



Public Works and Government Services Canada



Requisition Number: EZ899-172568/A

SPECIFICATIONS for:

**Pacific Highway Port of Entry
and
Abbotsford-Huntingdon Port of Entry
Repaving**

Project No: R.078171.001

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APPROVED BY:

Regional Manager, AES

Date

Construction Safety Coordinator

Date

TENDER:

Project Manager

Date

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FOR REFERENCE

- SK#5523.00 TOPOGRAPHIC SURVEY PLAN – HUNTINGDON PORT OF ENTRY REPAVING
- SK#5524.00 TOPOGRAPHIC SURVEY PLAN – PACIFIC CROSSING PARKING AND TRAFFIC LANES REPAVING

1.0 GENERAL

1.1 DESCRIPTION OF WORK

- .1 Work under this Contract comprises, but is not limited to, the provision of all labour, materials, services and equipment necessary for the re-grading and repaving work at Pacific Highway Port of Entry at 28 176th Street, Surrey, BC, and Abbotsford-Huntingdon Port of Entry at 2 Sumas Way, Abbotsford, BC.

1.2 CONTRACT DOCUMENTS

- .1 The Contract documents, drawings and specifications are intended to complement each other.
- .2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

1.3 TIME OF COMPLETION

- .1 Commence work immediately upon official notification of acceptance of offer. Complete contract work, including testing, adjusting and commissioning in 16 weeks.

1.4 HOURS OF WORK

- .1 All work which generates excessive noise, including cutting and coring, hammer drills and powder activated fastening shall be executed during the operating hours of low traffic volume prior to 10:00 am on any day.
- .2 All work shall be executed during normal operating hours between 7:00am and 7:00pm.
- .3 Any work required to be performed outside of normal operating hours must be arranged with CBSA and subject to the City's noise bylaw of the 2 municipalities.
- .4 Refer to phasing diagrams on the drawing for work hour for specific area of certain phase.

1.5 WORK SCHEDULE

- .1 Do not change approved Schedule without notifying Departmental Representative.
- .2 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.
- .3 Carry out work as follows:
 - .1 Within 5 working days after Contract award, submit bar (Gantt) chart as per specification Section 01 32 16.07 Construction Progress Schedule – Bar (Gantt) Chart and a schedule showing anticipated progress stages and final completion of the work within the time period required by the Contract documents. Indicate the following:
 - .1 Submission of shop drawings, product data, MSDS sheets and samples.
 - .2 Commencement and completion of work of each section of the specifications or trades for each phase as outlined.
 - .3 Final completion date within the time period required by the Contract documents.

1.6 COST BREAKDOWN

- .1 Before submitting the first progress claim, submit a breakdown of the Contract price in detail as directed by the Departmental Representative and aggregating Contract price. After approval, the cost breakdown will form the basis of progress payments.
- .2 For funding allocation purposes only, within 5 days after a contract award, submit a separate cost breakdown from Clause 1.6.1 above, dividing the contract price between "Pacific Highway POE" and "Abbotsford Huntingdon POE."
- .3 Separate the cost breakdown for the two Ports of Entry for each progress claim application.

1.7 CODE, BYLAWS, STANDARDS

- .1 Perform work in accordance with the National Building Code of Canada (NBC) 2015, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application, including but not limited to Workers' Compensation Board of BC, BC Building Code 2012 and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.
- .3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.

1.8 REGULATORY REQUIREMENTS

- .1 Building Permit
 - .1 Obtain Certificates, Licenses and other permits required by City of Surrey and City of Abbotsford, provincial or federal authorities to complete the work.
- .2 Provide inspection authorities with plans and information required for issue of final inspection certificates.
- .3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

1.9 DOCUMENTS REQUIRED

- .1 Maintain one copy each of the following at the job site:
 - .1 Contract drawings.
 - .2 Contract specifications.
 - .3 Addenda to Contract documents.
 - .4 Copy of work schedule.
 - .5 Reviewed shop drawings.
 - .6 Change orders.
 - .7 Other modifications to Contract.
 - .8 Field test reports.
 - .9 Reviewed samples.
 - .10 Manufacturer's installation and application instructions.
 - .11 One set of record drawings and specifications for "as-built" purposes.
 - .12 National Building Code of Canada 2010.
 - .13 Current construction standards of workmanship listed in technical Sections.

- .14 Building Safety Plan.

1.10 CONTRACTOR'S USE OF SITE

- .1 Use of site:
- .1 Exclusive and complete for execution of work.
 - .2 Assume responsibility for assigned premises for performance of this work.
 - .3 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Departmental Representative.
 - .4 Cooperate with and coordinate construction/demolition activities with property manager.
- .2 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with approved schedules.
- .3 Do not unreasonably encumber site with material or equipment.

1.11 EXAMINATION

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

1.12 EXISTING SERVICES

- .1 Where work involves breaking into or connecting to existing services, carry out work as directed in section 01 14 00 – Work Restrictions.
- .2 Record locations of maintained, re-routed and abandoned service lines.

1.13 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 his approval for actual location.

1.14 CUTTING AND PATCHING

- .1 Cut existing surfaces as required to accommodate new work.
- .2 Remove items as shown or specified.
- .3 Do not cut, bore, or sleeve load-bearing members.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .5 Fit work airtight to pipes, sleeves, ducts and conduits.
- .6 Conceal pipes, ducts and wiring in raised floors, wall and ceiling construction of finished areas except where indicated otherwise.

- .7 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
- .8 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.
- .9 Dust Control:
 - .1 Protect furnishings and equipment within work area with 0.102 mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
 - .2 Maintain and relocate protection until such work is complete.

1.15 ACCEPTANCE OF SUBTRADES

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

1.16 QUALITY OF WORK

- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
- .2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2015 and Construction Standards as specified herein.
- .3 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

1.17 WORKS COORDINATION

- .1 Coordinate work of sub-trades:
 - .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of work.
- .2 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.
- .3 Work cooperation:
 - .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
 - .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.
 - .3 Ensure disputes between subcontractors are resolved.
- .4 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
- .5 Maintain efficient and continuous supervision.

1.18 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- .1 Submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.
- .2 Allow sufficient time for the following:
 - .1 Review of product data.
 - .2 Approval of shop drawings.
 - .3 Review of re-submission.
 - .4 Ordering of approved material and/or products. Refer to individual technical sections of specifications.

1.19 TESTING AND INSPECTION

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

1.20 AS-BUILT DOCUMENTS

- .1 Keep one set of current white prints of all contract drawings and all addenda, revisions, clarifications, change orders, and reviewed shop drawings in the site office; and have them available at all times for review by Departmental Representative.
- .2 As the Work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.
- .3 At completion of the Work, transfer all deviations, including those called up by addenda, revisions, clarifications, shop drawings and change order, to a set of Issued for Construction drawings. Submit the 'red-marked' as-built set to the Departmental Representative, in hard copy and in PDF.

1.21 SECURITY REQUIREMENTS

- .1 Refer to Section 01 14 00 Work Restriction.

1.22 FINAL CLEANING

- .1 Refer to section 01 74 11 – Cleaning.

1.23 DUST CONTROL

- .1 Provide temporary dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.
- .2 Protect furnishings and equipment within work area with 0.102mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
- .3 Maintain and relocate protection until such work is complete.

1.24 SYSTEM OF MEASUREMENT

- .1 The metric system of measure (SI) will be employed on this contract.

1.25 PARTIAL OCCUPANCY & WARRANTY PERIOD

- .1 To maintain uninterrupted operation of the two Ports of Entry during the construction period, construction phasing is required to be implemented (refer to section 01 14 00 – Work Restrictions). Contractor will schedule progressive hand over of the completed work phase by phase for acceptance by Departmental Representative for occupancy. Warranty period of that phase or portion of work will deem to start from the date of Acceptance of Work and taken over for occupancy use.

1.26 SUBSTANTIAL COMPLETION

- .1 Notwithstanding clause 1.25.1, Substantial Completion of work will only apply to the whole project including release of holdback.

END OF SECTION 01 11 00

1.0 GENERAL

1.1 FACILITY OPERATIONS AND SECURITY PROCEDURES

- .1 Cooperate with and coordinate construction/demolition site activities with Canada Border Services Agency.
- .2 Speed limits are posted on site. Failure to abide by site speed limits may result in removal of employee and vehicle from site.

1.2 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 and other regulations.

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of property. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to all buildings on-site and provide for personnel and vehicle access.
- .3 The whole border crossing is operational during entire construction period. Contractor's work must not interfere with the normal operations of the facility.
- .4 Coordinate with Departmental Representative in scheduling operations to minimize conflict and to facilitate use of space.

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 3 working days of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends. The maximum number of shut-downs is limited to 4 for the duration of the project.
 - .1 Optimize and plan shut-downs so that services are restored in time for normal facility operation hours. Coordinate all shut-downs with utility providers, facility users and the property management firm.
 - .2 Contractor shall be held responsible for damages to facility equipment as the result of service shut-downs.
 - .3 Contractor shall be held responsible for any and all unscheduled shut-downs of building utilities and services.
 - .4 Contractor will not be allowed to connect to Departmental Representative's existing data and communication services.
 - .5 Obtain permission from Departmental Representative for access to restricted areas outside the construction zones 24 hours in advance.
- .3 Provide for personnel and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers & Enclosures.

1.5 SPECIAL REQUIREMENTS

- .1 Carry out noise generating Work, as per 1.8 Noise Control.
 - .1 Means and procedures of controlling and isolating other construction noise affecting occupied areas shall be responsibility of the Contractor and approved by the Departmental Representative.
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.

1.6 SECURITY

- .1 All construction personnel must wear Government issued picture identification at all times while working on CBSA property.
- .2 A Contractor pass will be signed out by each construction crew member at the start of the project. This pass must be worn and be visible at all times while on CBSA Property. This pass shall be surrendered to the CBSA personnel at the end of the project. If a pass is lost during the course of the project, a \$100.00 replacement fee shall be paid by the Contractor.
- .3 While on CBSA Property, all construction personnel shall remain within the designated work areas. Movement within CBSA restricted areas must be approved and may require escort by the CBSA personnel overseeing the work.
- .4 Due to the potential sensitive and personal nature of the interactions between the CBSA staff and the travelling public, construction personnel should make every reasonable effort not to interfere with the border process (including overhearing of conversations).
- .5 Construction personnel must remain aware of their surroundings and be accountable for their tools/equipment at all times. At no point should tools be left unattended that are within reach of the travelling public.
- .6 As construction personnel are within the CBSA areas, their actions and language content of conversation will be a direct reflection on the CBSA. Be mindful that the travelling public will be aware of your presence and act professionally at all times.
- .7 Construction personnel shall not have any interactions with the travelling public.
- .8 Construction personnel shall obey uniformed officers regarding operational directions (i.e. removal from the site during a dangerous situation) but shall refrain from taking direction from uniformed officers or PWGSC building maintenance regarding project construction. Should any contractor take direction from a party other than the Departmental Representative, he does so at his own risk.
- .9 Construction noise levels that disrupt the processing of travelers shall be conducted during the low volume hours as determined by the CBSA.
- .10 Any work which impacts the Operations onsite (traffic, commercial, support staff, etc.) must have one week's notice and must be approved by CBSA. CBSA withholds the right to have work completed at low volume periods (after hours such as 3am on a weekday morning).

