes • Strip & refinish hardware (sash pulleys & lock) • Introduce new sash handles
201	2	• Remove lower sash & refinish to reinstate operability • Refinish bottom rail of upper sash • Fabricate new storm to be applied to existing window frame • Strip & refinish hardware (sash pulleys, handles & lock) • Reinstate sash ribbons/cords
202	2	• Remove lower sash & refinish to reinstate operability • Refinish bottom rail of upper sash • Fabricate new storm sash to be applied to existing window frame • Strip & refinish hardware (sash pulleys & handles) • Repair damage (holes) to upper rail of lower sash • Replace glazing in upper sash
203	2	• Strip & refinish exterior frame, sill & interior sashes • Fabricate new storm sash to be applied to existing window frame • Strip & refinish hardware (sash pulleys & handles) • Replace cracked glazing pane at lower sash • Replace glazing compound at all sashes • Reinstate broken sash ribbon
204	2	• Strip & refinish exterior frame, sill & interior sashes • Fabricate new storm to be applied to existing window frame • Strip & refinish hardware (sash pulleys & handles) • Replace missing sash lock • Replace cracked glazing panes at upper & lower sashes • Replace glazing compound at all sashes
205	1	• Strip & refinish exterior frame & storm sash • Remove interior sill veneer – strip & refinish existing wood sill • Investigate condition of lower frame/sash area below existing interior sill
206	2	• Strip & refinish exterior frame & interior sashes • Repair damage to blind stop & parting strip • Repair bottom of exterior frame with epoxy • Replace glazing compound at interior sashes • Strip & refinish hardware (sash pulleys, handles & lock) • Fabricate new storm sash to be applied to existing window frame
207	2	• Strip & refinish exterior frame, sill & storm sash • Replace glazing compound at storm sash • Repair surface damage to lower interior sash (epoxy & refinish) • Strip & refinish hardware (sash pulleys, handles & lock)

Window	Priority	Description of Recommended Repairs
208	2	• Remove lower sash & refinish to reinstate operability • Repair surface damage to lower interior sash (epoxy & refinish) • Strip & refinish exterior frame, sill & storm sash • Replace glazing compound at storm sash • Strip & refinish hardware (sash pulleys, handles & lock) • Reinstate missing sash ribbon
209	2	• Remove lower sash & refinish to reinstate operability • Repair holes in stile of lower interior sash • Strip & refinish exterior frame, sill & storm sash • Dismantle storm sash to repair/reinforce connections • Splice new pieces to repair decay at lower exterior frame, bottom rail & stiles of storm sash • Replace glazing compound at storm sash • Strip & refinish hardware (sash pulleys & lock) • Reinstate missing sash ribbons/cords & handles
210	2	• Strip & refinish exterior frame, sill & interior sashes & interior stops • Repair area of decay at exterior sill with epoxy • Fabricate new storm sash to be applied to existing window frame • Reinstate missing sash ribbon • Replace broken sash lock • Replace cracked glazing pane at lower interior sash • Replace glazing compound at interior sashes
211	2	• Strip & refinish exterior frame, sill & sash • Replace cracked glazing pane • Replace glazing compound • Investigate further – no inspection from interior carried out
301	2	• Clean interior surfaces (frame sashes & sill) • Strip & refinish exterior frame, sill & sash • Repair hole through upper trim at interior • Reinstate louver in lower sash opening after repairs are complete
302	2	• Clean interior surfaces (frame sashes & sill) • Strip & refinish exterior frame, sill & sash • Prime & paint unfinished interior wood components • Reinstate louver in lower sash opening after repairs are complete
303	2	• Clean interior surfaces (frame sashes & sill) • Strip & refinish exterior frame, sill & sash • Replace cracked glazing pane in lower sash • Prime & paint unfinished interior wood components • Reinstate louver in lower sash opening after repairs are complete

Appendix D

As Built Drawings





HERITAGE RECORDING
SUMMARY RECORD

SUPERINTENDENT'S RESIDENCE
SAULT CANAL
NATIONAL HISTORIC SITE

SAULT STE-MARIE
ONTARIO

RECORDED BY:
B. PRINS
AMBER INGLIS
NOV. 1994

Canada

DRAWING INDEX

H1 —— COVER SHEET

H2 —— DRAWING INDEX & SITE PLAN

H3 —— BASEMENT PLAN, BASEMENT REFLECTED CEILING PLAN

H4 —— GROUND FLOOR PLAN, GROUND FLOOR ELECTRICAL PLAN

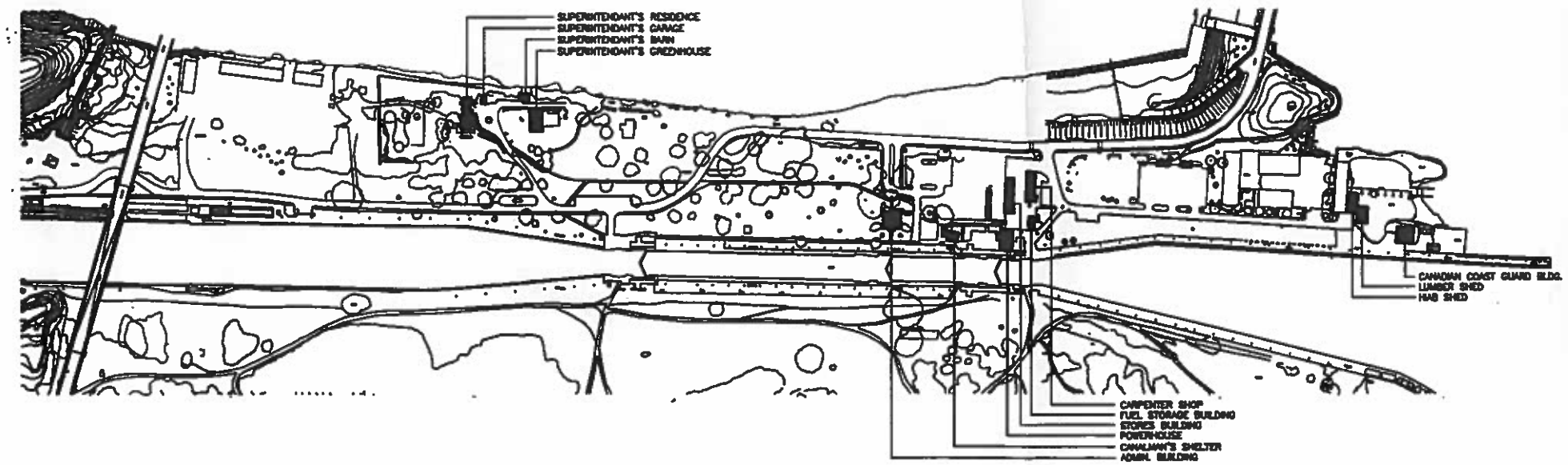
H5 —— SECOND FLOOR PLAN, SECOND FLOOR ELECTRICAL PLAN

H6 —— THIRD FLOOR PLAN & BASEMENT ELECTRICAL PLAN

H7 —— NORTH AND SOUTH ELEVATIONS, NEW PORCH

H8 —— WEST ELEVATION AND EAST ELEVATION

H9 —— PHOTOS AND PHOTO KEY PLAN



TIME PLOTTED

DATE PLOTTED

PERSON PLOTTING

SCALE OF PLOT

WAY PLOTTED

DRAWING NAME

No. | Date | Description | Drawn by / Dessiné par | Approved / Approuvé

Revision / Révision

A Detail number / No. de détail
B Location drwg. no. / No. du dessin
C Drawing sheet no. / No. de dessin

Client Acceptance / Acceptation du client
Signature _____ Date _____
File No./No. de dossier _____

Parks Canada / Parcs Canada

Canada

Project title / Titre du projet

SAULT CANAL
NATIONAL HISTORIC SITE
SUPERINTENDANT'S RESIDENCE

SAULT STE-MARIE, ONTARIO

Drawing title / Titre du dessin

DRAWING INDEX &
SITE PLAN

Scale / Echelle: AS SHOWN

Drawn by / Dessiné par: B. PENG — Date: JULY, 2002

Designed by / Conçu par — Date

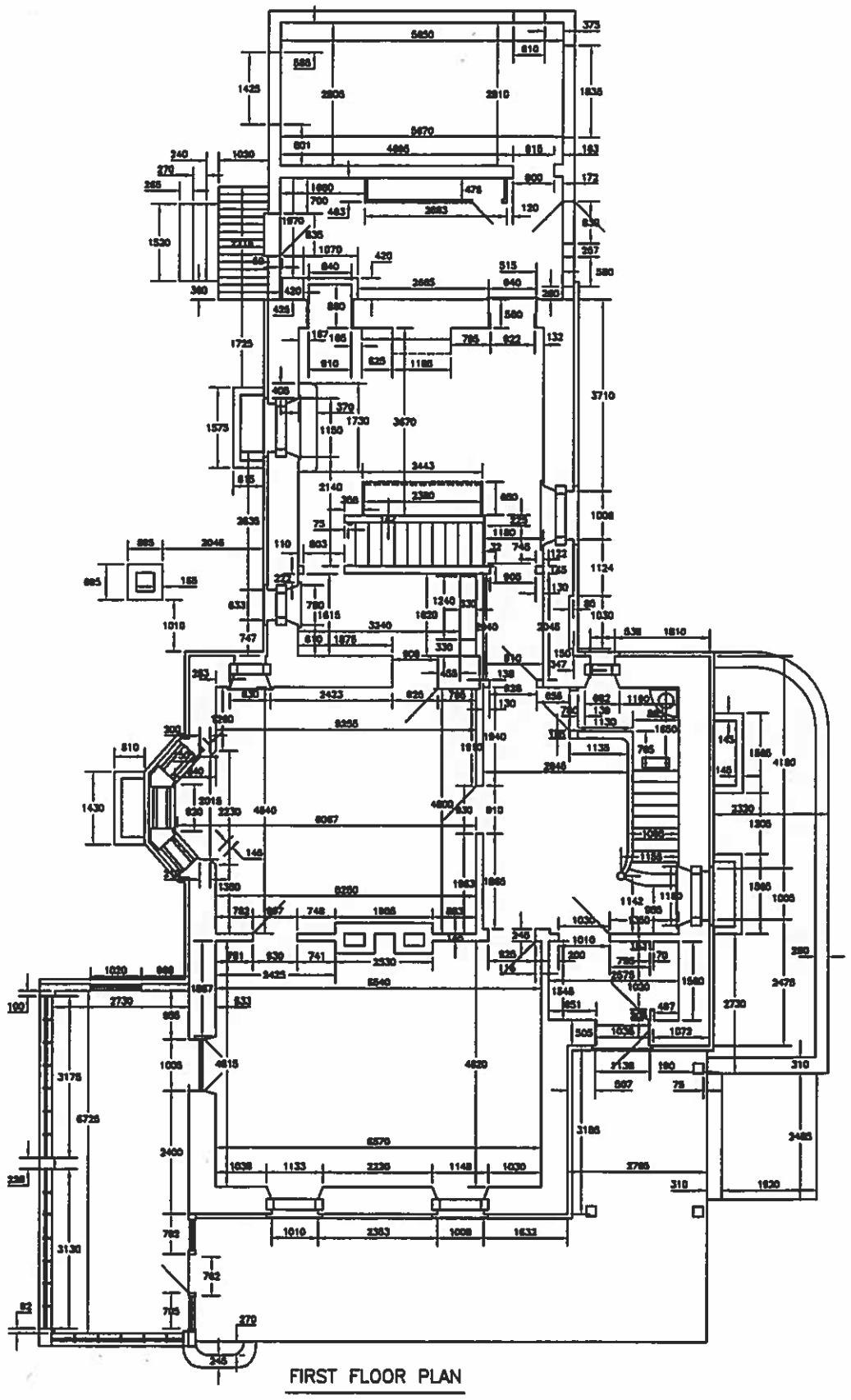
Checked by / Vérifié par: B. PENG — Date: JULY, 2002

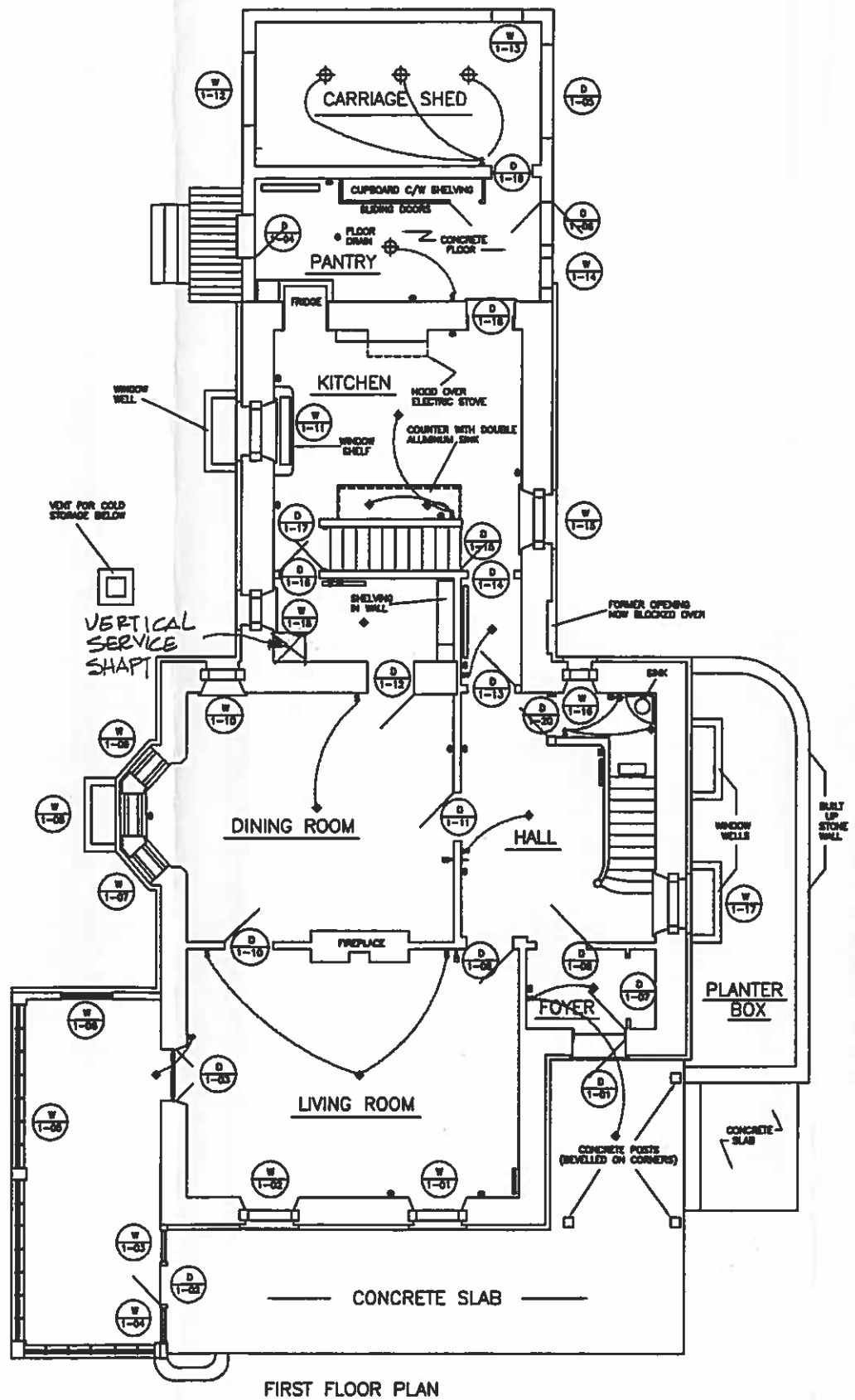
Approved by / Approuvé par: R. CAMPBELL — Date

Senior Project Manager / Gestionnaire de projet - Immobilisations

Project No./No. de projet | Agency No./No. de l'Org. | Sheet No./Feuille No.: H2

Drawing Reference No./Numéro de référence du dessin





FEB. 1994

– SERVANT BELL

$ – LIGHT SWITCH

– ELECTRICAL OUTLET

– HEATER

– CEILING LIGHT

T – THERMOSTAT

A Sheet number / Numéro de dessin
B Total number / Nombre total de dessins

Linear dimensions in millimeters / Dimensions linéaires en millimètres

Client Acceptance / Acceptation du client
Signature _____ Date _____
Rep. Name / Nom du client _____

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada
Architecture and Engineering Services for Parks Canada / Services d'architecture et de génie pour Parcs Canada

Canada

Heritage Recording For Parks Canada Ontario Region / Enregistrement des Richesses du Patrimoine Pour Parcs Canada Région de l'Ontario

Type of Record / Type d'enregistrement
SUMMARY RECORDING

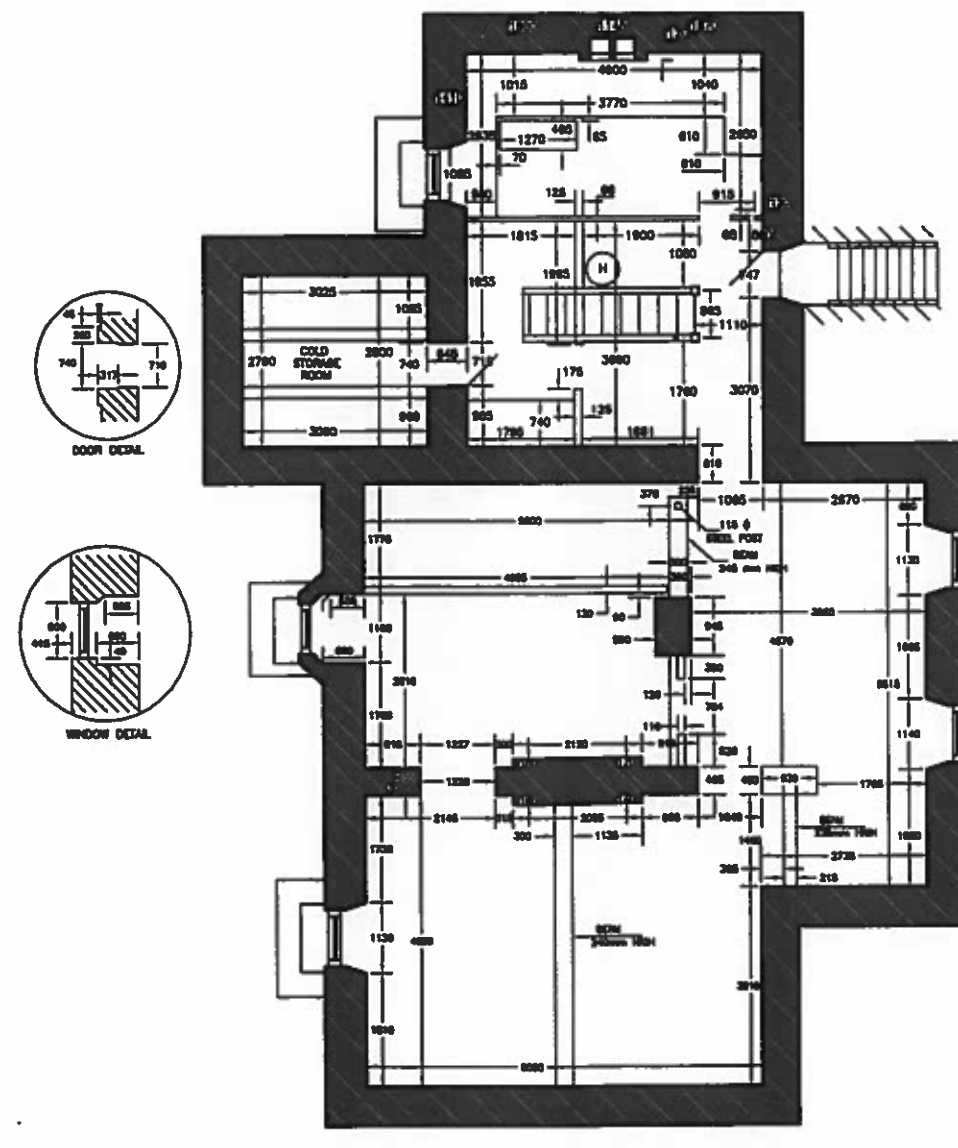
Project title / Titre du projet
HERITAGE RECORDING
SAULT CANAL
ALGOMA DISTRICT

Drawing title / Titre du dessin
FIRST FLOOR PLAN
SUPERINTENDENT'S RESIDENCE

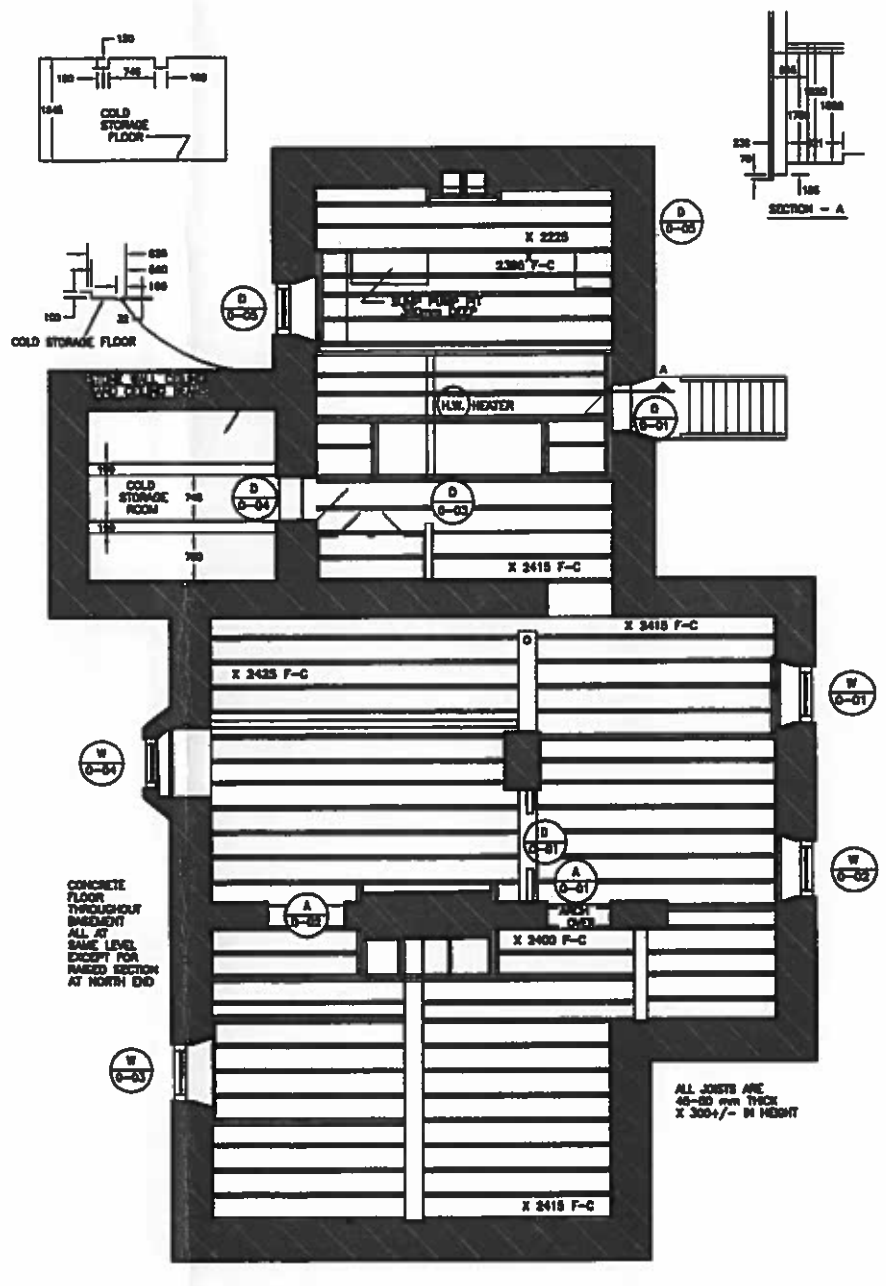
Scale / Echelle
1 : 50

Drawn by/ Dessiné par	Date
James N. McKAY	JAN. 1994
Field Recording by / Relevé-Terrain par	Date
Barrie PRINS Amber INGLIS	NOV. 1993
Approved by / Approuvé par	Date
Checked by/ Vérifié par	

Project No./ No. de projet | Asset No. | Sheet No./ Feuille No.
Drawing Reference No./No. de Dessin | H3



BASEMENT PLAN



BASEMENT PLAN

FEB. 1994

A Sheet number / A Numéro de dossier
B Sheet number / B Sur feuille numéro

Linear dimensions in millimeters / Dimensions linéaires en millimètres

Client Acceptance / Acceptation du client
Signature _____ Date _____
Rôle / Rôle de client _____

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada
Architecture and Engineering Services for Parks Canada / Services d'architecture et de génie pour Parcs Canada

Canada

Heritage Recording For Parks Canada Ontario Region / Enregistrement des Richesses du Patrimoine Pour Parcs Canada Région de l'Ontario

Type of Record / Type d'enregistrement
SUMMARY RECORDING

Project title / Titre du projet
SAULT CANAL
NATIONAL HISTORIC SITE
SUPERINTENDENT'S RES.

Drawing title / Titre du dessin
BASEMENT PLAN &
BASEMENT REFLECTED
CEILING PLAN

Scale / Échelle
1 : 50

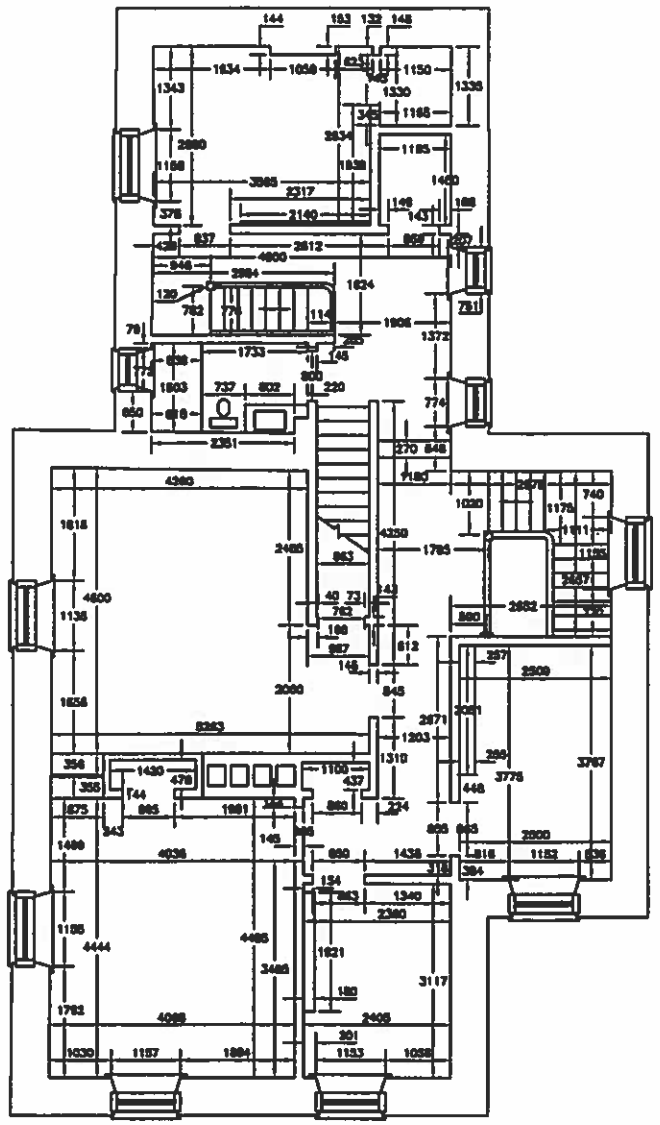
Drawn by / Dessiné par: James N. McKAY — Date: FEB. 1994

Field Recording by / Relevé–Terrain par: Bernie PRINS, Amber WELLS — Date: NOV. 1993

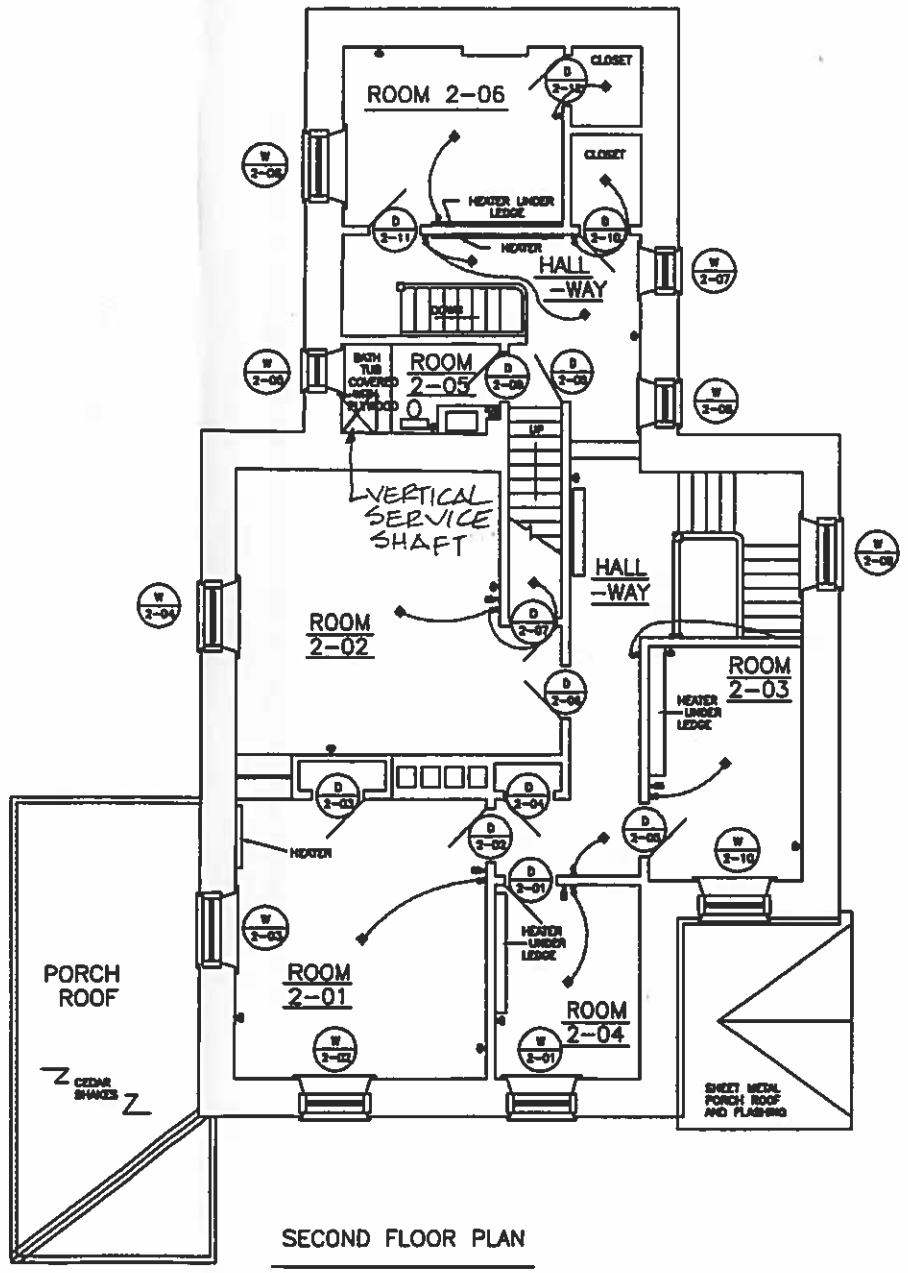
Approved by / Approuvé par — Date

Checked by / Vérifié par

Project No./ No. de projet | Asset No. | Sheet No./ Feuille No.
Drawing Reference No./No. du Dessin: H3