WORK RESTRICTIONS

- .11 Any work which impacts the flow of traffic (bus, regular passengers, or trucks) must be approved by CBSA and must have two weeks' notice.
- .12 All deliveries which require escort services against PIL traffic will require a minimum of 24 hrs notice to CBSA so that an escort may be arranged.

1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted within the Traffic Office.

1.8 NOISE CONTROL

- .1 Refer to section 01 11 00 clause 1.5 for hours of work when excessive noise and vibration generation is allowed.
- .2 Means and procedures of controlling and isolating construction noise affecting occupied areas shall be responsibility of the contractor and approval of Departmental Representative.
- .3 Level of work noise must be monitored by Contractor and maintained at a level no greater than 87 dBA, over an eight-hour period.
- .4 If work noise level exceeds 87 dBA, reduce noise either by using engineering devices to reduce or by shortening the duration of exposure.
 - .1 Refer to Table of maximum duration of exposure to sound levels higher than 87dBA permitted by Canada Occupational Health and Safety Regulations:

Sound Level in dBA	Maximum Duration of Exposure in Hours per Employee per 24-Hour Period	Sound Level in dBA	Maximum Duration of Exposure in Hours per Employee per 24-Hour Period
87	8.0	104	0.16
88	6.4	105	0.13
89	5.0	106	0.10
90	4.0	107	0.080
91	3.2	108	0.064
92	2.5	109	0.050
93	2.0	110	0.040
94	1.6	111	0.032
95	1.3	112	0.025
96	1.0	113	0.020
97	0.80	114	0.016
98	0.64	115	0.013
99	0.50	116	0.010
100	0.40	117	0.008
101	0.32	118	0.006
102	0.25	119	0.005
103	0.20	120	0.004

1.9 PHASING OF WORK

- .1 Contractor is only allowed to carry out work in one scope of work area at any one time. Contractor should therefore plan for 3 phases for work at Pacific Highway Point of Entry, and 4 phases for work at Abbotsford – Huntingdon Port of Entry.
- .2 Contractor is allowed to carry out work at both Pacific Highway Port of Entry and Abbotsford – Huntingdon Port of Entry at the same time.
- .3 Contractor must sequence their work not to shut down the full width of any roadway at any one time.
- .4 Phasing diagrams are provided in the architectural drawing package for reference. Contractor to submit work phasing with schedule and traffic management plan for departmental representative's review and approval prior to commencement of construction.
- .5 Traffic control personnel should be provided at all phases as required.

END OF SECTION 01 14 00

1.0 GENERAL

- .1 This section includes the following:
 - .1 Coordination of Work under administration of Departmental Representative.
 - .2 Scheduled Pre-construction and Site meetings.
 - .3 Project planning and construction schedule.
 - .4 Site progress monitoring and control.

1.1 DESCRIPTION

- .1 Coordinate and manage construction schedule, submittals, use of site, temporary utilities, construction facilities, quality control program, and construction Work, with progress of Work of subcontractors, other contractors and Departmental Representative.

1.2 PRE-CONSTRUCTION MEETING

- .1 Refer to Section 01 31 19 Project Meetings item 1.2.

1.3 PROJECT PLANNING

- .1 Plan construction activities, submittals and field reviews ahead of time for efficient and effective management to ensure timely completion of project.

1.4 SCHEDULES

- .1 Submit preliminary construction schedule to Departmental Representative during Pre-Construction meeting.
- .2 After review, revise and resubmit schedule. Submit final full schedule within 2 weeks after Pre-Construction meeting.
- .3 During progress of Work revise and resubmit with the monthly progress payment draw to the Departmental Representative.

1.5 CONSTRUCTION SITE MEETINGS

- .1 Refer to Section 01 31 19 Project Meeting item 1.3.

1.6 WALK THROUGH FIELD REVIEW BY DEPARTMENTAL REPRESENTATIVE

- .1 Departmental Representative will carry out the following:
 - .1 Walk-through field review of the work with contractor's representatives.
 - .2 Preparation and distribution of the Walk-through field review Reports. Reports will be distributed within 5 days of field review.

1.7 SUBMITTALS

- .1 Submit requests for interpretation of Contract Documents, and obtain instructions through Departmental Representative utilizing Request for Information forms.
- .2 Process substitutions through Departmental Representative.
- .3 Deliver closeout submittals for review and inspections, for transmittal to Departmental Representative.

1.8 CLOSEOUT PROCEDURES

- .1 Notify Departmental Representative when Work is considered Substantially Complete. Contractor to prepare list of defects, deficiencies and incomplete work prior to inspection by Departmental Representative. Follow procedures as outlined in Section 01 78 00 – Closeout Submittals.
- .2 Accompany Departmental Representative on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Departmental Representative's instructions for correction of items of Work listed in deficiency list.
- .4 Notify Departmental Representative of instructions for completion of items of Work determined in Departmental Representative's final inspection.

END OF SECTION 01 31 00

1.0 GENERAL

1.1 ADMINISTRATIVE

- .1 Schedule and administer site meetings throughout the progress of the work on a regular basis or at the call of Departmental Representative.
- .2 Prepare and distribute agenda at least three (3) days prior to the meetings.
- .3 Distribute written notice of each meeting seven (7) days in advance of meeting date to Departmental Representative.
- .4 Meeting space will be held in site trailer provided by the Contractor.
- .5 Preside at meetings.
- .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within five (5) days after meetings and transmit to meeting participants and affected parties not in attendance, Departmental Representative and Consultants.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRE- CONSTRUCTION MEETING

- .1 Within 10 days after award of Contract: Departmental Representative will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Attendance will include, but is not limited to, the Departmental Representative, representative of the Canadian Border Services Agency (CBSA), consultants, and Contractor.
- .3 Departmental Representative to establish time and location of preconstruction meeting, Contractor to notify parties concerned a minimum of 5 working days before meeting.
- .4 Contractor will chair the meeting, record minutes and issue minutes.
- .5 Agenda to include:
 - .1 Introduction of official representative of participants in the Work.
 - .2 Start date on site.
 - .3 Communication Protocol for submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 - Temporary Utilities.
 - .5 Canadian Border Services Agency (CBSA) Security requirements.
 - .6 Site safety in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and Section 01 35 33 Health and Safety Requirements.
 - .7 Communication Protocol for proposed changes, change orders, procedures, approvals required.
 - .8 Owner's Work.

- .9 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Review of surveyors, inspection and testing agencies or firms being submitted for use in the project.

1.3 PROGRESS MEETINGS

- .1 During course of Work and two weeks prior to Project Completion, schedule progress meetings bi-weekly.
- .2 Attendance to include but is not limited to Departmental Representatives, representative of the Canadian Border Services agency (CBSA) ,consultants, and Contractor.
- .3 Contractor is responsible to record minutes of meetings and circulate to attending parties and affected parties not in attendance within five (5) days after meeting.
- .4 Record next meeting dates in the meeting minutes or notify parties minimum of seven (7) days in advance for other ad-hoc meetings.
- .5 Agenda to include, at a minimum, the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Health and Safety including any incidents, near misses, and WorkSafe BC visits.
 - .3 Review of Work progress since previous meeting.
 - .4 Coordination discussions with Canadian Border Services agency (CBSA).
 - .5 Construction schedule review.
 - .6 Review of off-site fabrication delivery schedules.
 - .7 Corrective measures and procedures to regain projected schedule.
 - .8 Request for Information (RFI) log review.
 - .9 Engineering Disciplines Reviews.
 - .1 Architectural
 - .2 Structural
 - .3 Mechanical
 - .4 Electrical
 - .5 Civil
 - .10 Change order log review.
 - .11 Review submittal schedule.
 - .12 Review updated as built.
 - .13 Review and resolve site issues.
 - .14 New business.

**CONSTRUCTION PROGRESS SCHEDULE BAR
(GANTT) CHART**

1.0 GENERAL

1.1 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

**CONSTRUCTION PROGRESS SCHEDULE BAR
(GANTT) CHART**

- .5 Clearly show sequence and interdependence of construction activities and indicate:
 - .1 Start and completion of all items of Work, their major components and interim milestones completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
 - .1 Time for submittals, re-submittal and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
 - .3 Include sufficient detail for project activities to assure adequate planning and execution of work. Activities should generally range in duration from 3 to 10 days each.
 - .4 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated to allow coordination and control of project activities. Show continuous flow from left to right.
 - .5 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being whenever possible, continuous series of activities throughout length of project to form critical path.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 5 working days after Award of Contract Project schedule in form of Bar (GANTT) Chart for planning, monitoring and reporting of project progress.

1.4 REVIEW OF THE SCHEDULE

- .1 Allow 10 working days for Departmental Representative to review proposed schedule. Make necessary changes to proposed schedule within 5 days.
- .2 Submit letter ensuring the schedule has been prepared in coordination with major subcontractors and suppliers.
- .3 Promptly provide additional information to validate practicability of schedule as required by Departmental Representative.
- .4 Submittal of Schedule indicates that it meets Contract Requirements and will be executed generally in sequence.

1.5 COMPLIANCE WITH SCHEDULE

- .1 Comply with reviewed schedule.
- .2 Proceed with significant changes and deviations from schedule sequence of activities which cause delay only after review by Departmental Representative.
- .3 Identify activities that are behind schedule and causing delay. Provide recovery plan and schedule to regain slippage.
 - .1 Recovery plan and schedule must include:
 - .1 An increase of personnel on the site for effective activities or work packages.
 - .2 An increase in materials and equipment.
 - .3 Additional work shifts, longer hours.
 - .4 Resource loaded schedule indicating the items noted above.

**CONSTRUCTION PROGRESS SCHEDULE BAR
(GANTT) CHART**

1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule that shows milestone and activity types and expand from the following items:
 - .1 Award.
 - .2 Shop Drawings, Samples and Approvals.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Mock-ups and Approvals.
 - .6 Procurement.
 - .7 Construction.
 - .8 Installation.
 - .9 Site Works.
 - .10 Training.
 - .11 Shutdowns for systems indicated in Section 01 14 00 – 1.4 – Existing Services Shutdown.
 - .12 Commissioning.