SECOND FLOOR PLAN



SECOND FLOOR PLAN

B – SERVANT BELL

$ – LIGHT SWITCH

– ELECTRICAL OUTLET

– HEATER

– CEILING LIGHT

T – THERMOSTAT

A Detail number / Numéro de détail
B Sheet number / No feuille numéro

Linear dimensions in millimeters / Dimensions linéaires en millimètres

Chief Examiner / Examinateur en chef
Signature _____ Date _____
File No. / No. de dossier _____

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada
Architecture and Engineering Services for Parks Canada / Services d'architecture et de génie pour Parcs Canada

Canada

Heritage Recording For Parks Canada Ontario Region / Enregistrement des Richesses du Patrimoine Pour Parcs Canada Région de l'Ontario

Type of Record / Type d'enregistrement
SUMMARY RECORDING

Project title / Titre du projet
HERITAGE RECORDING
SAULT CANAL
ALGOMA DISTRICT

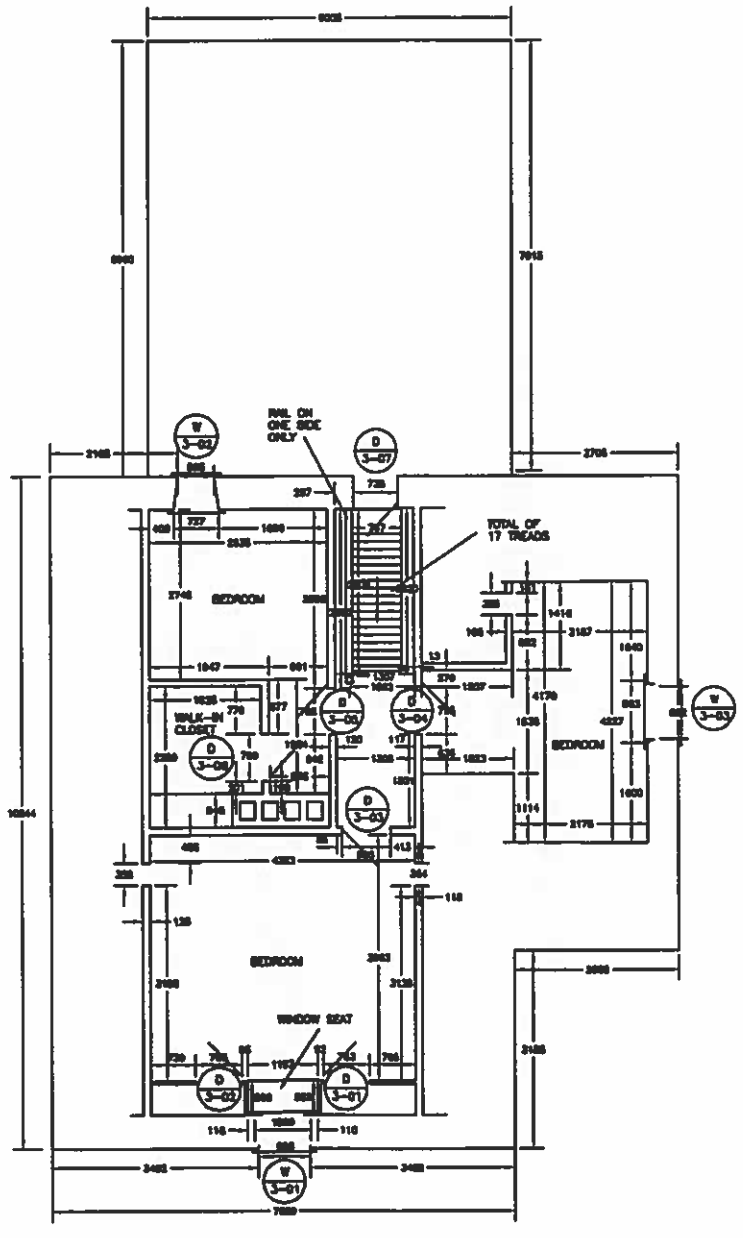
Drawing title / Titre du dessin
SECOND FLOOR PLAN
SUPERINTENDENT'S RESIDENCE

Scale / Echelle
1 : 50

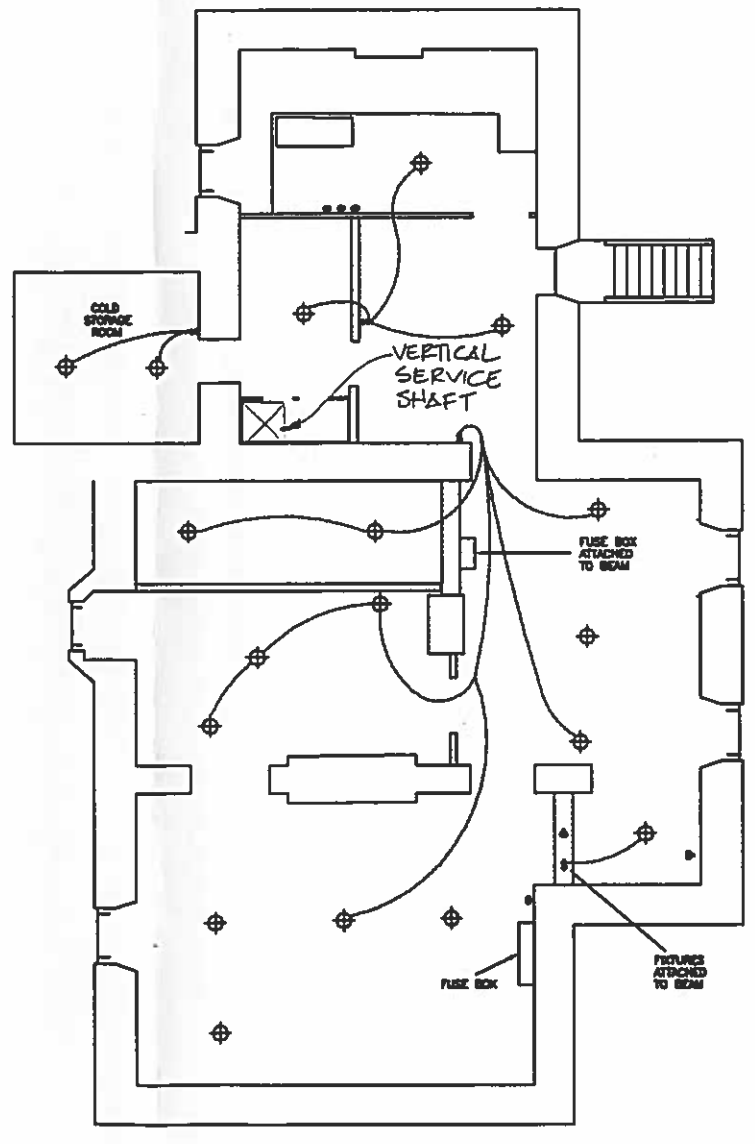
Drawn by/ Dessiné par	Date
James N. McKAY	JAN. 1994
Field Recording by / Relevé–Terrain par	Date
Bernie PENNS Amber SKELLS	NOV. 1993
Approved by / Approuvé par	Date
Checked by/ Vérifié par	

Project No./ No. de projet	Asset No.	Sheet No./ Feuille No.
Drawing Reference No./No. de Dessin		H4

FEB. 1994



THIRD FLOOR PLAN



BASEMENT ELECTRICAL DETAILS

- SERVANT BELL
- LIGHT SWITCH
- ELECTRICAL OUTLET
- HEATER
- CEILING LIGHT
- THERMOSTAT

MARCH 1994

Canada

Heritage Recording For Parks Canada Ontario Region

Enregistrement des Richesses du Patrimoine Pour Parcs Canada Région de l'Ontario

Type of Record / Type d'enregistrement
SUMMARY RECORDING

Project title / Titre du projet
HERITAGE RECORDING
SAULT CANAL
ALGOMA DISTRICT

Drawing title / Titre du dessin
THIRD FLOOR PLAN &
BASEMENT ELECTRICAL
SUPERINTENDENT'S RES.

Scale / Echelle
1 : 50

Drawn by/ Dessiné par: James H. McKAY — Date: MARCH 1994

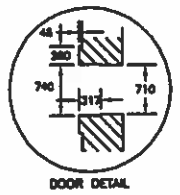
Field Recording by / Relevé-Terrain par: Barrie PRINS, Amber INGLIS — Date: NOV. 1993

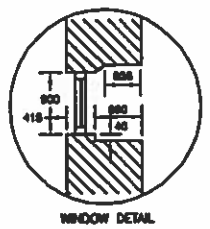
Approved by / Approuvé par — Date

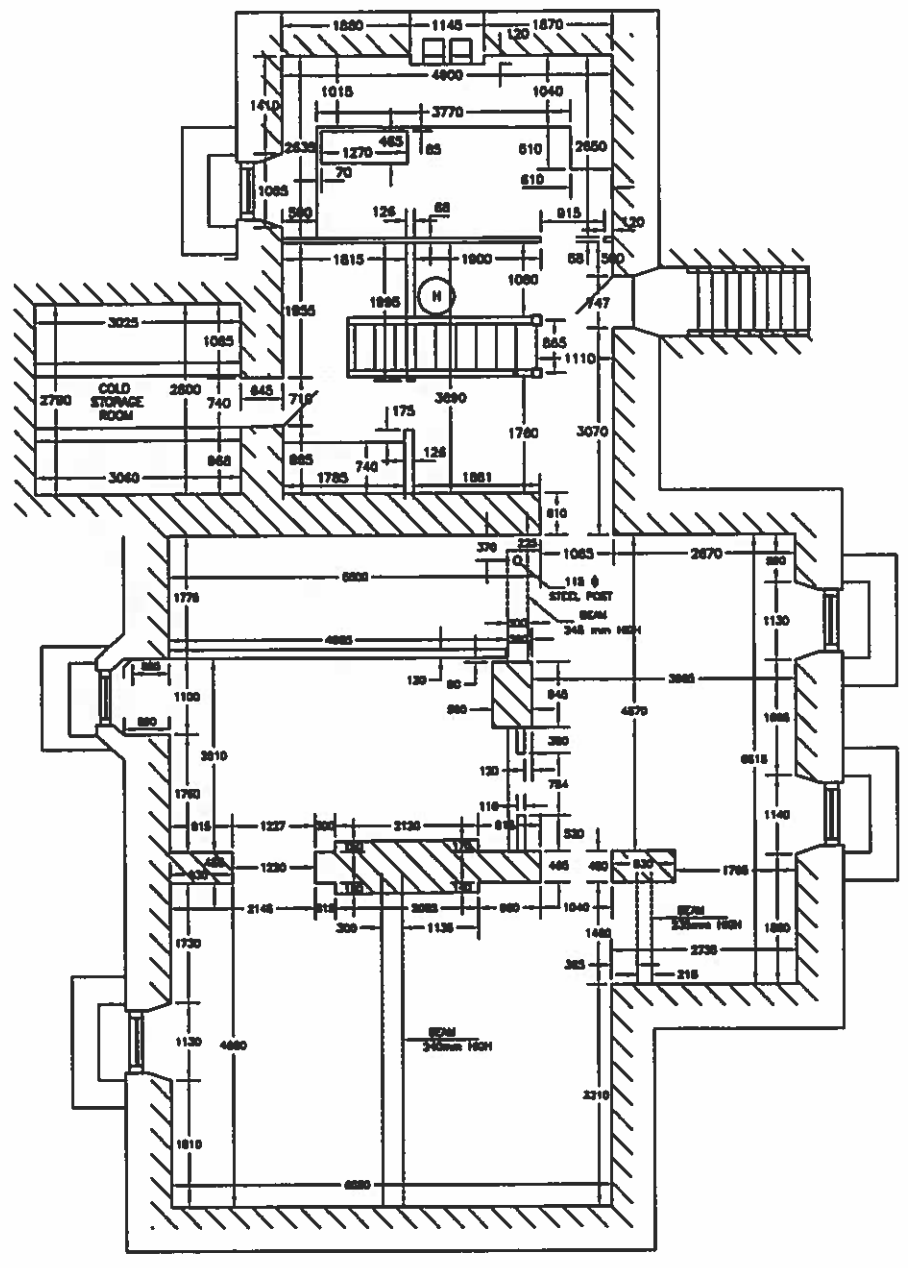
Checked by/ Vérifié par

Project No/ No. de projet — Asset No. — Sheet No/ Feuille No. H5

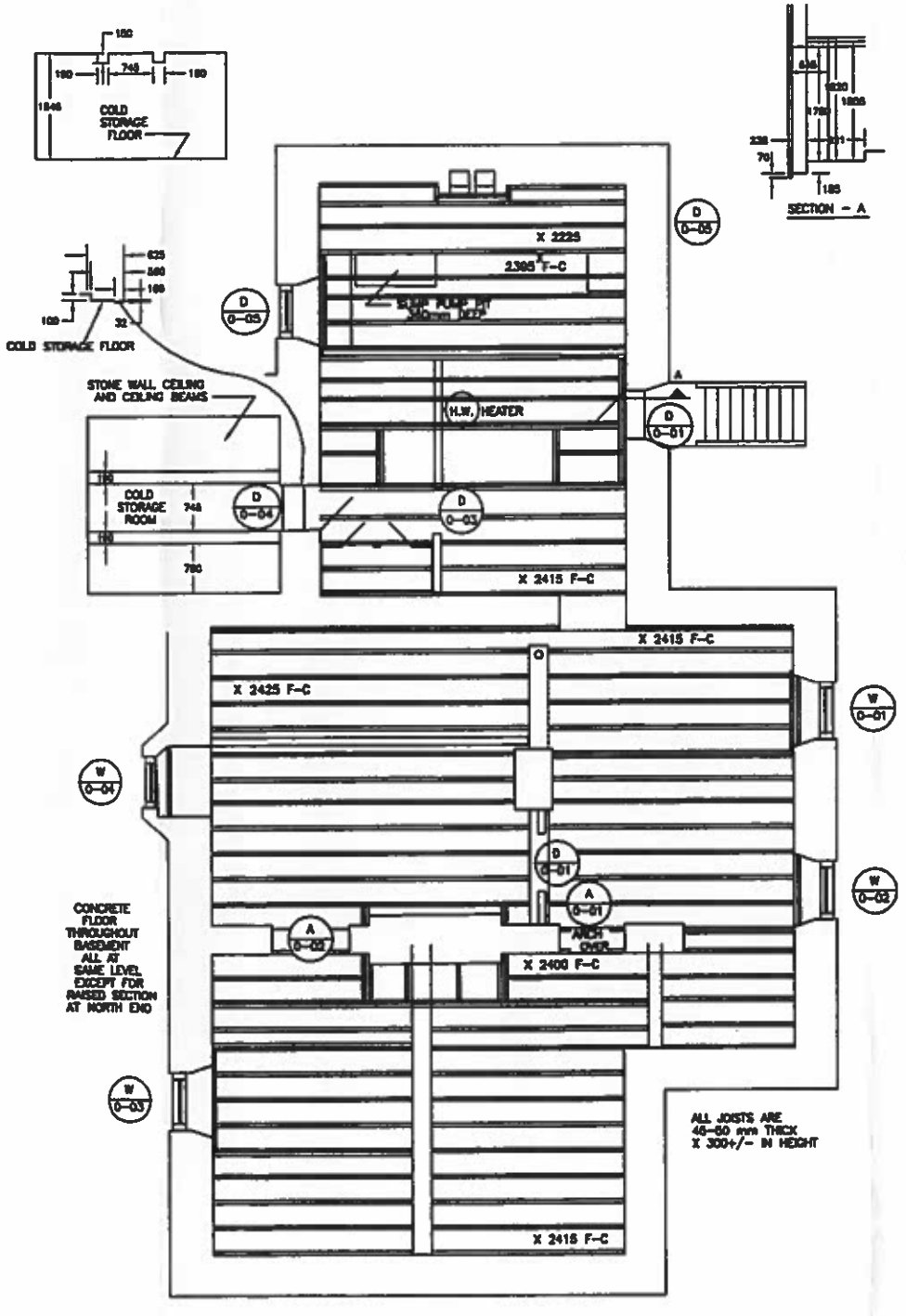
Drawing Reference No./No. du Dessin







BASEMENT PLAN



BASEMENT PLAN

FEB. 1994

A Detail number / B Sheet number
A Numéro de détail / B Sur feuille numéro

Linear dimensions in millimeters / Dimensions linéaires en millimètres

Client Acceptance / Acceptation du client

Signature _____ Date _____

File No. / No. de dossier _____

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

Architecture and Engineering Services for Parks Canada / Services d'architecture et de génie pour Parcs Canada