1.7 PROJECT SCHEDULE REPORTING

- .1 On an ongoing basis, schedule on job site must show “progress to date”. Arrange participation on and off site of subcontractor and suppliers, as and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.
- .2 Maintain a daily log of progress of the work:
 - .1 Submit daily force report to Departmental Representative daily prior to noon the following day indicating:
 - .1 Total number of personnel on site.
 - .2 Major subcontractors on site listed by trade.
 - .3 Major equipment on site, i.e. excavators, cranes, drills.
 - .4 Concrete volumes.
 - .5 Visitors to site.
 - .6 Weather
 - .7 Documents required from Departmental Representative to Contractor to maintain.
- .3 Perform schedule update monthly dated on last working day of the month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .6 Submit monthly schedule updates with the progress payment request.

**CONSTRUCTION PROGRESS SCHEDULE BAR
(GANTT) CHART**

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

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

1.8 PROJECT MEETINGS

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

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

END OF SECTION 01 32 16.07

1.0 GENERAL

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Do not proceed with work until relevant submissions are reviewed by Departmental Representative.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 When specified in the Contract document, submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

- .4 Allow 10 days for Departmental Representative's review of each submission, unless noted otherwise.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification sections and as Departmental Representative may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, electronic copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of Construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

- .22 Shop drawings format larger than 11" x17" (275mm x 430mm) must be submitted with hardcopies together with electronic format. Submit sufficient copies such that Departmental Representative will keep 5 copies plus contractor's distribution and maintenance manual.
- .23 Electronic submissions will only be reviewed and returned electronically. No hardcopies will be returned to contractor.
- .24 All electronic submissions to be uploaded to Document Control System Collaborative site hosted by PWGSC. Contractor will be responsible for becoming familiar with and utilizing the system.

1.3 SAMPLES

- .1 Submit for review samples in duplicate as required in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will be kept onsite and will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

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

1.5 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement and as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Viewpoints and their locations as reasonably determined by Departmental Representative.
- .4 Provide photographic documentation of adjacent existing conditions prior to commencement of construction for determining and accidental damage as a result of contractor's work.

- .5 Frequency of photographic documentation: monthly as directed by Departmental Representative.
 - .1 Upon completion of: demolition, framing and services before concealment of Work, and as directed by Departmental Representative.

1.6 CERTIFICATES AND TRANSCRIPTS

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

END OF SECTION 01 33 00

1.0 GENERAL

1.1 REFERENCES

- .1 Government of Canada.
 - .1 Canada Labour Code - Part II
 - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC 2015):
 - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 Canadian Standards Association (CSA as amended):
 - .1 CSA Z797-2009 Code of Practice for Access Scaffold
 - .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
 - .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures
- .4 Fire Protection Engineering Services, HRSDC:
 - .1 FCC No. 301, Standard for Construction Operations.
 - .2 FCC No. 302, Standard for Welding and Cutting.
- .5 American National Standards Institute (ANSI):
 - .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .6 Province of British Columbia:
 - .1 Workers Compensation Act Part 3-Occupational Health and Safety.
 - .2 Occupational Health and Safety Regulation
- .7 Current B.C. Electrical Code

1.2 RELATED SECTIONS

- .1 Construction Progress Schedule Bar (GANTT) Chart Section 01 32 16.7
- .2 Submittal Procedures Section 01 33 00
- .3 Temporary Utilities Section 01 51 00
- .4 Temporary Barriers Enclosures Section 01 56 00

1.3 WORKERS' COMPENSATION BOARD COVERAGE

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.
- .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

1.4 COMPLIANCE WITH REGULATIONS

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

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

1.5 SUBMITTALS

- .1 Submit to Departmental Representative submittals listed for review. In accordance with Section 01 33 00
- .2 Work effected by submittal shall not proceed until review is complete.
- .3 Submit the following:
 - .1 Company Health and Safety Plan.
 - .2 Site Specific Safety Plan
 - .3 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
 - .4 Copies of incident and accident reports.
 - .5 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Material Information System (WHMIS) requirements.
 - .6 Emergency Procedures.
- .4 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within 2 days after Receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.
- .5 Medical surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of work, and submit additional certifications for any new site personnel to Departmental Representative.
- .6 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
 - .1 Be construed to imply approval by the Departmental Representative.
 - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
 - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

1.6 RESPONSIBILITY

- .1 Assume responsibility as the Prime Contractor for work under this contract.
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 HEALTH AND SAFETY COORDINATOR

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

1.8 GENERAL CONDITIONS

- .1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
 - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.
 - .2 Secure site at night time as deemed necessary to protect site against entry.

1.9 REGULATORY REQUIREMENTS

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

1.10 WORK PERMITS

- .1 Obtain specialty trade permits related to project before start of work.

1.11 FILING OF NOTICE

- .1 The General Contractor is to complete and submit a Notice of Project as required by Provincial authorities.
- .2 Provide copies of all notices to the Departmental Representative.

1.12 HEALTH AND SAFETY PLAN

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
 - .1 Primary requirements:
 - .1 Contractor's safety policy.
 - .2 Identification of applicable compliance obligations.
 - .3 Definition of responsibilities for project safety/organization chart for project.
 - .4 General safety rules for project.
 - .5 Job-specific safe work, procedures.
 - .6 Inspection policy and procedures.
 - .7 Incident reporting and investigation policy and procedures.

**HEALTH AND
SAFETY REQUIREMENTS**

- .8 Occupational Health and Safety Committee/Representative procedures.
- .9 Occupational Health and Safety meetings.
- .10 Occupational Health and Safety communications and record keeping procedures.
- .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
- .3 List hazardous materials to be brought on site as required by work.
- .4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
- .5 Identify personal protective equipment (PPE) to be used by workers.
- .6 Identify personnel and alternates responsible for site safety and health.
- .7 Identify personnel training requirements and training plan, including site orientation for new workers.
- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
- .4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review: the review of Health and Safety Plan by Public Works and Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

1.13 EMERGENCY PROCEDURES

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
 - .1 Designated personnel from own company.
 - .2 Regulatory agencies applicable to work and as per legislated regulations.
 - .3 Local emergency resources.
 - .4 Departmental Representative and site staff.
- .2 Include the following provisions in the emergency procedures:
 - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
 - .2 Evacuate all workers safely.
 - .3 Check and confirm the safe evacuation of all workers.
 - .4 Notify the fire department or other emergency responders.
 - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
 - .6 Notify Departmental Representative and site staff.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
 - .1 Work at high angles.
 - .2 Work in confined spaces or where there is a risk of entrapment.
 - .3 Work with hazardous substances.
 - .4 Underground work.
 - .5 Work on, over, under and adjacent to water.
 - .6 Workplaces where there are persons who require physical assistance to be

moved.

- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.
- .5 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

1.14 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information system (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
 - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00.
 - .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when Esquimalt Graving Dock Staff have left the building.
 - .3 Provide adequate means of ventilation in accordance with Section 01 51 00.

1.15 ELECTRICAL SAFETY REQUIREMENTS

- .1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
 - .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.
 - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.16 ELECTRICAL LOCKOUT

- .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
- .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.
- .3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.17 OVERLOADING

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

1.28 CONFINED SPACES

- .1 Carry out work in confined spaces in compliance with Occupational Health and Safety Regulation, Part 9.

1.19 POWDER-ACTUATED DEVICES

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

1.20 FIRE SAFETY AND HOT WORK

- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

1.21 FIRE SAFETY REQUIREMENTS

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the latest edition of National Fire Code of Canada

1.22 FIRE PROTECTION AND ALARM SYSTEM

- .1 Fire protection and alarm systems shall not be:
 - .1 Obstructed.
 - .2 Shut off.
 - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

1.23 UNFORESEEN HAZARDS

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

1.24 POSTED DOCUMENTS

- .1 Post legible versions of the following documents on site:
 - .1 Health and Safety Plan.
 - .2 Sequence of work.
 - .3 Emergency procedures.
 - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
 - .5 Notice of Project.
 - .6 Floor plans or site plans.
 - .7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
 - .8 Workplace Hazardous Materials Information System (WHMIS) documents.
 - .9 Material Safety Data Sheets (MSDS).
 - .10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
- .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

1.25 MEETINGS

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

1.26 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance with health and safety issues identified.
- .3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

END OF SECTION 01 35 33

1.0 GENERAL

1.1 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Contractor.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

- .1 Submit electronic copy of inspection and test reports to Departmental Representative. Testing and Inspection companies engaged by the Contractor will furnish paper copies of reports on site to allow for work to proceed in a timely manner.
- .2 Provide copies to subcontractor of work being, inspected or tested or manufacturer or fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

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

1.8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed.

1.0 GENERAL

1.1 RELATED REQUIREMENTS

1.2 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2- 2008, Stipulated Price Contract.
- .2 Canada Green Building Council (CAGBC)
 - .1 LEED Canada – NC 1.0 (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1. 189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978 (R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2 – M1987 (R2001), Access Scaffolding for Construction Purpose.
 - .4 CAN/CSA-Z321-96 (R2001), Signs and Symbols for the Occupational Environment.
- .5 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Indicate use of supplemental or other staging area.
- .3 Provide construction facilities in order to execute work expeditiously.
- .4 Remove from site all such work after use.

1.5 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.
- .3 Lay down area to be designated by and arranged with CBSA.

1.6 CONSTRUCTION PARKING

- .1 There is no construction parking on site.
- .2 Provide and maintain adequate access to project site.

1.7 FIRST AID

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

1.8 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.

1.9 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.

1.10 CONSTRUCTION SIGNAGE

- .1 No other signs or advertisements, other than warning signs, are permitted on site.
- .2 Maintain approved signs and notices in good condition for duration of project, and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

1.11 HOARDING

- .1 Prior to all demolition and construction, install module lock fence or protective barrier. Maintain in safe and clean condition throughout duration of project. Submit hoarding plan to Departmental Representative for approval.
- .2 Erect and maintain safety barricades around all work area and other danger areas as required by Building Code and WCB.
- .3 Installation of hoarding must not create permanent damage to existing paving to remain. All damaged paving must be restored to original condition.

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.

1.0 GENERAL

1.2 REFERENCES

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

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

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

1.3 INSTALLATION AND REMOVAL

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

- .2 Remove from site all such work after use.

1.4 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around work area.

- .2 Provide as required by governing authorities.

1.5 ACCESS TO SITE

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

1.6 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.

1.7 FIRE ROUTES

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

- .2 Maintain clearance for all egress routes.

1.8 PROTECTION OFF-SITE AND PUBLIC PROPERTY

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

- .2 Be responsible for damage incurred.

1.9 PROTECTION OF EXISTING PROPERTY

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

- .2 Provide necessary screens, covers, and hoardings.

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

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

1.10 WASTE MANAGEMENT AND DISPOSAL

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

END OF SECTION 01 56 00

1.0 GENERAL

1.1 QUALITY OF PRODUCTS

- .1 Products, materials and equipment (referred to as products) incorporated into work shall be new, not damaged or defective, and of the best quality (compatible with the specifications) for the purpose intended. If requested, furnish evidence as to type, source and quality of the products provided.
- .2 Defective products will be rejected regardless of previous inspections.
 - .1 Inspection does not relieve responsibility, but is precaution against oversight or error.
 - .2 Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
 - .3 Retain purchase orders, invoices and other documents to prove that all products utilized in this Contract meet the requirements of the specifications. Produce documents when requested by the Departmental Representative.
 - .4 Should any dispute arise as to quality or fitness of products, the decision rests strictly with the Departmental Representative based upon the requirements of the Contract documents.
 - .5 Unless otherwise indicated in the specifications, maintain uniformity of manufacture for any particular or like item throughout the project.
 - .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.

1.2 AVAILABILITY OF PRODUCTS

- .1 Immediately upon signing the Contract, review product delivery requirements and anticipate foreseeable supply delays for any items.
- .2 If delays in supply of products are foreseeable, notify Departmental Representative of such in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the work.
- .3 In event of failure to notify Departmental Representative at the start of work and should it subsequently appear that the work may be delayed for such reason, the Departmental Representative reserves the right to substitute more readily available products of similar character, at no increase in either the Contract price or the Contract time.

1.3 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in the specifications, install or erect products in accordance with the manufacturer's instructions.
 - .1 Do not rely on labels or enclosures provided with products.
 - .2 Obtain written instructions directly from the manufacturer.
- .2 Notify Departmental Representative in writing of conflicts between the specifications and the manufacturer's instructions so that the Departmental Representative may establish the course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Departmental Representative to require removal and reinstallation at no increase in either the Contract price or the Contract time.

1.4 CONTRACTOR'S OPTIONS FOR SELECTION OF PRODUCTS FOR TENDERING

- .1 Products are specified by "Prescriptive" specifications: select any product meeting or exceeding specifications.
- .2 Products specified under "Acceptable Products": select any one of the indicated manufacturers, or any other manufacturer meeting or exceeding the Prescriptive specifications and indicated Products.
- .3 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.
- .4 Products specified to meet particular design requirements or to match existing materials: use only material specified Approved Product. Alternative products may be considered provided full technical data is received in writing by Departmental Representative in accordance with "Special Instructions to Tenderers".
- .5 When products are specified by a referenced standard or by or Performance specifications, upon request of Departmental Representative obtain from manufacturer an independent laboratory report showing that the product meets or exceeds the specified requirements.

1.5 SUBSTITUTION AFTER CONTRACT AWARD

- .1 No substitutions are permitted without prior written approval of the Departmental Representative.
- .2 Proposals for substitution may only be submitted after Contract award. Such request must include statements of respective costs of items originally specified and the proposed substitution.
- .3 Proposals will be considered by the Departmental Representative if:
 - .1 Products selected by tenderer from those specified are not available;
 - .2 Delivery date of products selected from those specified would unduly delay completion of Contract, or
 - .3 Alternative product to that specified, which is brought to the attention of and considered by Departmental Representative as equivalent to the product specified, and will result in a credit to the Contract amount.
 - .4 Should the proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on the project. Pay for design or drawing changes required as result of substitution.
 - .5 Amounts of all credits arising from approval of the substitutions will be determined by the Departmental Representative and the Contract price will be reduced accordingly.

1.0 GENERAL

1.1 REFERENCES

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

1.2 QUALIFICATIONS OF SURVEYOR

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

1.3 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
- .2 Contractor is responsible to provide GPR Survey of existing services as required to verify existing underground condition prior to excavation.

1.4 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.5 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

1.6 SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.7 SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

END OF SECTION 01 71 00

1.0 GENERAL

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner or separate contractor.
- .3 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 MATERIALS

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

1.3 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.

- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

END OF SECTION 01 73 00

1.0 GENERAL

1.1 REFERENCES

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

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

- .7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .8 Remove dirt and other disfiguration from exterior surfaces.
- .9 Sweep and wash clean paved areas.
- .10 Remove snow and ice from access to buildings.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

END OF SECTION 01 74 11

1.0 GENERAL

1.1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's Waste Management Plan and Goals.
- .2 Accomplish maximum control of solid construction waste.
- .3 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .3 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .4 Inert Fill: inert waste - exclusively asphalt and concrete.
- .5 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Reuse: repeated use of product in same form but not necessarily for same purpose.
Reuse includes:
 - .1 Salvaging reusable materials from re-modeling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .11 Separate Condition: refers to waste sorted into individual types.
- .12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction,

demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.

- .14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials.

1.3 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
 - .1 Waste Audit.
 - .2 Waste Reduction Workplan.
 - .3 Material Source Separation Plan.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
 - .1 Submit 2 copies of completed Waste Reduction Workplan (WRW).
 - .2 Submit 2 copies of completed Demolition Waste Audit (DWA).
 - .3 Submit 2 copies of Materials Source Separation Program (MSSP) description.
- .3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
 - .1 For each material reused, sold or recycled from project, include amount quantities by number, type and size of items and the destination.
 - .2 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.5 WASTE AUDIT (WA)

- .1 Conduct WA prior to project start-up.
- .2 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

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

- .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Describe management of waste.
- .5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.
- .6 Post WRW or summary where workers at site are able to review content.
- .7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

- .1 Prepare DWA prior to project start-up.
- .2 Complete DWA.
- .3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
 - .1 Transport to approved and authorized recycling facility.

1.9 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect surface drainage, mechanical and electrical from damage and blockage.
- .4 Separate and store materials produced during dismantling of structures in designated areas.
- .5 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.

1.10 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner, into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.11 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Provide temporary security measures approved by Departmental Representative.

1.12 SCHEDULING

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

2.0 PRODUCTS

2.1 NOT USED

- .1 Not Used.

3.0 EXECUTION

3.1 APPLICATION

- .1 Do Work in compliance with WRW.

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

3.2 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.3 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

- .1 Schedule E - Government Chief Responsibility for the Environment:
 - .1 Ministry of Environment Lands and Parks
810 Blanshard Street, 4th Floor
Victoria, BC V8V 1X4
604-387-1161 / 604-356-6464
 - .2 Waste Reduction Commission Soils and Hazardous Waste
770 South Pacific Blvd, Suite 303
Vancouver BC, V6B 5E7
604-660-9550 / 604-660-9596

END OF SECTION 01 74 19

1.0 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

- .1 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing two weeks prior to the satisfactory completion site visit of the Contractor's Inspection to allow Departmental Representative to schedule relevant authorities.
 - .2 Request Departmental Representative's Inspection.
 - .3 Departmental Representative's Review: Departmental Representative and Contractor will perform review of Work to identify obvious defects or deficiencies. Contractor and Departmental Representative will agree to the value set forth in the Deficiencies identified in the Certificate of Final Completion and set a schedule of completion for all deficiencies.
 - .4 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted, and balanced and are fully operational.
 - .4 Certificates required by authorities having jurisdiction.
 - .5 Commissioning of all systems: Final commissioning reports have been submitted to the Departmental Representative.
 - .6 Operation of systems have been demonstrated to Owner's personnel.
 - .7 Work is complete and ready for Final Inspection.
- .2 Submit required forms as described in General Conditions and Standard Acquisition Contract Clause (SACC) manual.

END OF SECTION 01 77 00

1.0 GENERAL

1.1 RELATED SECTIONS

- | | | |
|----|-----------------------------|------------------|
| .1 | Quality Control | Section 01 45 00 |
| .2 | Examination and Preparation | Section 01 71 00 |
| .3 | Closeout Procedures | Section 01 77 00 |

1.2 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy of maintenance manual will be returned after substantial completion inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Completion of the Work, submit to the Departmental Representative, four draft copies of operating and maintenance manuals in English.
- .5 An electronic copy Interactive Operating and Maintenance Manual System is required as specified under clause 1.3. Provide 4 sets of the Electronic Interactive Operating and Maintenance Manual System to the Departmental Representative.
- .6 Hard copies of the Operating and Maintenance Manual System is required as specified under clause 1.4. Provide 4 sets of the Hard Copy Interactive Operating and Maintenance Manual System to the Departmental Representative.
- .7 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .8 If requested, furnish evidence as to type, source and quality of products provided.
- .9 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .10 Pay costs of transportation.
- .11 Certificate of Completion.

1.3 INTERACTIVE OPERATING AND MAINTENANCE MANUAL SYSTEM

- .1 In addition to the printed copies, submit provide an Interactive Operating and Maintenance Manual System as specified herein.
- .2 System Description and Requirements
 - .1 All as constructed drawings and operation and maintenance (O&M) manuals listed under the Scope of Work shall be converted, where necessary, into Portable Data File (PDF) format for viewing using the Adobe Acrobat Reader.

- .2 Documentation storage and retrieval system shall be structured based on a database framework with direct links to the appropriate PDF files. Documents retrieval and viewing shall be executed through a menu driven approach.
- .3 Program shall be capable of storing separately and independently data of multiple buildings and shall be expandable for addition of new buildings and systems.
- .4 Data of each building shall be accessible by the input of either the building name or building number as defined by the Departmental Representative.
- .5 O&M data and as constructed drawings shall be classified by their corresponding disciplines as applicable, including:
 - .1 Architectural
 - .2 Civil
 - .3 Under each discipline, data shall be grouped into the following four major categories:
 - .1 Basic Documents
 - .1 'Basic Documents' shall, according to the type of services or disciplines, include the full contents of each hard copy of the O&M manuals with the addition of Miscellaneous Maintenance Reports and Records, or as defined by the user. In general the following shall be included unless specifically excluded by the Departmental Representative:
 - .1 Introduction
 - .2 Consultant/Contractor/Suppliers List
 - .3 System Description
 - .4 Maintenance Schedules
 - .5 Testing and Commissioning (T&C) Reports
 - .6 Misc. Reports
 - .7 Specifications
 - .8 Equipment and/or point schedules as identified in the hard copy documents
 - .9 Others as stipulated by the Departmental Representative
 - .2 All Basic Documents PDF files shall be enhanced with appropriate bookmarks to facilitate searching of information within the document or linking to other relevant documents for references.
 - .2 'As-Constructed' Drawings
 - .1 'As-Constructed' drawings shall be converted from the original electronic files, such as CAD, into PDF format. If only the hard copies of the 'as constructed' drawings are available, they shall be scanned and saved in PDF format. PDF files of the 'As-Constructed' drawings shall be enhanced with the following bookmarks to zoom into legible views on the computer screen as a minimum:
 - .1 Drawing Number and Title
 - .2 Drawing Notes
 - .3 Major Equipment Locations
 - .4 Cross-links to other related drawings
 - .5 Revisions

1.4 FORMAT HARD COPY MANUALS

- .1 Organize data in the form of an 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. 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 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. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in .dwg format on CD.