Canada

Heritage Recording For Parks Canada Ontario Region / Enrégistrement des Richesses du Patrimoine Pour Parcs Canada Région de l'Ontario

Type of Record / Type d'enregistrement

SUMMARY RECORDING

Project title / Titre du projet

HERITAGE RECORDING SAULT CANAL ALGOMA DISTRICT

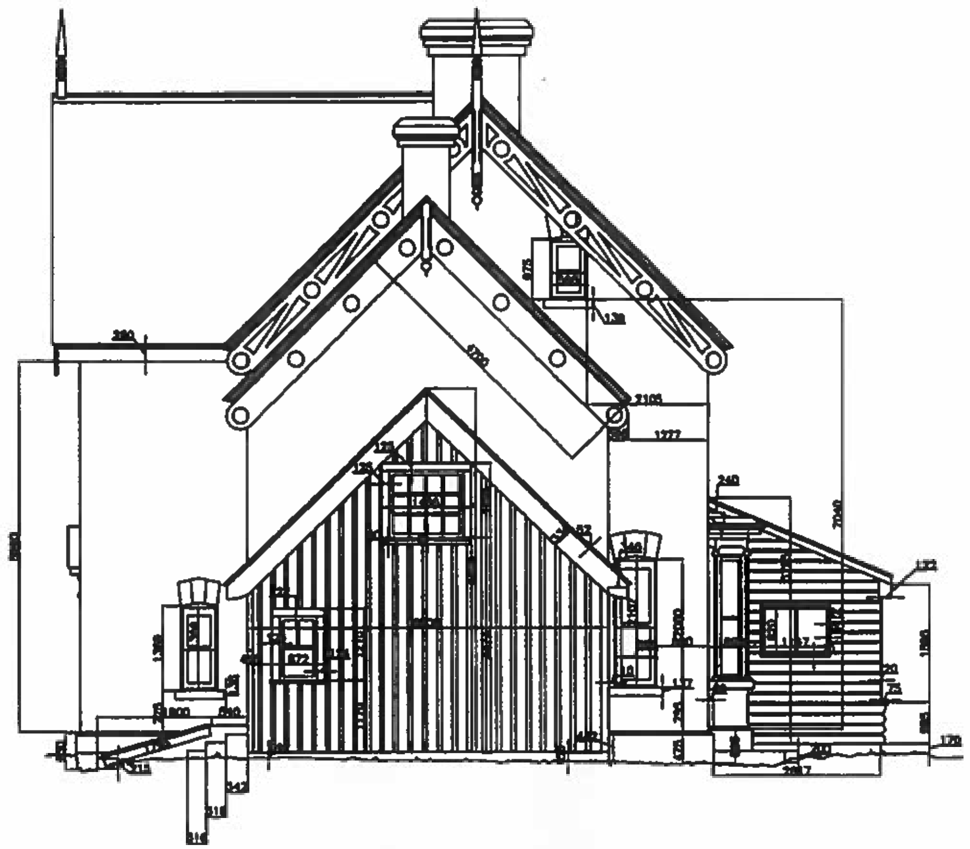
Drawing title / Titre du dessin

BASEMENT PLAN SUPERINTENDENT'S RESIDENCE

Scale / Echelle

1 : 50

Drawn by/ Dessiné par	Date
James N. McKAY	FEB. 1994
Field Recording by / Relevé–Terrain par	**Date**
Bernie PRINS Amber INGLIS	NOV. 1993
Approved by / Approuvé par	**Date**
Checked by/ Vérifié par	



NORTH ELEVATION
1 : 50

SOUTH ELEVATION
1 : 50

SOUTH ELEVATION WITH NEW PORCH
1 : 50

A Detail number / A Numéro de détail
B Sheet number / B Sur feuille numéro

Linear dimensions in millimetres / Dimensions linéaires en millimètres

Client Acceptance / Acceptation du client
Signature ________ Date ______
File No. / No. de dossier ________

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada
Architectural and Engineering Services for Parks Canada / Services d'architecture et de génie pour Parcs Canada

Canadä

Heritage Recording For Parks Canada Ontario Region / Enregistrement des Richesses du Patrimoine Pour Parcs Canada Région de l'Ontario

Type of Record / Type d'enregistrement
SUMMARY

Project title / Titre du projet
SAULT CANAL
NATIONAL HISTORIC SITE
SUPERINTENDENT'S RES.

Drawing title / Titre du dessin
NORTH & SOUTH
ELEVATIONS
NEW PORCH

Scale / Échelle
1 : 50

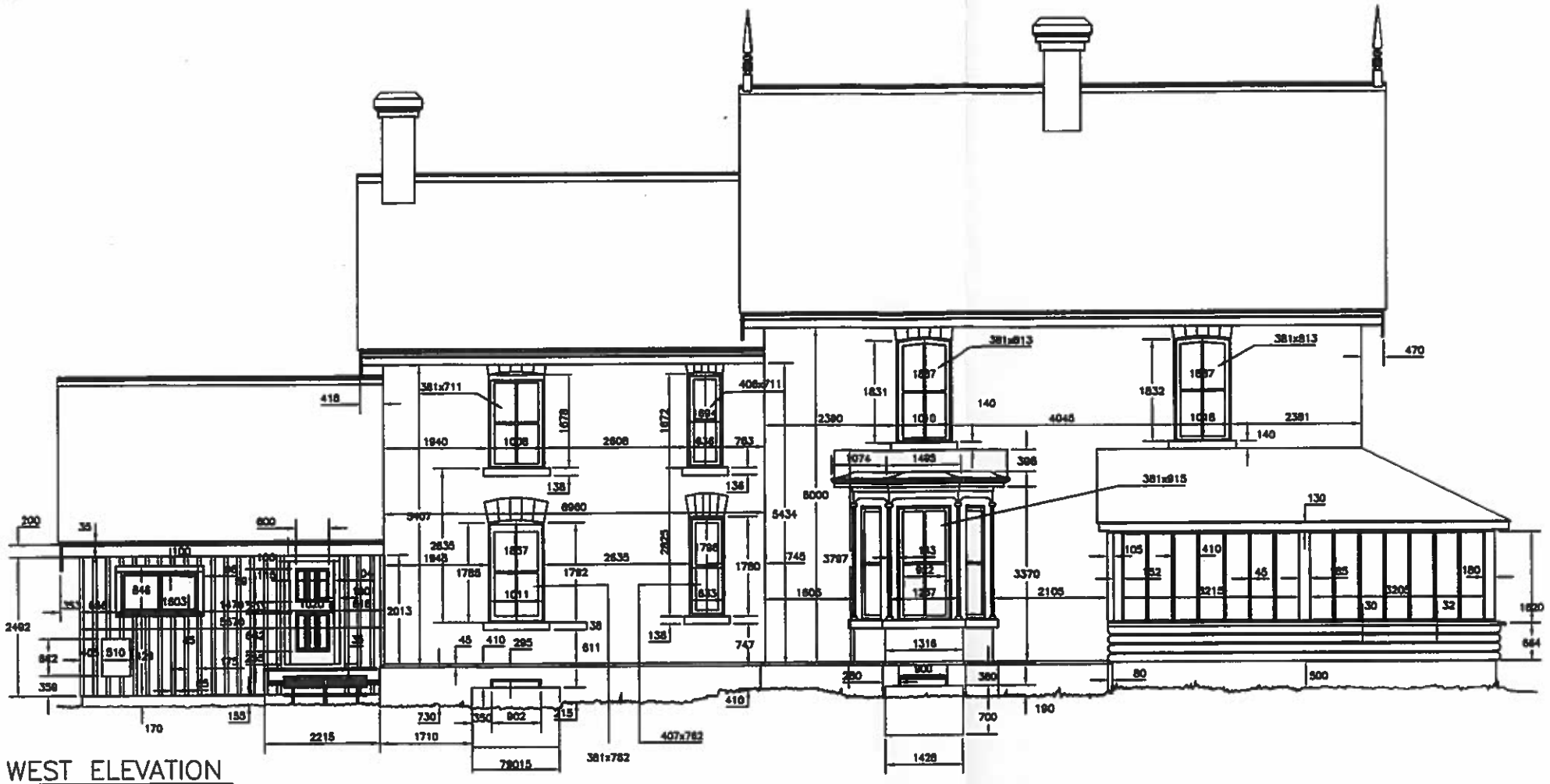
Drawn by/ Dessiné par — Date
Kevin W. CROZIER

Field Recording by / Relevé-Terrain par — Date
Bernie PRINS
Amber INGLIS

Approved by / Approuvé par — Date

Checked by/ Vérifié par

Project No./ No. de projet — Asset No. — Sheet No./ Feuille No.
Drawing Reference No./No. du Dessin
H7



WEST ELEVATION
1 : 50

EAST ELEVATION
1 : 50

A Detail number / B Sheet number — A Numéro de détail / B Sur feuille numéro

Linear dimensions in millimeters / Dimensions linéaires en millimètres

Client Acceptance / Acceptation du client

Signature _____ Date _____

File No. / No. de dossier _____

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

Architecture and Engineering Services for Parks Canada / Services d'architecture et de génie pour Parcs Canada

Canada

Heritage Recording For Parks Canada Ontario Region / Enrégistrement des Richesses du Patrimoine Pour Parcs Canada Région de l'Ontario

Type of Record / Type d'enregistrement

SUMMARY

Project title / Titre du projet

SAULT CANAL NATIONAL HISTORIC SITE SUPERINTENDENT'S RES.

Drawing title / Titre du dessin

EAST AND WEST ELEVATIONS

Scale / Echelle

1 : 50

Drawn by/ Dessiné par — Date

Kevin W. CROZIER

Field Recording by / Relevé—Temoin par — Date

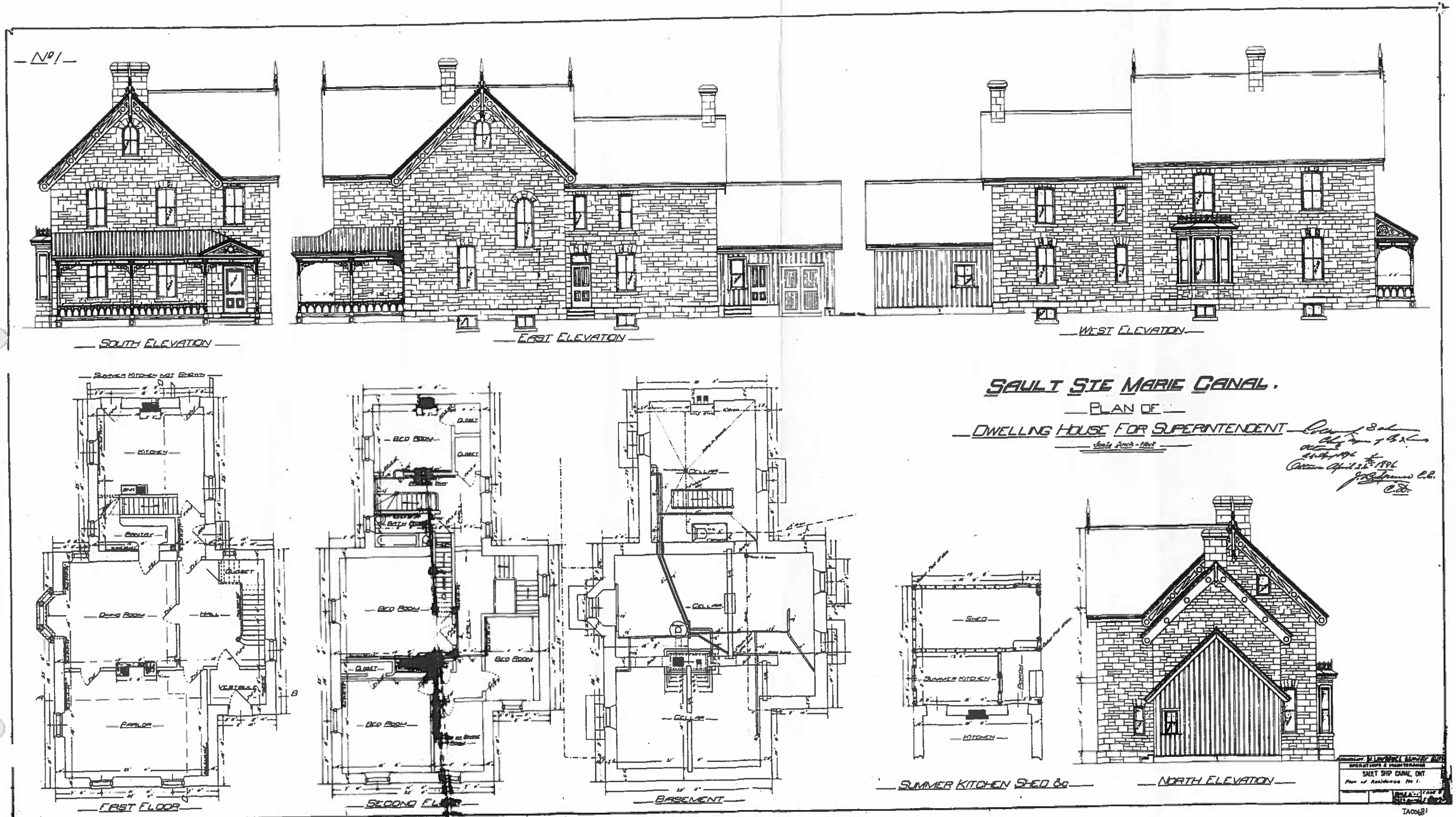
Bernie PRINS
Amber INGLIS

Approved by / Approuvé par — Date

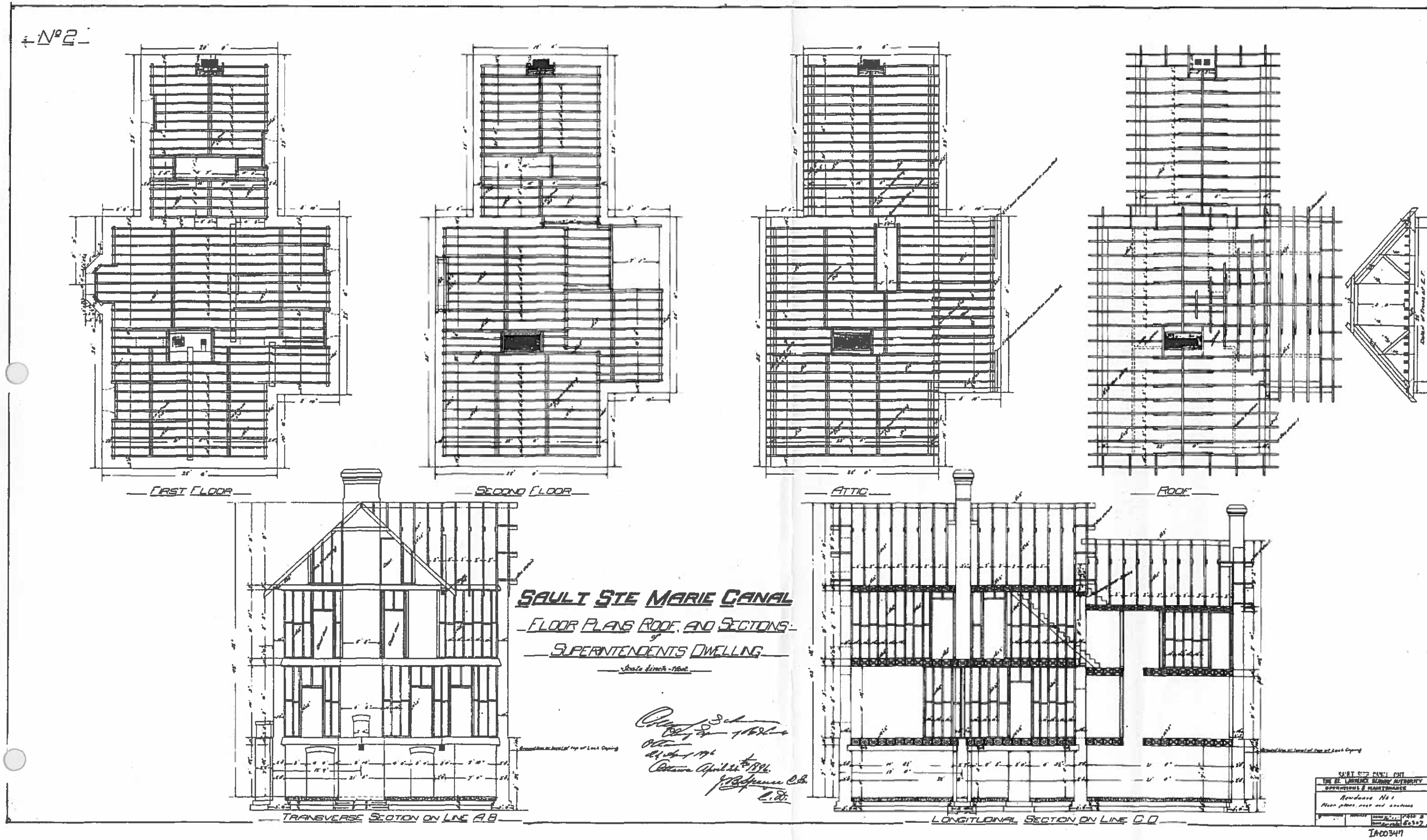
Checked by/ Verifié par

Project No./ No. de projet | Asset No. | Sheet No./ Feuille No.