1.5 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 date of submission;
 - .2 names, addresses, and telephone and fax numbers of Contractor, Subcontractors, Suppliers with name of responsible parties;
 - .3 schedule of products and systems, indexed to content of volume.
 - .4 copy of hardware schedule and paint schedules, complete with the actual manufacturer, supplier and identification names and numbers.
 - .5 all extended guarantees, warranties, maintenance bonds, certificates, letters of guarantees, registration cards, as called for in the various sections of the specification.
 - .6 complete set of all final reviewed shop drawings.
 - .7 certificates of inspection by authorities having jurisdiction.
 - .8 test reports and certificates as applicable.
 - .9 complete set of as constructed drawings.
- .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 clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.6 'AS CONSTRUCTED' DRAWINGS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the 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. 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. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Mark changes as work progresses and as changes occur. Include changes to existing drainage systems, control systems and low voltage control wiring. Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed. Use different colour waterproof ink for each service.
- .7 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 AS INSTALLED" (Signature of Contractor) (Date).
- .8 Provide an electronic copy of as constructed drawings.

1.7 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .3 Field changes of dimension and detail.

- .4 Changes made by change orders.
- .5 Details not on original Contract Drawings.
- .6 References to related shop drawings and modifications.

- .5 Specifications: legibly 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.

1.8 WARRANTIES AND BONDS

- .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 the applicable item of work.
- .4 Except for items put into use with Owner's permission; leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

END OF SECTION 01 78 00

1.0 GENERAL

1.1 RELATED REQUIRMENTS

- .1 Work includes all traffic line paint in the scope area as shown on drawings.

1.2 REFERENCES

- .1 Environmental Protection Agency (EPA)
 - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual – November 2007.
 - .2 Standard GPS-1- 05, MPI Green Performance Standard for Painting and Coatings.
- .4 National Fire Code of Canada 2015.
- .5 Society for Protective Coatings (SSPC)
 - .1 Systems and Specifications, SSPC Painting Manual 2005.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: to have a minimum of five years proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work
 - .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
- .2 Conform to the standards contained in the Master Painters Institute Architectural Painting Specification Manual, latest edition (hereafter referred to as MPI Painting Specification Manual) for all painting products including preparation and application of materials. MPI Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
- .3 All paint manufacturers and products used shall be as listed under the “Approved Products” section of the MPI Painting Specification manual.
- .4 Other paint materials shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .5 Single-Source Responsibility: provide primers and undercoat paint produced by the same manufacturer as the finish coat.
- .6 All painting and decorating work shall be inspected by Paint Inspection Agency (inspector) acceptable to the specifying authority and the local MPI Accredited Quality Assurance Association. The painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of the project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule etc.

EXTERIOR PAINTING

- .7 All surfaces requiring painting or repainting shall be inspected by the inspection agency who shall advise on all aspects of painting work including preparation, notifying the Consultant, the Contractor and the Trade Contractor of any defects or problems prior to commencing painting work or after the prime coat shows defects in the substrate, and as the work progresses.
- .8 Standard of Acceptance:
 - .1 Wall: No defects visible from a distance of 1000mm at 90° to surface.
 - .2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .9 Mock-Ups:
 - 1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .1 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.
 - .2 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
 - .3 Locate where directed.
 - .4 Allow 24 hours for inspection of mock-up before proceeding with work.
 - .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- .10 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .11 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.4 PERFORMANCE REQUIREMENTS

- .1 Environmental Performance Requirements:
 - .1 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.
- .2 Green Performance in accordance with MPI Standard GPS-1.

1.5 SCHEDULING

- .1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about building.

1.6 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data for the use and application of paint thinner.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application.
- .3 Samples:
 - .1 Submit manufacturer's standard range of color choices on each specified color type as listed in Colour Schedule of this section for selection, review and acceptance of each color.
 - .2 Submit triplicates 200 x 300 mm sample panels of each paint with specified paint in colours, gloss/sheen and textures required, based on selected colors, to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
 - .1 1 mm plate steel for finishes over metal surfaces.
 - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
 - .4 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Lead, cadmium and chromium: presence of and amounts.
 - .2 Mercury: presence of and amounts.
 - .3 Organochlorines and PCBs: presence of and amounts.
 - .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .6 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
 - .7 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
 - .2 Quantity: provide one - 4 litre (1 gallon) can of each type and colour of primer stain finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.8 DELIVERY, STORAGE & HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, supplemented as follows:
 - .1 Deliver and store materials in original containers, sealed, with labels intact.
 - .2 Labels: to indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
 - .3 Remove damaged, opened and rejected materials from site.
 - .4 Provide and maintain dry, temperature controlled, secure storage.
 - .5 Observe manufacturer's recommendations for storage and handling.
 - .6 Store materials and supplies away from heat generating devices.
 - .7 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.
 - .8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
 - .9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative
 - .10 Remove paint materials from storage only in quantities required for same day use.
 - .11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .12 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada latest edition.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
 - .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

EXTERIOR PAINTING

- .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.
- .8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

1.9 AMBIENT CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85 % or when dew point is less than 3 degrees C variance between air/surface temperature.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
- .3 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
 - .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint

EXTERIOR PAINTING

- manufacturer's limits.
- .3 Surface to be painted is wet, damp or frosted.
- .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
- .7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
- .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
- .9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.10 GUARANTEE

- .1 Furnish either the local MPI Accredited Quality Assurance Association's two (2) year guarantee, or, alternatively, a 100% two (2) year Maintenance Bond – both in accordance with MPI Painting Manual requirements. The Maintenance Bond shall warrant that all painting work has been performed in accordance with MPI Painting Manual requirements
- .2 All painting and decorating work shall be in accordance with MPI Painting Manual requirements and shall be inspected by the local MPI Accredited Quality Assurance Association's Paint Inspection Agency (inspector), whether using either the MPI Accredited Quality Assurance Association's guarantee, or the Maintenance Bond option. The cost for such inspections, and for either the local MPI Accredited Quality Assurance Association's Guarantee, or the Maintenance Bond, shall be included in the Base Bid Price.
- .3 Painting and decorating Subcontractors choosing the Maintenance Bond option shall provide a maintenance bond consent from a reputable surety company licensed to do business in Canada. Cash or certified check are not acceptable in lieu of surety consent.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Paint materials listed in latest edition of MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems: to be products of single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" ratings are acceptable for use on this project.
- .4 Use only MPI listed materials.
- .5 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, to be as follows:
 - .1 Be water-based.
 - .2 Be non-flammable biodegradable.
 - .3 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
 - .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .6 Water-borne surface coatings must be manufactured and transported in a manner that steps of

- processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada.
- .7 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
 - .8 Water-borne surface coatings and recycled water-borne surface coatings must have flash point of 61.0 degrees C or greater.
 - .9 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
 - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .10 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.
 - .11 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
 - .12 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
 - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
 - .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
 - .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 COLOURS

- .1 Departmental Representative will provide Colour Schedule after Contract award. Submit proposed Colour Schedule to Departmental Representative for approval.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in accordance with paint manufacturer's instructions. If directions

are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative .

- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 Matte	Max.5	Max.10
Finish (flat) Gloss Level 2 -Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 -Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 -Satin-Like Finish	20 to 35	Min.35
Gloss Level 5 -Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 -Gloss finish	70 to 85	
Gloss Level 7 -High Gloss Finish	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated.

2.5 EXTERIOR PAINTING SYSTEMS

- .1 New surfaces
 - .1 Concrete Surface (for parking lines, etc.)
EXT 3.2F Alkyd zone/traffic marking finish.
 - .2 Asphalt Paving (for parking lines, etc.)
EXT 2.1B Alkyd zone/traffic marking finish.
- .2 Existing surfaces
 - .1 Concrete Surface (for parking lines, etc.)
REX 3.2F Alkyd zone/traffic marking finish.
 - .2 Asphalt Surface (for parking lines, etc.)
REX 2.1B Alkyd zone/traffic marking finish.
 - .3 Structural Steel and Metal Fabrications (for bollard, etc)
REX 5.1D Alkyd (Gloss level 4) finish.
- .3 All paint systems to be MPI Premium Grade 3 coat system.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 EXISTING CONDITIONS

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

3.3 EXAMINATION

- .1 Exterior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.
- .2 Exterior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Departmental Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .3 Where assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.

3.4 PROTECTION

- .1 Protect adjacent surfaces and structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.
- .2 Protect factory finished products and equipment.
- .3 Protect passing pedestrians, building occupants and general public in and about building.
- .4 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .5 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Departmental Representative.

3.5 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly

EXTERIOR PAINTING

- atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
- .4 Brush out immediately runs and sags.
- .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative.

- .5 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

- .7 Sand and dust between coats to remove visible defects.

- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

- .2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

- .3 Do not paint over nameplates.

- .4 Paint fire protection piping red.

- .5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.7 RESTORATION & CLEANING

- .1 Clean and re-install hardware items removed before undertaken painting operations.

- .2 Remove protective coverings and warning signs as soon as practical after operations cease.

- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

EXTERIOR PAINTING

- .6 Proceed in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

END OF SECTION 09 91 13

**PACIFIC HIGHWAY PORT OF ENTRY
AND
ABBOTSFORD-HUNTINGTON PORT OF ENTRY
REPAVING**

**APPENDIX A
Geotechnical Investigation
Abbotsford – Huntingdon Port of Entry**



17 November 2016

GEOTECHNICAL INVESTIGATION

Abbotsford-Huntingdon Port of Entry, BC Project No. R.078926.001

Submitted to:

Public Works and Government Services Canada
219, 800 Burrard Street
Vancouver, BC V6Z 0B9

Attention: Mr. Biren Juttun, Civil Design Manager



REPORT



Report Number: 1314470497-050-R-Rev0-11000





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1.0 INTRODUCTION

Further to our work plan of 22 July 2016, Golder Associates Ltd. (Golder) has conducted a geotechnical investigation at the Abbotsford-Huntingdon Port of Entry, BC for assessment of select asphalt and concrete pavements as a part of a Canada Border Services Agency (CBSA) repaving project. This report presents the results of the investigation, and our geotechnical comments and recommendations on the proposed repaving.

This report should be read in conjunction with the *Important Information and Limitations of this Report* presented in Appendix A for the proper use and interpretation of this report.

2.0 BACKGROUND INFORMATION

Golder understands that it is proposed to improve drainage and select asphalt and concrete pavements at the Abbotsford Huntingdon Port of Entry in Abbotsford, BC. RF Binnie and Associates (Binnie) conducted a site review on 2 September 2015. Based on the site review, Binnie has identified a portion of concrete pavement of the commercial lane for replacement and asphalt pavement at the intersection of 1st Avenue and exit lanes of the Border Crossing for repaving. In addition, it is also proposed to construct new pavement in an area just north of the USA/Canada border in the commercial vehicle area shown in Figure 1. The new construction is to create more space for trucks cue.

The traffic information provided by PWGSC indicates that the commercial vehicular traffic is 400 trucks of various classes during weekdays and 100 trucks per day during weekend period.

Chernoff Thompson Architect (CTA) drawings (CTA Ref: R.078169.001) provided to Golder show the following repaving provisions:

- Concrete Pavement
 - Remove existing concrete slab
 - Reconstruct 200 mm thick concrete slab with 15M rebars @ 250 o/c both ways
- Asphalt Pavement
 - Remove existing asphalt
 - Repave to match existing asphalt thickness (100 mm minimum)
- New Asphalt Pavement
 - 100 mm thick asphalt
 - 150 mm thick granular base (as required)
 - 250 mm thick granular subbase (as required)



3.0 SCOPE OF WORK

The accepted work plan provided for the following tasks:

- i) Task 1 – Geotechnical investigation and recommendations
- ii) Task 2 – Geotechnical Design Review, input
- iii) Task 3 – Construction Services – Geotechnical Field and QC Review

This report includes works carried out under Task 1. Drainage improvement designs will be by others.

4.0 GEOTECHNICAL INVESTIGATION

4.1 Desktop Review

Golder reviewed the drawings provided and noted the pavement repaving provisions made. Golder also reviewed the available web imagery to understand the existing site conditions.

4.2 Site Visit and Visual Review

Golder conducted a site visit along with a PWGSC representative on 16 August 2016 to review the site conditions and plan the field works. The following provides our comments on the visual condition of the subject pavements:

i) Concrete Pavement

There are two commercial northbound lanes with concrete pavement between the CBSA booths and the USA/Canada Border. The west side northbound lane's concrete pavement is proposed to be reconstructed. The subject concrete pavement consists of 6 panels measuring a total of approximately 23 m in length and width varying from 4.5 to 5.2 m.

The concrete slabs did not show any significant visible cracks except edge cracking at isolated locations. However, the surface exhibited exposed aggregate due to loss of cement mortar over a period of time. The filler separating the slab panels appeared to be worn out at a number of locations. At some of the gaps where the filler was worn out, vegetation growth was visible. Photographs 1 and 2 show the concrete pavement condition.



Photograph 1 – Slab joint filler deterioration and vegetation growth



Photograph 2 – exposed aggregate, slab edge broken and vegetation growth





ii) Asphalt Pavement

The geometry of asphalt pavement at the 1st Avenue and Port of Entry exit lanes intersection is of irregular shape. The traffic from commercial lanes and light vehicle lanes pass through this intersection. The intersection permits traffic only in the north direction to Sumas Way. Eastbound traffic entering the intersection also proceeds north on Sumas Way. There is no roadway limb on east side of the intersection. While the traffic from commercial and light vehicle lanes enters the intersection separately, there is minor weaving of light and commercial traffic at the intersection before exiting.

The asphalt pavement used by commercial traffic appeared to have been repaired in the past as a large patch was conspicuous. The previously repaired patch was observed to be in poor condition exhibiting longitudinal and transverse cracks at close intervals, some depressions and failed joints.

The portion of pavement used by light vehicles also exhibited cracks at comparatively fewer locations. However, the asphalt surface appeared to be worn out due to loss of surficial asphalt exposing aggregate.

Photographs 3 to 5 show typical asphalt pavement distress.

Photograph 3 – Cracked asphalt of commercial lane





Photograph 4 – Cracked asphalt of commercial lane



Photograph 5 – Cracked asphalt of commercial lane and light vehicles





4.3 Traffic Data

Based on the traffic information provided in Section 2.0, we have assumed an average truck factor of 2.5 ESAL for the mixed type of commercial vehicles. Accordingly, the design lane traffic is estimated to be 5.72 million ESALS. Since there is no separate lane demarcation for commercial and light vehicles at the 1st Avenue intersection, we have assumed the commercial traffic to be governing for the purpose of pavement design and assessment.

The new asphalt pavements that will be constructed just north of the USA/Canada border will be to provide additional space for truck cueing. Therefore, we have assumed that the design lane traffic to be 25% of the total commercial traffic considering two existing northbound lanes.

4.4 Asphalt Pavement Deflection Testing

The structural strength of asphalt pavements was assessed on 22 August 2016 using a Benkelman beam apparatus which utilizes a single rear axle truck loaded with 80kN on its rear axle. For testing purpose, the asphalt pavement area at the 1st Avenue intersection was divided into five lanes (Lanes 1 through 5). Lanes 1 and 2 corresponded to light vehicle usage while Lanes 3 to 5 corresponded to commercial vehicle traffic usage. Weaving of light and commercial traffic is likely in Lanes 2 and 3. The lane configuration is shown in Figure 1.

Pavement deflections were obtained at 5 m intervals. Asphalt pavement temperature was noted. The pavement deflection data was corrected by applying seasonal and temperature correction factors. The corrected data was subjected to statistical analysis to obtain the Most Probable Spring Rebound (MPSR). Table 1 presents a summary of the statistical analysis.

Table 1: Summary of Pavement Deflection Analysis

Lane	Number of Readings	Deflection (mm)				
		Minimum	Maximum	Mean	Standard Deviation	MPSR
1 st Avenue intersection (All lanes)	23	0.22	1.87	0.82	0.49	1.80
Lanes 1 and 2 (light vehicles)	10	0.27	1.87	0.74	0.48	1.70
Lanes 3, 4 and 5 (commercial vehicles)	13	0.22	1.87	0.89	0.50	1.90

The individual Benkelman beam deflection readings and reports are included in Appendix B.

For the review purpose, we have assumed that the 1st Avenue classification corresponds to an 'Arterial' road. The maximum allowable MPSR for an Arterial road in Abbotsford is 1.00 mm. An MPSR of 1.80 mm of the pavement indicates inherent weakness of the pavement structure or subgrade.



4.5 Geotechnical Test Holes

The geotechnical investigation consisting of three augerholes (AH16-01 through AH16-03) was carried out on 26 August 2016. Auger holes AH16-01, AH16-02 and AH16-03 were located in the grass area (east of the shed along commercial lane), concrete pavement and asphalt pavement areas respectively as shown in Figure 1. The depth of augerholes was 3.0 m. A dynamic cone penetration test to evaluate relative density of subsurface soils was conducted to a depth of 5.7 m in the vicinity of AH16-01.

A track-mounted solid stem continuous auger drill rig provided by Downrite Drilling was utilized to advance the augerholes. The augerhole advancement was conducted under full-time supervision of a Golder engineer who logged the soils and groundwater conditions encountered. Representative soil samples were retrieved from auger flights and taken to Golder's Burnaby, BC laboratory for visual classification and testing.

Upon completion, the augerholes were backfilled with soil cuttings and closed in accordance with BC Provincial Guidelines on Groundwater Protection. The augerholes were sealed at surface with concrete patch mix and asphalt patch mix for the augerholes in concrete and asphalt pavement respectively.

Prior to conducting augerholes, Golder initiated a BC1 Call to obtain buried utility information. Thereafter, services of Western Utility Locate Services were utilized to locate the augerholes in areas considered to be free of buried utilities. At the 1st Avenue intersection, the buried utilities were observed to be too heavily congested in order to safely advance any augerhole. Therefore, a safe location in the vicinity of the intersection was selected on 1st Avenue at approximately 8 m west from the intersection where the surficial appearance of the pavement appeared to be similar to the pavement at the intersection.

Services of a traffic control subcontractor were utilized during utility location as well as augerhole advancement.

Records of Augerhole Sheets are presented in Appendix C.

4.6 Laboratory Testing Program

Select soil samples were subjected to laboratory testing that included natural water content determinations, Atterberg Limits determinations and grain size distribution analyses.

Laboratory test results are presented in Appendix D.



5.0 SUBSURFACE CONDITIONS

The soil descriptions presented in this report are based on accepted standard methods of classification and identification routinely used in current geotechnical state-of-practice. The stratigraphic boundaries discussed herein are inferred from visual observations only. These boundaries represent general transitions between soil types, rather than discrete planes of contact between different soil materials. Care should be exercised when extrapolating soil conditions between augerholes as soil conditions may vary both laterally and with depth.

The subsurface conditions encountered at discrete augerholes are summarized in Table 2.

Table 2: Summary of subsurface conditions.

Auger Hole #	Depth (from – to), m	Soil Type
AH16-01	0.00 – 0.87	Sand, some to silty, dry, compact
	0.87 – 3.00	Silt, trace to sandy, trace gravel, moist, soft to firm, sand becomes fine at 2.40 m
AH16-02	0.00 – 0.27	Concrete
	0.27 – 0.90	FILL, Crushed gravel (road base material), compact
	0.90 – 3.00	Silty clay to clayey silt, some sand, trace gravel, moist to wet, soft, sand becomes fine at 2.10 m
AH16-03	0.00 – 0.15	Asphalt
	0.15 – 0.60	FILL, Crushed gravel (road base), compact
	0.60 – 1.15	Topsoil
	1.15 – 2.10	Silty clay to clayey silt, some sand, trace gravel, moist to wet, soft
	2.10 – 3.00	Silt, sandy, wet, sand becomes fine at 2.45 m

A total of 15 natural water content determinations were conducted on soil samples. Natural water contents in fine grained soils ranged 23% to 50% while the natural water content of buried topsoil in AH16-03 was 102% to 220%.

Atterberg Limits determinations were conducted on two fine-grained samples from AH16-01. The test results are summarized in Table 3.

Table 3: Atterberg Limits Results – Augerhole AH16-01

Augerhole	Sample	Depth (m)	Natural Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Classification
AH16-01	3	1.25 – 1.35	27.2	21	28	7	CL-ML
AH16-01	4	1.95 – 2.05	27.2	20	25	5	ML

Three soil samples were also subjected to grain size distribution analyses. The results are summarized in Table 4 below.



Table 4: Grain Size Distribution – Augerhole AH16-01 and AH16-03

Augerhole	Sample	Depth (m)	Gravel Content (%)	Sand Content (%)	Fines Content (%)
AH16-01	2	0.75 – 0.85	4	82	14
AH16-01	4	1.95 – 2.05	2	47	51
AH16-03	3	1.40 – 1.50	0	2	98

5.1 Existing Pavement Structure

The existing pavement structure inferred at the two auger hole locations is shown in Table 5.

Table 5: Existing Pavement Structure Details

AH16-02		AH16-03	
Pavement Course	Thickness (mm)	Pavement Course	Thickness (mm)
Concrete	270	Asphalt	150
Granular base	630	Granular base	450
Subbase	0	Subbase	0
Total	900	Total	600

5.2 Groundwater and Seepage Observations

Groundwater seepage was not encountered at AH16-01 and AH16-03 during the time they remained open. However, walls of AH16-02 sloughed below 1.95 m depth but groundwater was not visible above the sloughed wall elevation. Perched groundwater conditions are likely to emerge atop relatively less permeable fine-grained soils during and immediately after periods of wet weather.