Drawing Reference No./No. du Dessin | H8



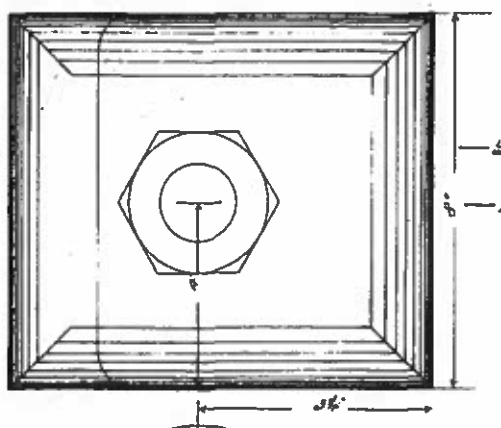
Nº 1
SOUTH ELEVATION
EAST ELEVATION
WEST ELEVATION
SAULT STE MARIE CANAL.
PLAN OF
DWELLING HOUSE FOR SUPERINTENDENT
Scale 1 inch - 16 feet
Ottawa April 2nd 1896
SUMMER KITCHEN NOT SHOWN
KITCHEN
PANTRY
CLOSET
DINING ROOM
HALL
VESTIBULE
PARLOR
FIRST FLOOR
BED ROOM
CLOSET
BATH ROOM
HALL
SECOND FLOOR
CELLAR
BASEMENT
SHED
SUMMER KITCHEN
PORCH
KITCHEN
SUMMER KITCHEN SHED &c
NORTH ELEVATION
SAULT SHIP CANAL, ONT.
Plan of Residence No 1.
TAC0481


No 2
FIRST FLOOR
SECOND FLOOR
ATTIC
ROOF
SAULT STE MARIE CANAL
FLOOR PLANS ROOF AND SECTIONS
of
SUPERINTENDENTS DWELLING
TRANSVERSE SECTION ON LINE A.B.
LONGITUDINAL SECTION ON LINE C.D.
Ottawa April 24th 1896.
THE ST. LAWRENCE SEAWAY AUTHORITY
OPERATIONS & MAINTENANCE
Residence No 1
Floor plans, roof and sections
IA00347

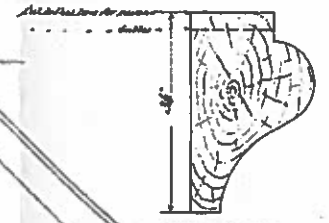
SAULT STE MARIE CANAL

SUPERINTENDENTS DWELLING

Scale 1" = 1 foot

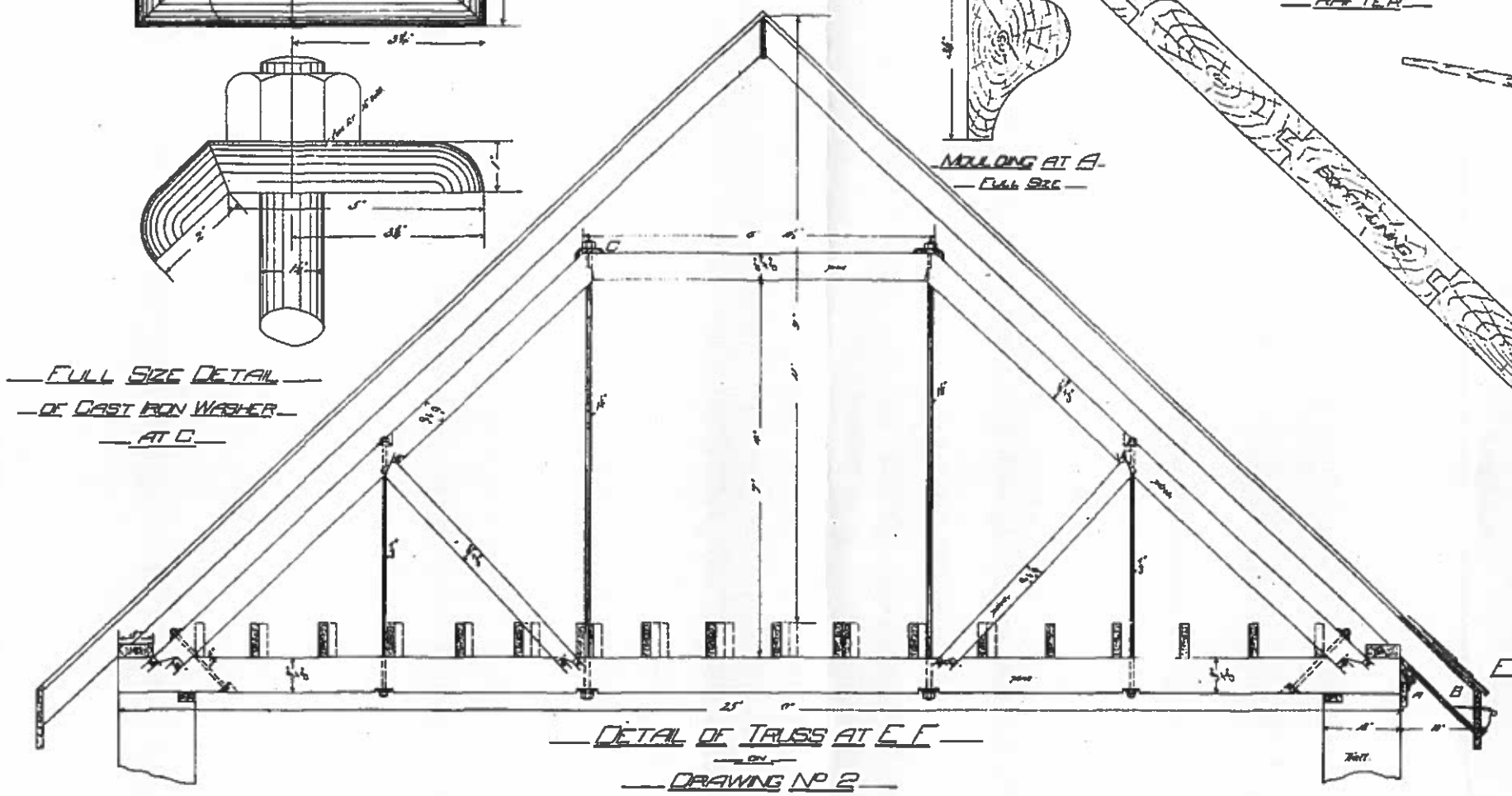


FULL SIZE DETAIL OF CAST IRON WASHER AT C.



MOULDING AT A

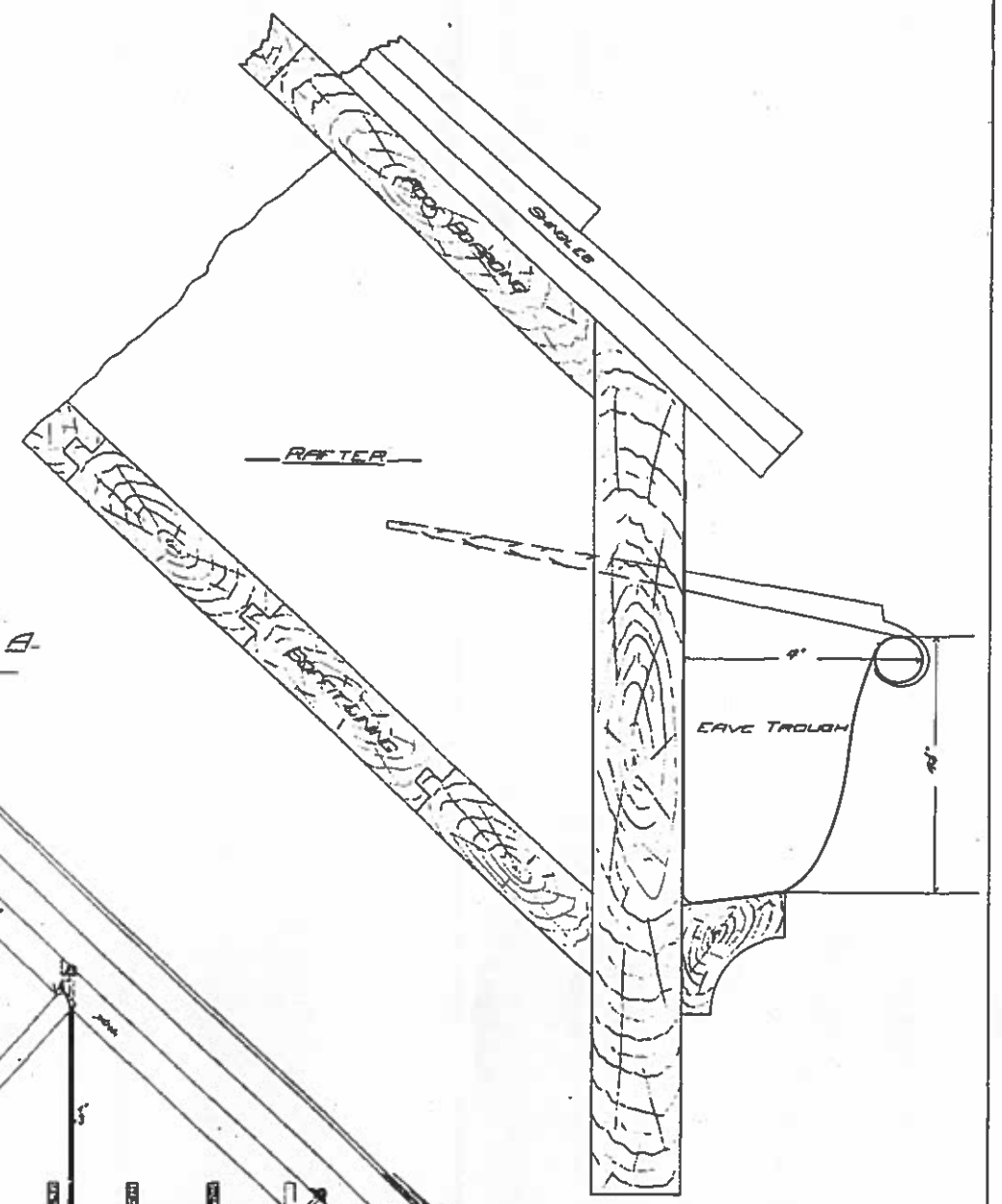
FULL SIZE



DETAIL OF TRUSS AT E F

ON

DRAWING N° 2



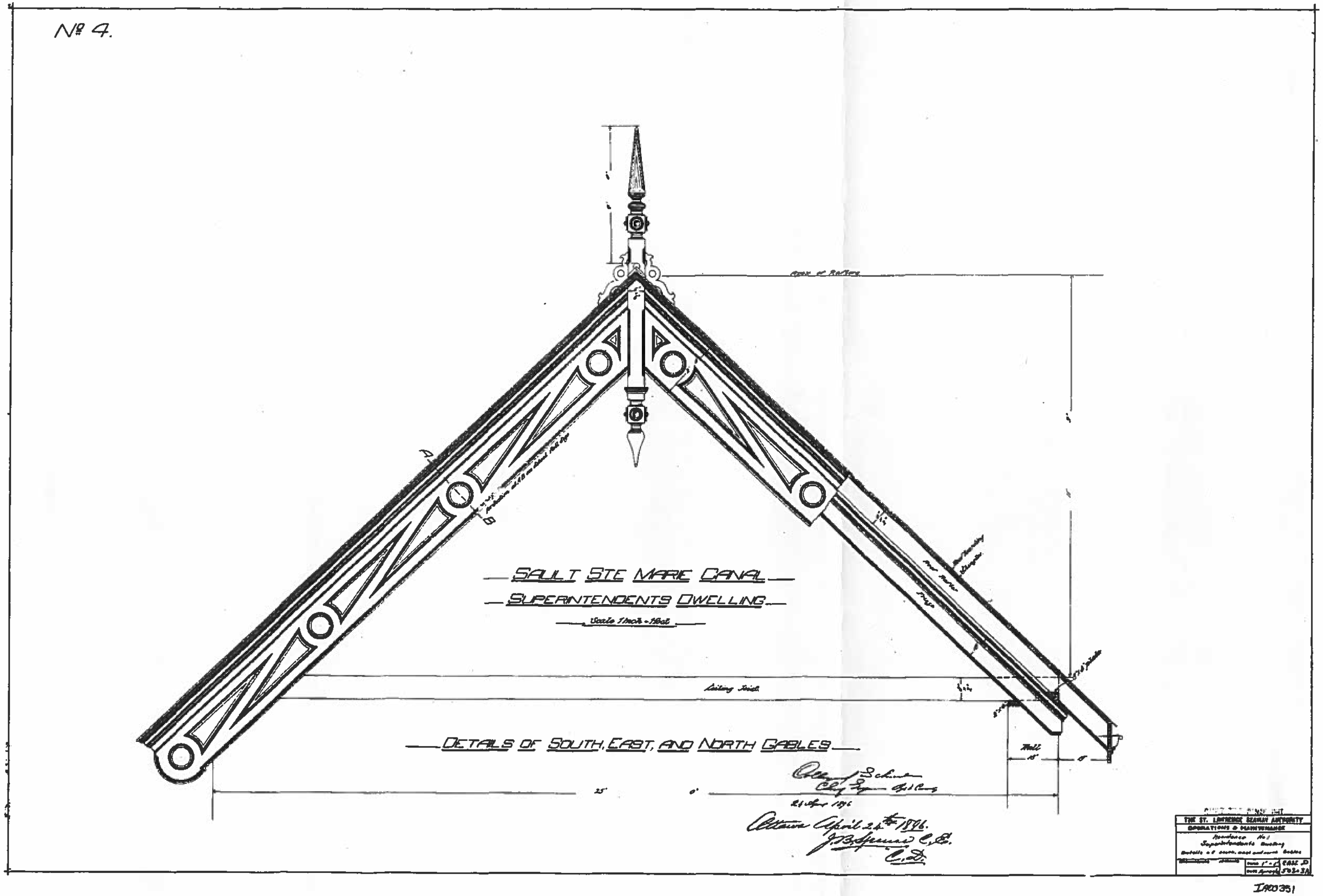
FULL SIZE DETAIL AT B

THE ST. LAWRENCE SEAWAY AUTHORITY
OPERATIONS & MAINTENANCE

Residence No 1
Detail of Truss

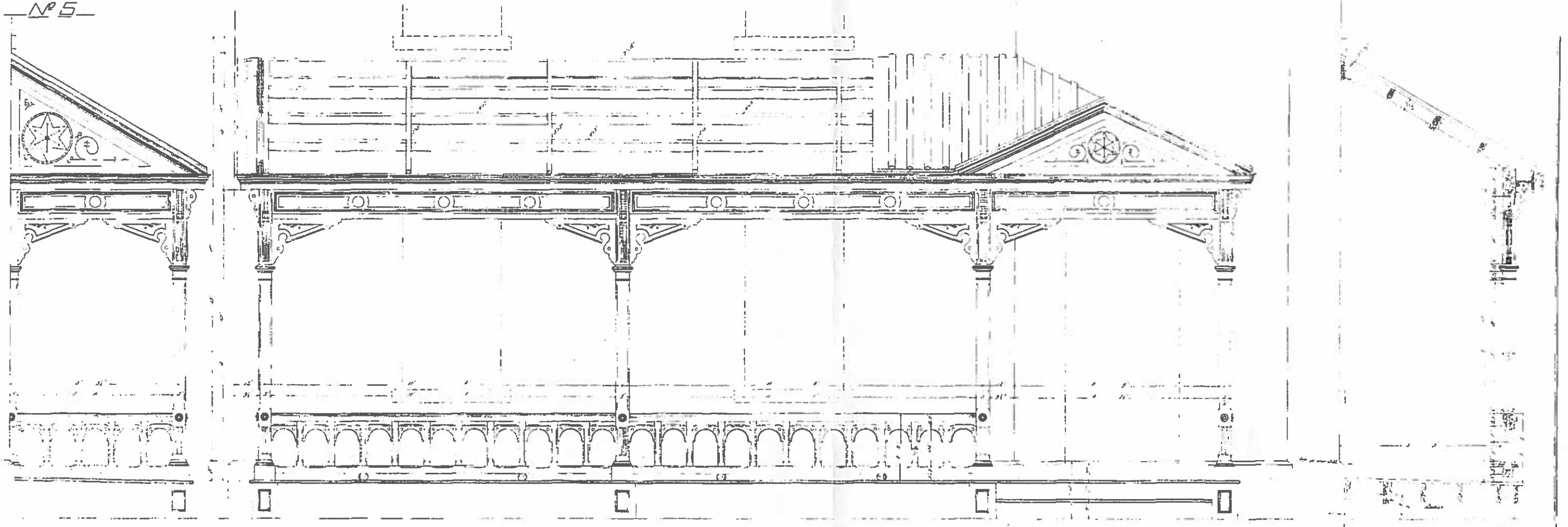
DRAWING NO
50-36

DA00358



Nº 4.
SAULT STE MARIE CANAL
SUPERINTENDENTS DWELLING
Scale 1 Inch = 1 Foot
Ceiling Joist
DETAILS OF SOUTH, EAST, AND NORTH GABLES
24 Apr 1896
Ottawa April 24th 1896.
J. B. Spence C.E.
C.E.
THE ST. LAWRENCE SEAWAY AUTHORITY
OPERATIONS & MAINTENANCE
IRO0351

No 5



ELEVATION OF WEST END

FRONT ELEVATION

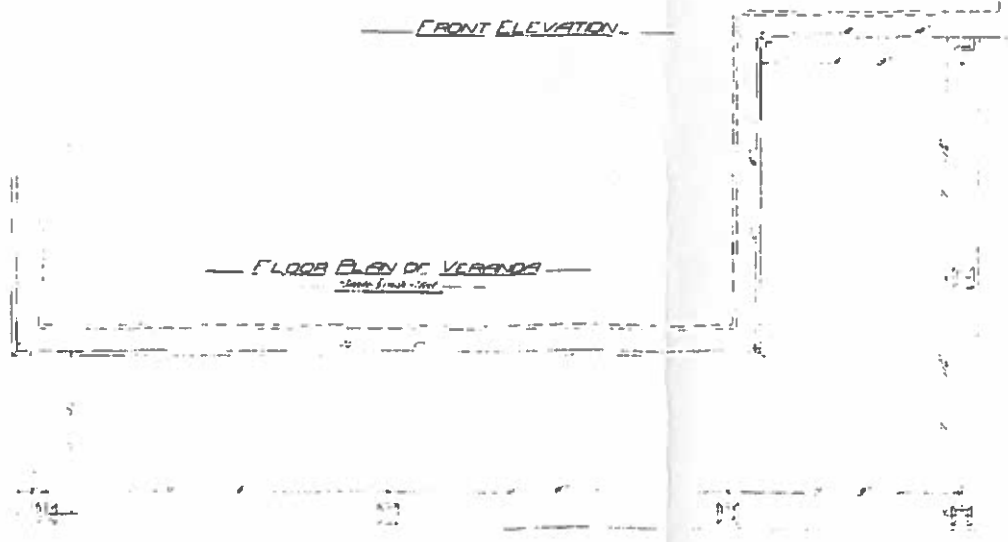
SECTION OF VERANDA

SAULT STE. MARIE CANAL

DETAILS OF VERANDA

for

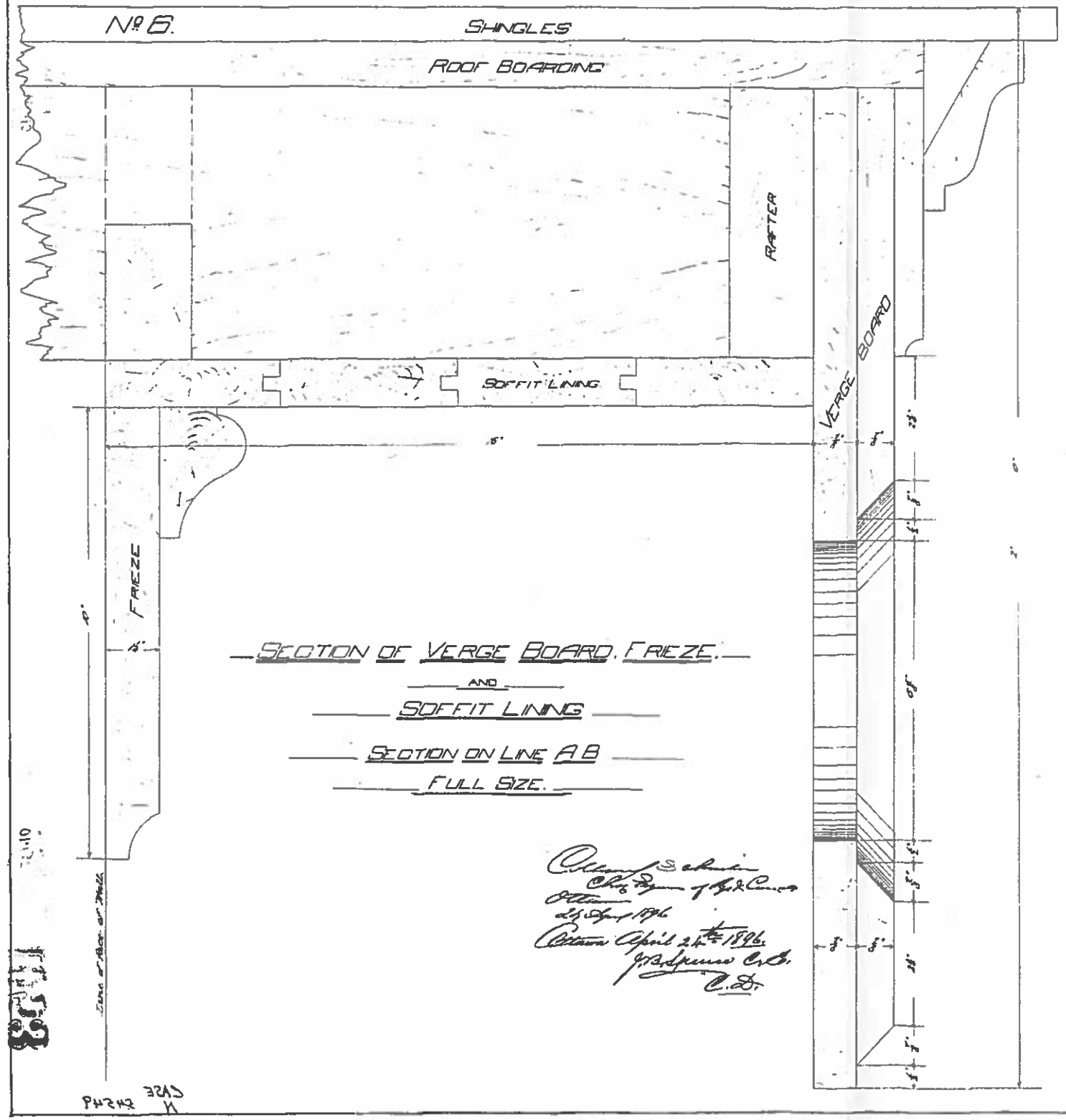
SUPERINTENDENTS DWELLING



FLOOR PLAN OF VERANDA

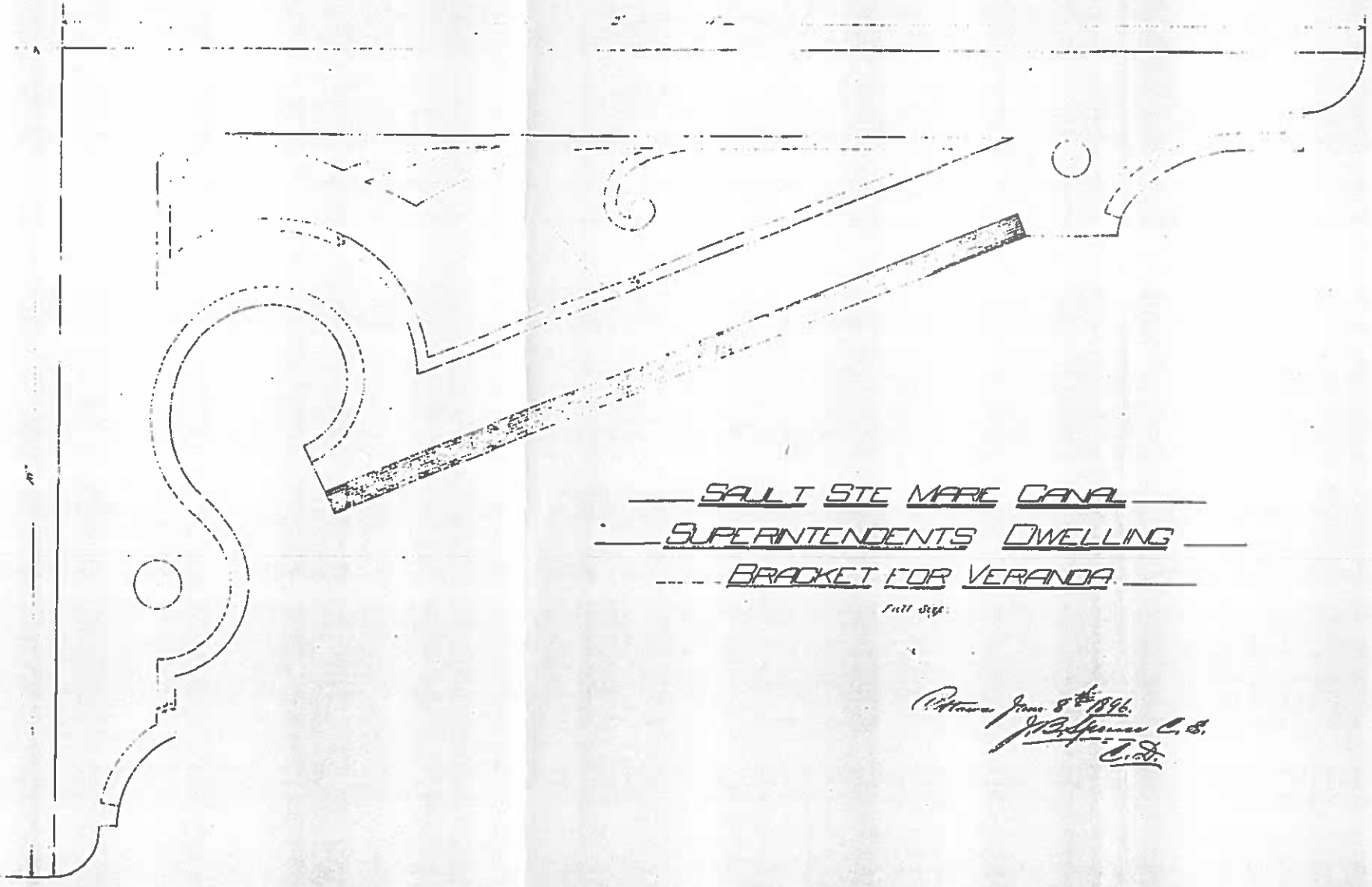
12

* 54 560



THE ST. LAWRENCE SEAWAY AUTHORITY
OPERATIONS & MAINTENANCE

IA 00351



SAULT STE MARIE CANAL

SUPERINTENDENTS DWELLING

BRACKET FOR VERANDA

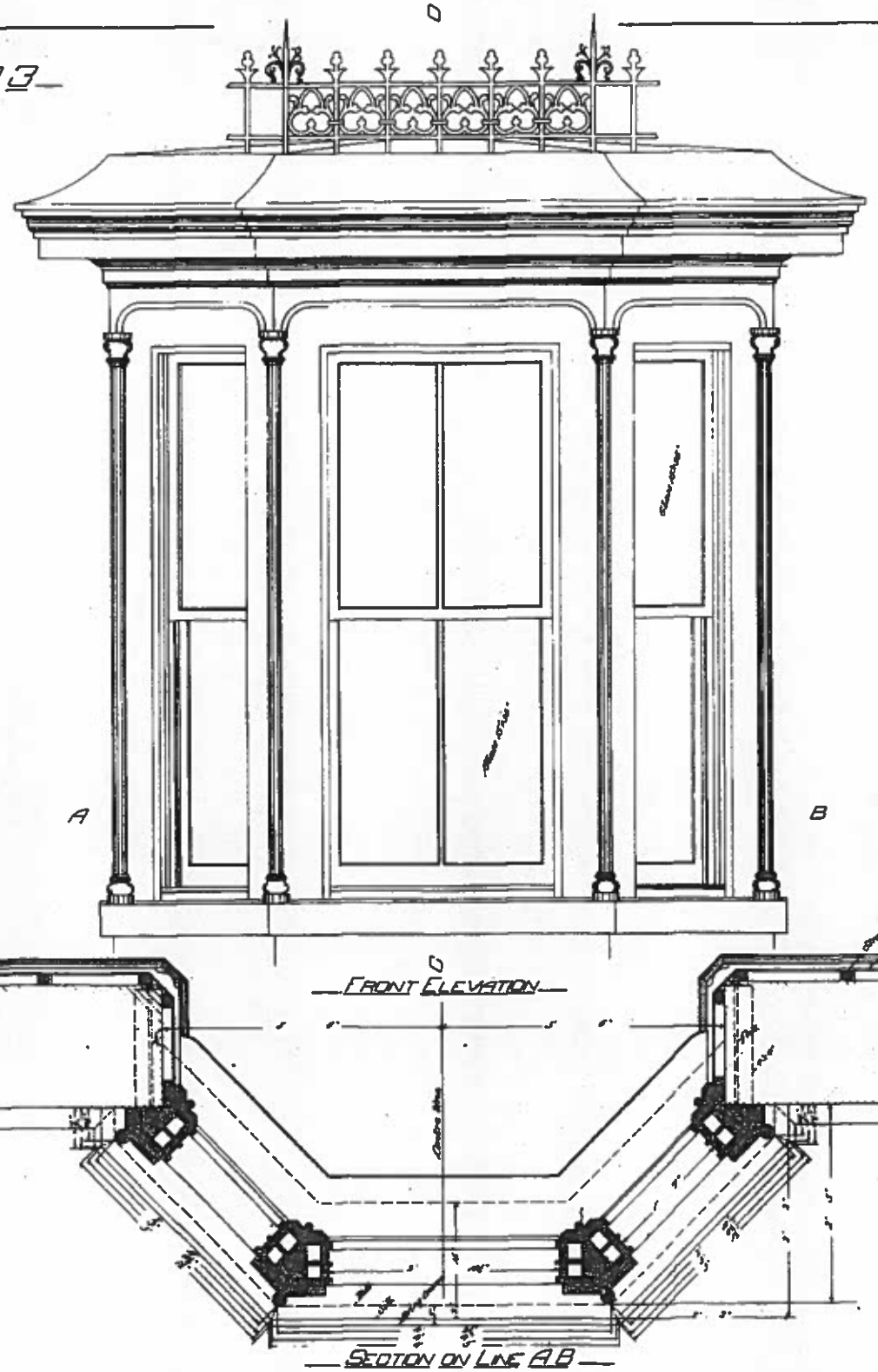
Full Size.