6.0 GEOTECHNICAL RECOMMENDATIONS

6.1 General

During the subsurface investigation, topsoil was encountered beneath the asphalt pavement at AH16-03 indicating a poor subgrade. The cracking of asphalt pavement appears to be due to poor subgrade or inadequate pavement structure for traffic the pavement volume. The strength of the pavement requires to be augmented for durability. For new pavement just north of the USA/Canada border, a competent subgrade is available at shallow depth.

6.2 Repaving Asphalt Pavement at 1st Avenue Intersection

As per Chernoff Thompson Architect drawings, it is proposed to remove existing asphalt and replace it with new asphalt. The existing asphalt thickness on 1st Avenue was determined to be 150 mm from AH16-03.



The pavement assessment analysis shows that for an MPSR of 1.80 mm and design lane traffic of 5.72 million ESALs, a 160 mm thick asphalt overlay will be required over the existing pavement of 1st Avenue. The high overlay requirement appears to be due to poor subgrade strength and/or inadequate pavement structure for the heavy traffic the pavement is exposed to.

If a new pavement is to be designed at the 1st Avenue intersection, the following minimum pavement structure would be required:

Asphalt:	150 mm
Granular Base:	150 mm
Granular subbase:	600 mm
Total:	900 mm

The above design assumes a subgrade resilient modulus of 30 MPa for the subgrade encountered at AH16-03.

In comparison to the above, the existing pavement structure of 600 mm (150 mm asphalt + 450 mm granular) as encountered at AH16-03 (Table 5) is considered to be significantly deficient. The pavement weakness is evidenced by visible cracks in the pavement, failure of the asphalt patch in area used by commercial vehicles and high MPSR.

In view of the foregoing, the following two options for rehabilitation of pavement are recommended.

Option 1 – Reconstruct Pavement from a competent subgrade

The construction methodology would be as follows:

- Remove asphalt and dispose off-site.
- Remove existing granular base course material and stockpile for evaluation if it can be reused.
- Extend the excavation to a depth of 900 mm below surrounding subgrade where firm silt subgrade is anticipated.
- Install 600 mm thick granular subbase (75 mm minus aggregate to National Master Specifications (NMS) Section 32 11 16.01).
- Install 150 mm thick granular base course (Gradation 3 of NMS Section 32 11 23).
- Install 150 mm thick asphalt courses (100 mm thick lower course and 50 mm thick surface course to NMS Section 32 12 16).



Granular courses to be compacted to at least 100% of material's SPMDD.

Option 2 – Replacement of Asphalt Only

- Remove existing asphalt.
- Review exposed granular surface for any base failure. At base failure locations, sub-excavate to a competent subgrade and restore using Gradation 3 material of NMS Section 32 11 23 and compacting to at least 100% of material's SPMDD.
- Install 150 mm thick asphalt courses as described under Option 1 above.

The proposed replacement of 150 mm thick asphalt (Option 2) without addressing the weak subgrade and inadequate pavement structure will likely result in premature maintenance. If pavement reconstruction (Option 1) is not an option then the life of pavement can be prolonged to some extent by increasing the asphalt thickness to 200 mm consisting of two lower course lifts of 75 mm each and one 50 mm thick lift of surface course asphalt to NMS Section 32 12 16). However, full depth pavement repairs may still be required at locations where the pavement distress is significant. The increased thickness of asphalt will alter the surface drainage pattern requiring input from Civil Design Engineer.

6.3 Repaving Concrete Pavement

As per Chernoff Thompson Architect drawings, it is proposed to remove existing concrete and replace with 200 mm thick reinforced concrete pavement. We recommend that concrete pavement thickness be increased to at least 225 mm for the anticipated commercial traffic. The existing concrete slab being 270 mm thick, therefore, addition of granular base material will be required to raise the base elevation to the underside of the proposed concrete slab.

The base course material should be compacted to at least 100% of material's SPMDD.

6.4 New Asphalt Pavement North of USA/Canada Border

Based on the soils encountered at AH16-01, for the new asphalt pavement just north of the USA/Canada border, the following minimum pavement structure is recommended over a competent subgrade:

Asphalt:	100 mm (NMS 40 mm thick surface course underlain by 60 mm thick lower course)
Base Course:	150 mm (Gradation 3 of NMS Section 32 11 23)
Subbase Course:	570 mm (75 mm minus aggregate to NMS Section 32 11 16.01)
Total:	820 mm

For the above pavement design, a subgrade resilient modulus of 30 MPa has been assumed.



6.5 Subgrade Preparation

6.5.1 New pavement just north of USA/Canada Border

Subgrade preparation for new asphalt pavement would consist of removal of surficial soils containing organic and underlying soils to the design subgrade elevation. We anticipate compact silty sand deposits at subgrade elevation for the proposed new pavement structure at area just north of USA/Canada Border. If soft soils are encountered at subgrade elevation, then we recommend over-excavation be conducted to a further 300 mm depth. The over-excavation should be restored using subbase course fill compacted to at least 100% of material's SPMDD.

6.5.2 Option 1 at 1st Avenue

The subgrade preparation as stated under Section 6.5.1 would be applicable if the 1st Avenue intersection pavement is to be reconstructed per Option 1. Firm silt soil deposits are anticipated at the subgrade elevation.

6.6 Temporary Cut Slopes

Temporary excavation slopes within compact soil deposits should not exceed 4H:3V (horizontal: vertical). Flatter slopes will be necessary if groundwater seepage is encountered. A geotechnical engineer should be consulted under such conditions.

Should steeper slopes be necessary due to spatial constraints or other considerations, the temporary slopes may be locally over-steepened, subject to approval of the geotechnical engineer.

6.7 Control of Groundwater Seepage

The ground water seepage during construction, if any, could be managed by diverting it to a sump at a low point and pumping out.

6.8 Liquefaction Potential

The subsurface soil deposits encountered were generally fine-grained with the presence of varying percentage of medium to fine sand. Such soils have low susceptibility to liquefaction under a seismic event and no catastrophic failure of pavement is anticipated.



7.0 CLOSURE

We trust the foregoing is sufficient for your immediate needs. Should you have any questions, please contact the undersigned.

GOLDER ASSOCIATES LTD.



Nirmal Chander, PEng
Senior Geotechnical Engineer

NC/MAK/kn

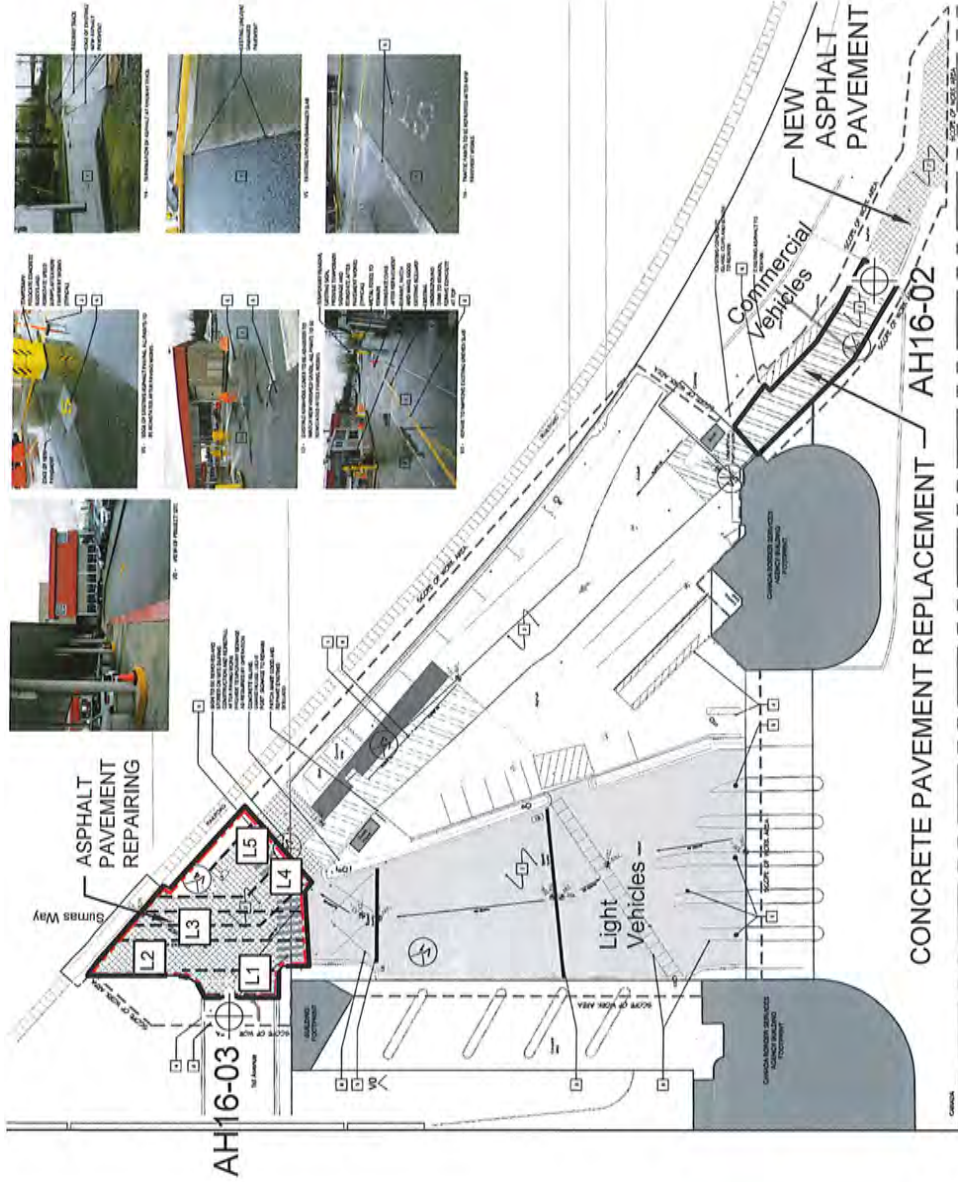
Reviewed by:



Maureen A Kelly, PEng
Principal, Senior Geotechnical Engineer

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- LEGEND**
- BENKELMAN BEAM TEST AREA
 - BENKELMAN BEAM TEST LANE
 - APPROXIMATE TEST HOLE LOCATION

REFERENCE(S)

BASE DRAWING TAKEN FROM R.078169.001 SHEET A-02, DATED 2016-03-04 BY CHERNOFF THOMPSON ARCHITECTS.