Ottawa June 8th 1896.

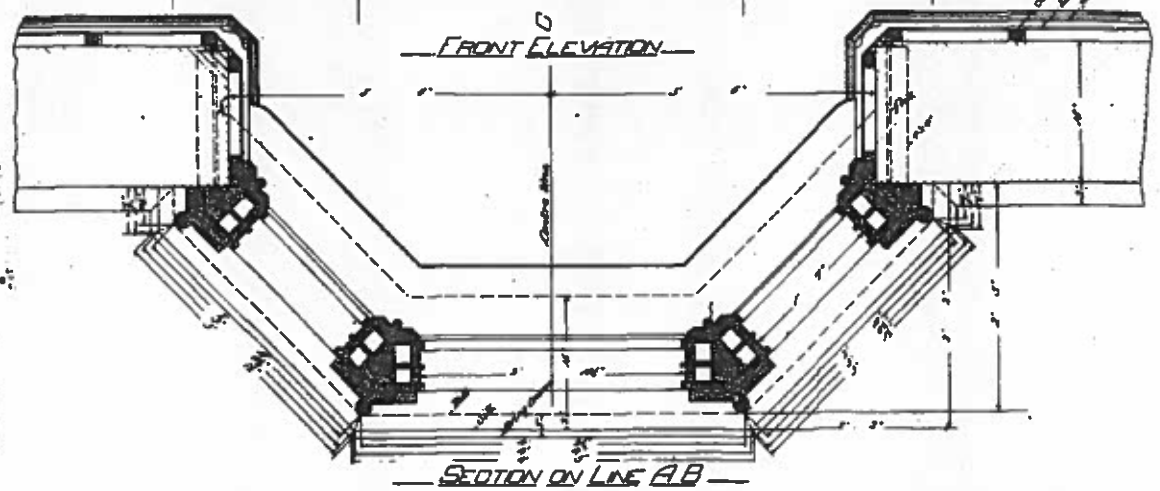
J. Page C.E.

C.E.

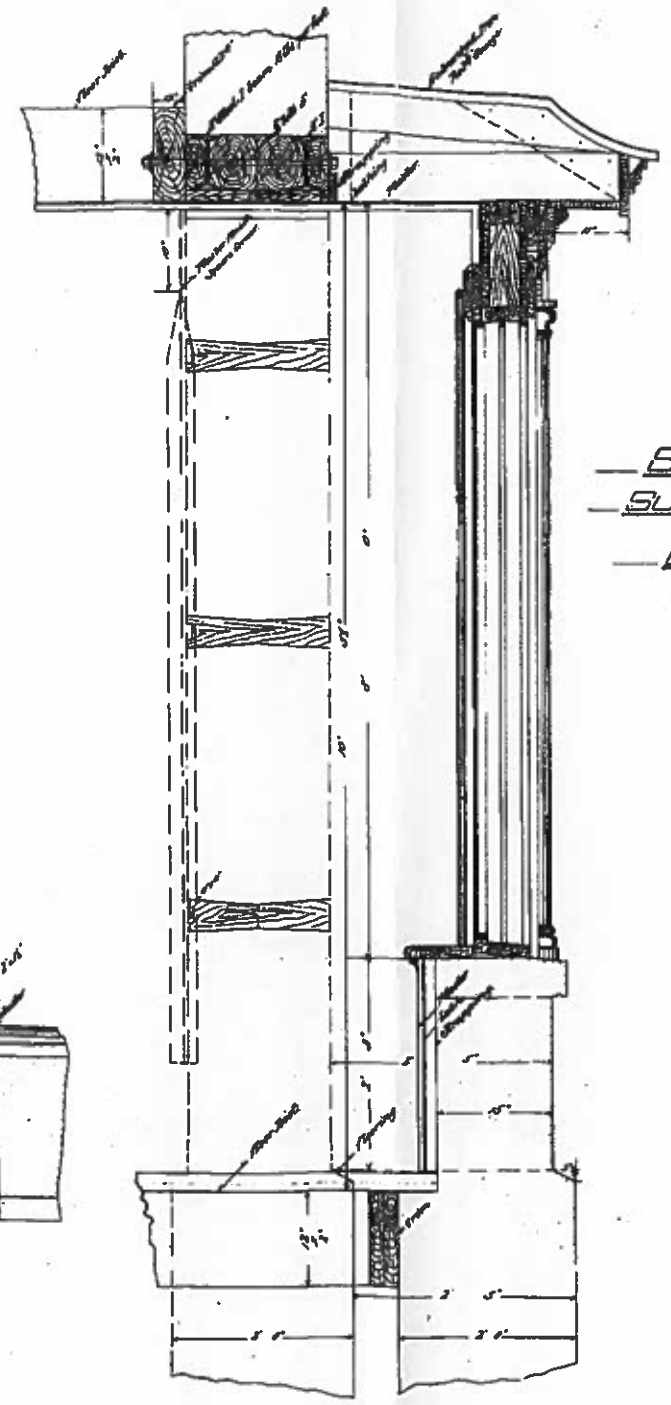
No 3



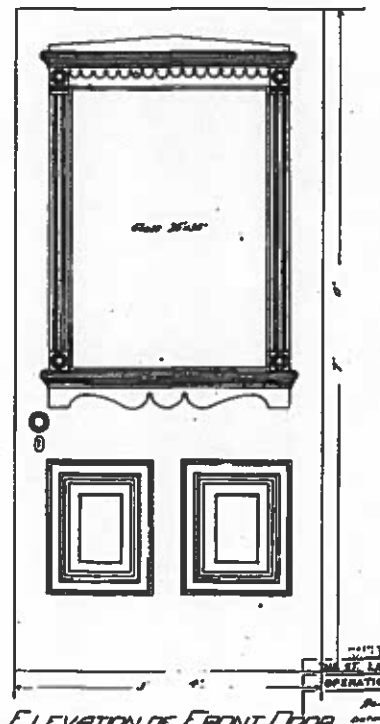
FRONT ELEVATION



SECTION ON LINE A B



SECTION ON LINE C D



ELEVATION OF FRONT DOOR

SAULT STE MARIE CANAL

SUPERINTENDENTS DWELLING

DETAILS of BAY WINDOW

Scale ¼ inches = 1 ft

Chief Engineer

Chief Engineer

Ottawa April 24th 1896.

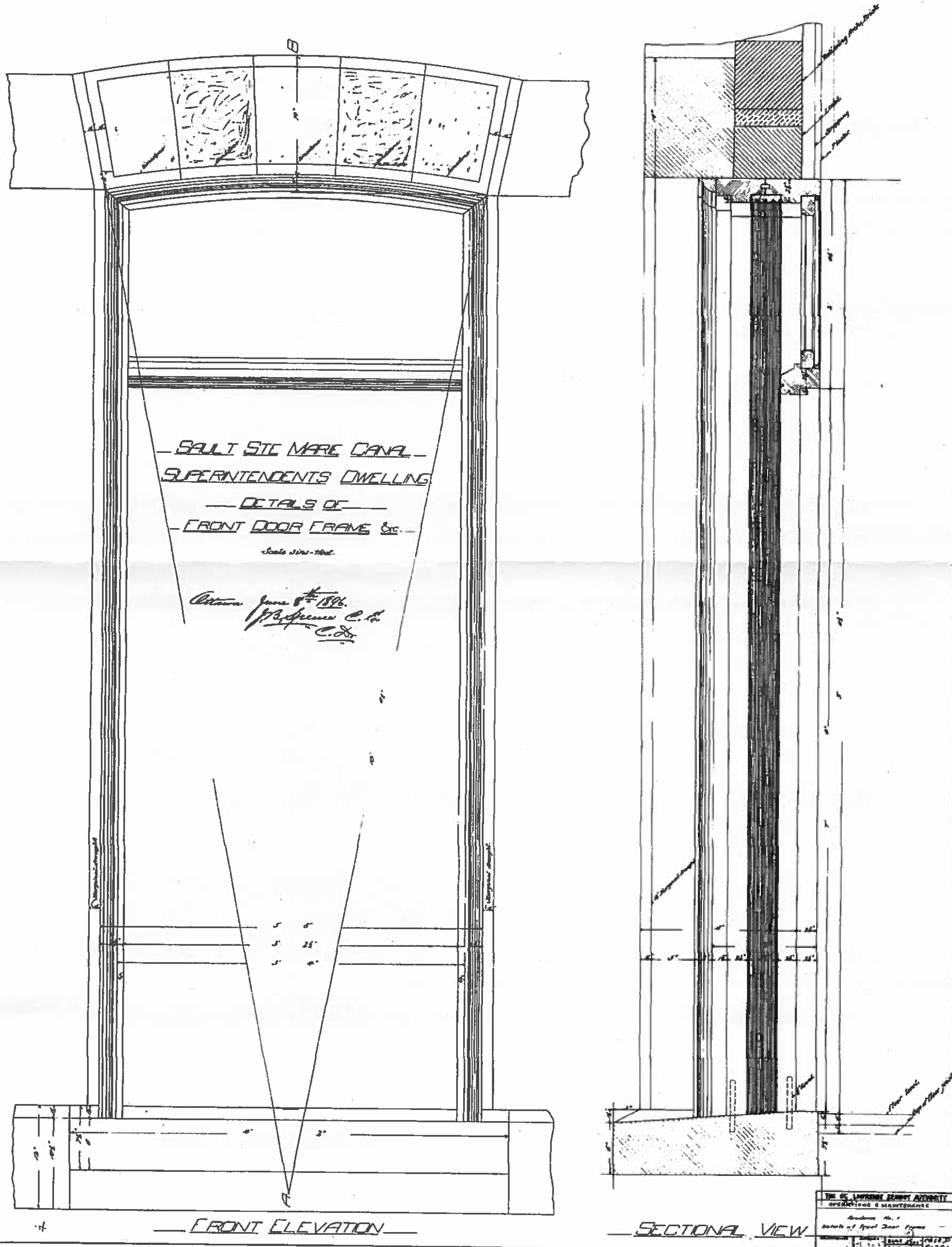
Assistant Engineer C.C.

Contractor

ST. LAWRENCE SEAWAY AUTHORITY
OPERATIONS & MAINTENANCE

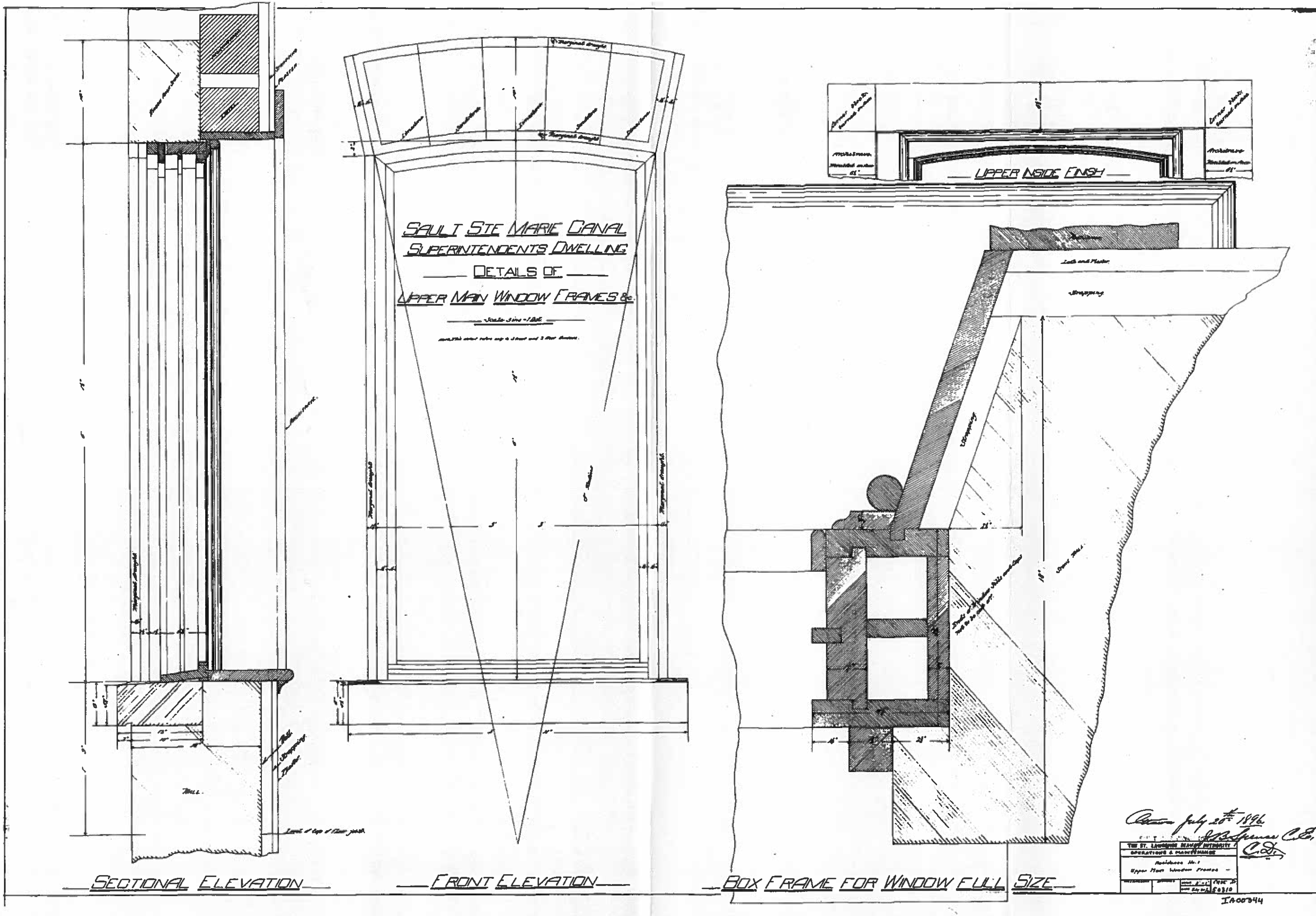
Residence No1
corner of Bay Window

DA00341



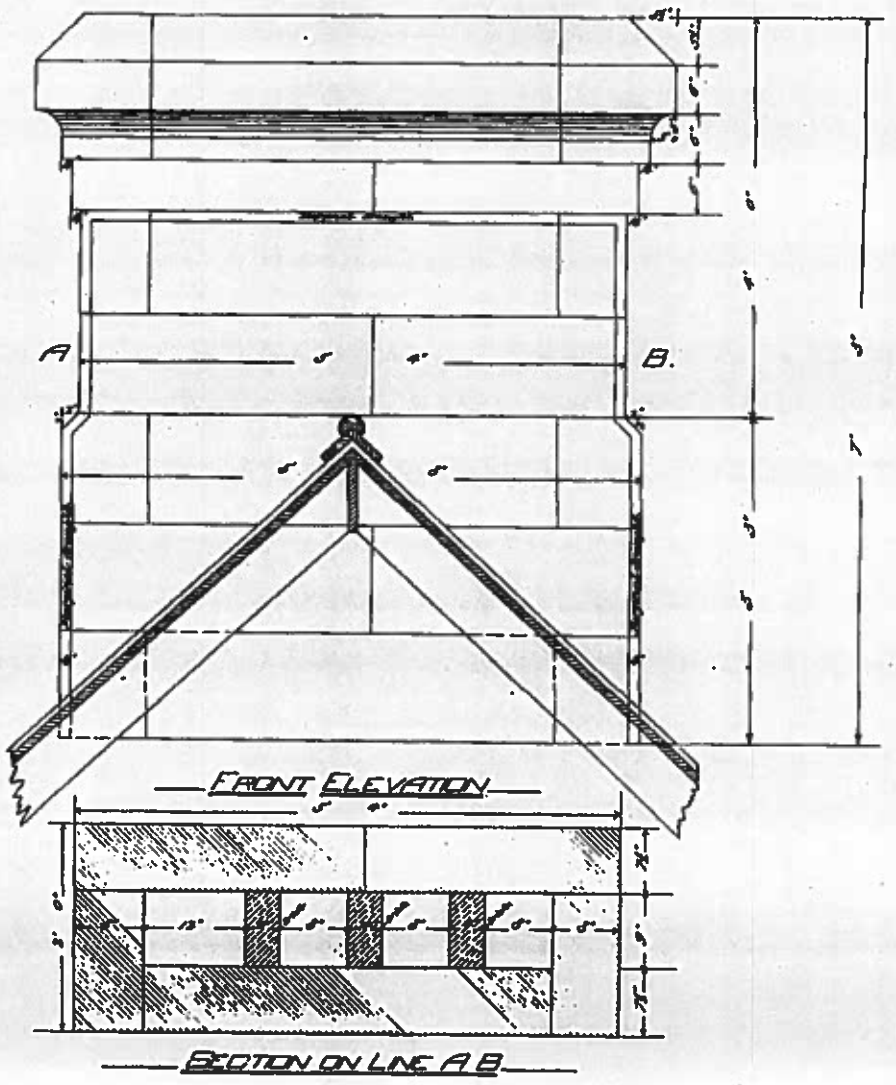
FRONT DOOR DETAILS
SUPT'ENDENT DWELLING
CASE D 50321

IA80337


SAULT STE MARIE CANAL
SUPERINTENDENTS DWELLING
DETAILS OF
UPPER MAIN WINDOW FRAMES &c.
Scale 1 in = 1 ft.
SECTIONAL ELEVATION
FRONT ELEVATION
BOX FRAME FOR WINDOW FULL SIZE
UPPER INSIDE FINISH
Marginal draught
Architrave
Lath and Plaster
Strapping
Stone Wall
Wall
Ottawa July 20th 1896
C.E.
THE ST. LAWRENCE SEAWAY AUTHORITY
OPERATIONS & MAINTENANCE
Residence No. 1
Upper Main Window Frames
50310
IA00344

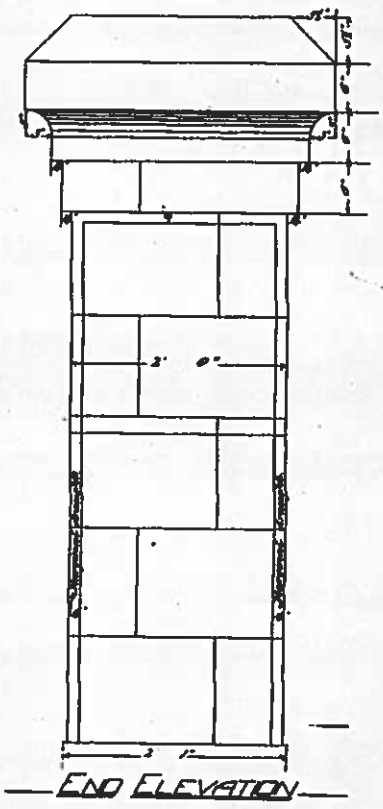
SAULT STE. MARIE CANAL
SUPERINTENDENTS DWELLING
DETAILS OF CHIMNEY

Scale 3/4in. = 1ft-0.



FRONT ELEVATION

SECTION ON LINE A B



END ELEVATION

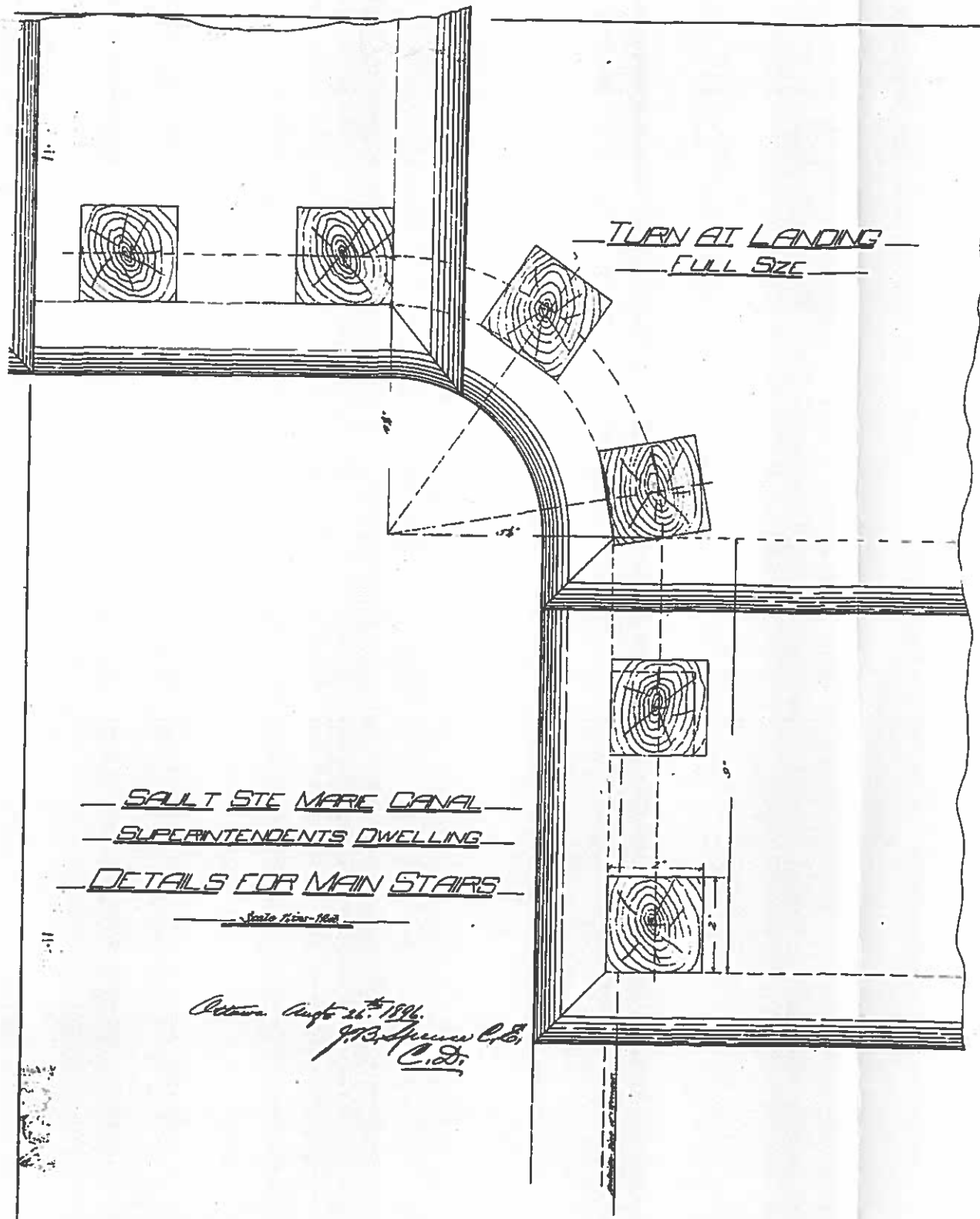
Ottawa June 23rd 1896.

J. B. Spence C.E.

THE ST. LAWRENCE CANALS AUTHORITY
OPERATIONS & MAINTENANCE

Details of Chimney
Dwelling No. 1

IA00349



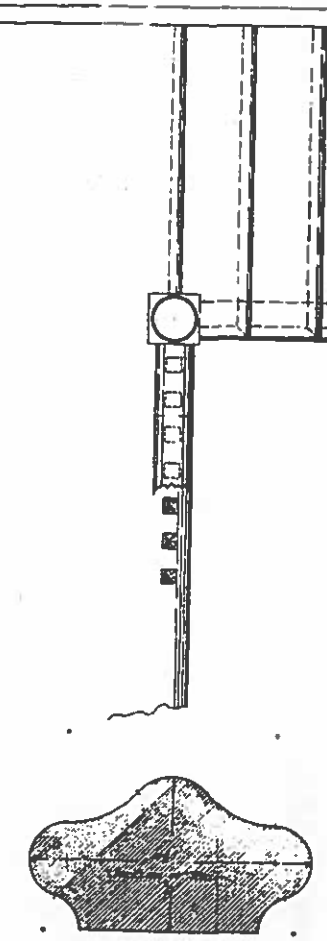
SAULT STE MARIE CANAL

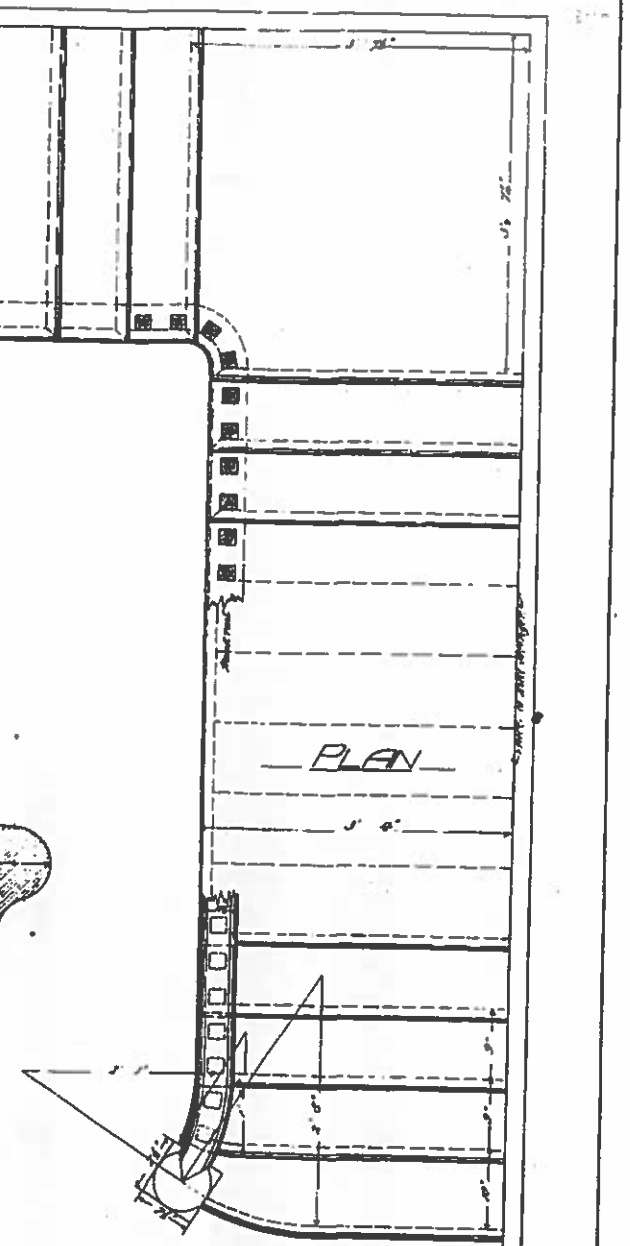
SUPERINTENDENTS DWELLING

DETAILS FOR MAIN STAIRS

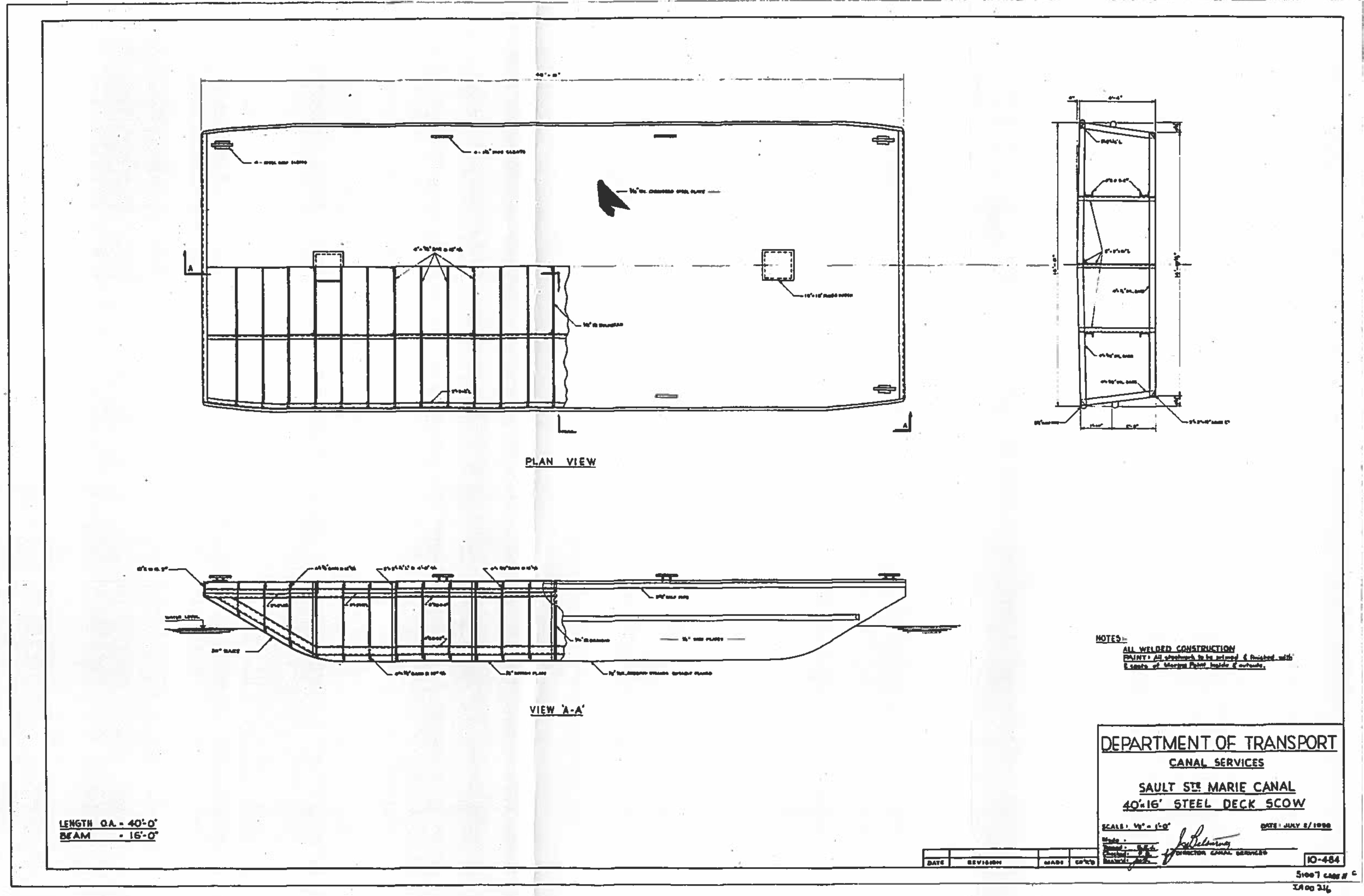
Scale ¼ in = 1 ft.

Ottawa Augt 21st 1914.
J.B. Spence C.E.
C.D.





SAULT STE MARIE CANAL
THE ST. LAWRENCE SEAWAY AUTHORITY
OPERATIONS & MAINTENANCE
Residence No.
Details for Main Stairs
IA60339


PLAN VIEW
VIEW 'A-A'
LENGTH O.A. - 40'-0"
BEAM - 16'-0"
NOTES:-
ALL WELDED CONSTRUCTION
DEPARTMENT OF TRANSPORT
CANAL SERVICES
SAULT STE MARIE CANAL
40'x16' STEEL DECK SCOW
DIRECTOR CANAL SERVICES
DATE
REVISION
MADE
CH'K'D
10-484