CLIENT
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

PROJECT
ABBOTSFORD HUNTINGDON PORT OF ENTRY
ABBOTSFORD, BC

CONSULTANT



YYYYMMDD	2016-04-19
DESIGNED	NC
PREPARED	Z
REVIEWED	NC
APPROVED	MAK

TITLE	TEST HOLE LOCATIONS AND BENKELMAN BEAM TEST LANES
PROJECT NO.	1314470497
PHASE	11000
REV.	0
FIGURE	1



APPENDIX A

Important Information and Limitations of this Report



Important Information and Limitations of this Report

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.



APPENDIX A

Important Information and Limitations of this Report

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



APPENDIX B

Benkelman Beam Test data

Golder Associates Ltd.

Client: PWGSC
 Project Name: Abbotsford Huntingdon Port of Entry, BC
 Golder Project #: 1314470497 Phase 11000

BENKELMAN BEAM TEST REPORT

Description of work: Abbotsford Huntingdon Port of Entry, BC (All Lanes)
 Location: STA 0+00 at south line of pedestrian crossing at 1st Avenue and Border exit
 Test date: 22-Aug-16 Report # 1
 Pavement Temperature: 27 °C Tested by: JZ
 Seasonal Correction: 1.120 Temperature Correction: 0.960

Station (m)	Wheel Path	Dial Reading (mm)	Rebound (mm)	Seasonal and Temperature Corrected Rebound (mm)	Comments
Lane 1					
0+000	Inner	0.15	0.30	0.33	
0+005	Outer	0.25	0.51	0.55	
0+010	Inner	0.13	0.25	0.27	
0+015	Outer	0.30	0.61	0.66	
0+020	Inner	0.23	0.46	0.49	
Lane 2					
0+000	Inner	0.20	0.41	0.44	
0+005	Outer	0.86	1.73	1.87	at edge of patch
0+010	Inner	0.41	0.81	0.88	
0+015	Outer	0.56	1.12	1.21	inside patch
0+020	Inner	0.30	0.61	0.66	
Lane 3					
0+000	Inner	0.33	0.66	0.71	
0+005	Outer	0.41	0.81	0.88	
0+010	Inner	0.61	1.22	1.32	inside patch
0+015	Outer	0.10	0.20	0.22	
0+020	Inner	0.48	0.97	1.04	at edge of patch
Lane 4					
0+000	Inner	0.28	0.56	0.60	
0+006	Outer	0.20	0.41	0.44	
0+009	Inner	0.20	0.41	0.44	
Lane 5					
0+000	Inner	0.13	0.25	0.27	
0+005	Outer	0.86	1.73	1.87	inside patch
0+010	Inner	0.64	1.27	1.37	inside patch
0+015	Outer	0.66	1.32	1.43	inside patch
0+020	Inner	0.46	0.91	0.99	

Average corrected rebound: 0.82 mm
 Standard deviation: 0.49 mm
 Most Probable Spring Rebound (MPSR): 1.80 mm

Golder Associates Ltd.

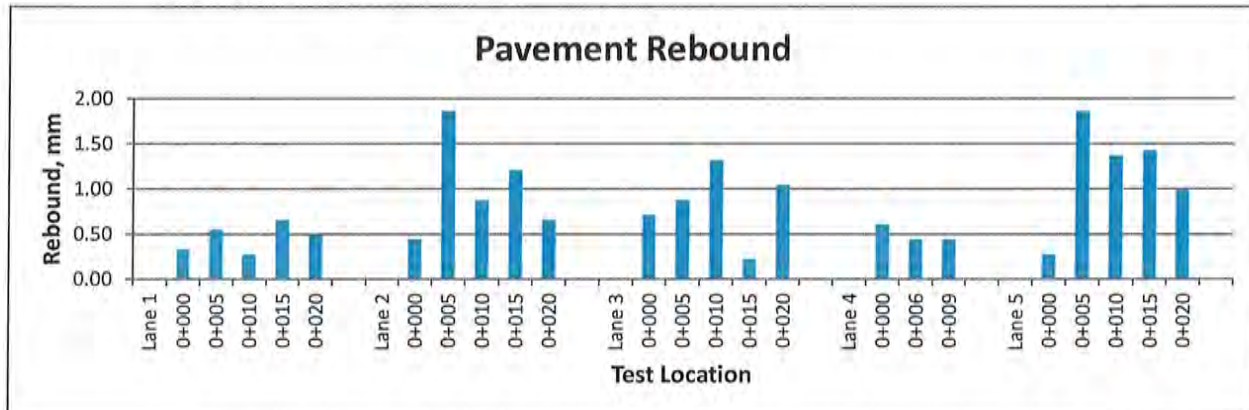
Client: PWGSC
 Project Name: Abbotsford Huntingdon Port of Entry, BC
 Golder Project #: 1314470497 Phase 11000

BENKELMAN BEAM TEST REPORT

Description of work: Abbotsford Huntingdon Port of Entry, BC (All Lanes)
 Location: STA 0+00 at south line of pedestrian crossing at 1st Avenue and Border exit
 Test date: 22-Aug-16 Report # 1
 Pavement Temperature: 27 °C Tested by: JZ
 Seasonal Correction: 1.120 Temperature Correction: 0.960

Station (m)	Wheel Path	Dial Reading (mm)	Rebound (mm)	Seasonal and Temperature Corrected Rebound (mm)	Comments
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Note: LC: Longitudinal crack, TC: Transverse crack, TP: Trench patch, AC; Alligator cracking,
 PH: Pot-hole, MC: Minor crack



Golder Associates Ltd.

Client: PWGSC
 Project Name: Abbotsford Huntingdon Port of Entry, BC
 Golder Project #: 1314470497 Phase 11000

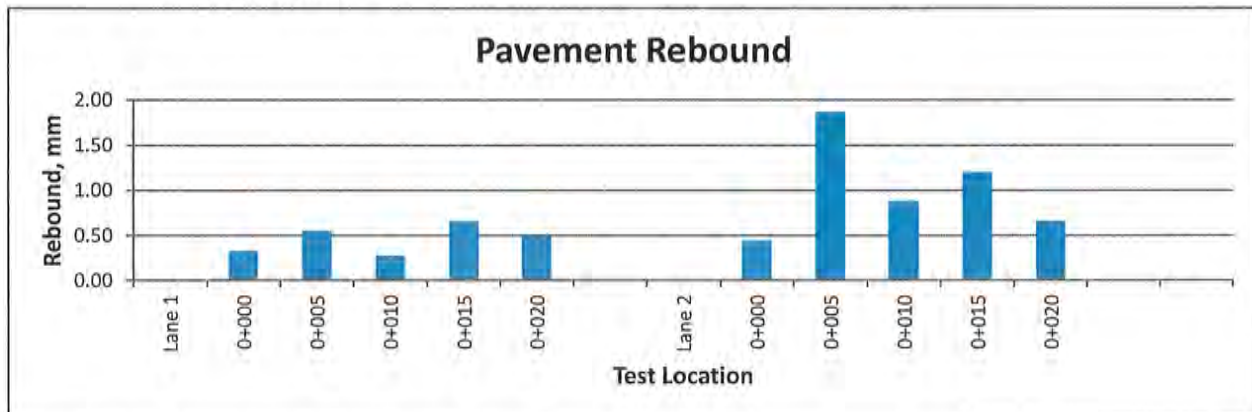
BENKELMAN BEAM TEST REPORT

Description of work: Benkelman Beam Testing of asphalt pavement (light vehicle lanes) at Abbotsford Huntingdon Port of Entry, Abbotsford, BC
 Location: STA 0+00 at south line of pedestrian crossing at 1st Avenue and Border exit
 Test date: 22-Aug-16 Report # 2
 Pavement Temperature: 27 °C Tested by: JZ
 Seasonal Correction: 1.120 Temperature Correction: 0.960

Station (m)	Wheel Path	Dial Reading (mm)	Rebound (mm)	Seasonal and Temperature Corrected Rebound (mm)	Comments
Lane 1					
0+000	Inner	0.15	0.30	0.33	
0+005	Outer	0.25	0.51	0.55	
0+010	Inner	0.13	0.25	0.27	
0+015	Outer	0.30	0.61	0.66	
0+020	Inner	0.23	0.46	0.49	
Lane 2					
0+000	Inner	0.20	0.41	0.44	
0+005	Outer	0.86	1.73	1.87	at edge of patch
0+010	Inner	0.41	0.81	0.88	
0+015	Outer	0.56	1.12	1.21	inside patch
0+020	Inner	0.30	0.61	0.66	

Average corrected rebound: 0.74 mm
 Standard deviation: 0.48 mm
 Most Probable Spring Rebound (MPSR): 1.70 mm

Note: LC: Longitudinal crack, TC: Transverse crack, TP: Trench patch, AC: Alligator cracking, PH: Pot-hole, MC: Minor crack



Golder Associates Ltd.

Client: **PWGSC**
 Project Name: **Abbotsford Huntingdon Port of Entry, BC**
 Golder Project #: **1314470497 Phase 11000**

BENKELMAN BEAM TEST REPORT

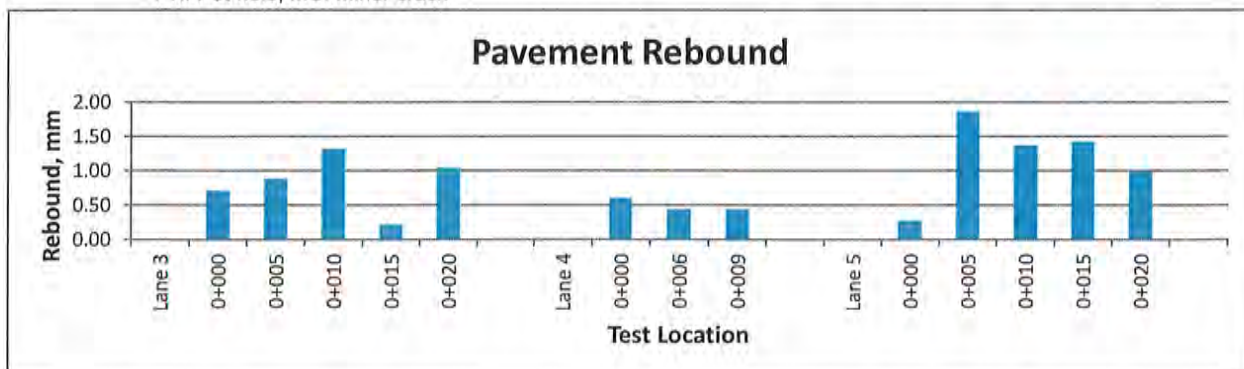
Description of work: **Benkelman Beam Testing of asphalt pavement (commercial lane) at Abbotsford Huntingdon Port of Entry, Abbotsford, BC**
 Location: **STA 0+00 at south line of pedestrian crossing at 1st Avenue and Border exit**

Test date: **22-Aug-16** Report # **3**
 Pavement Temperature: **27 °C** Tested by: **JZ**
 Seasonal Correction: **1.120** Temperature Correction: **0.960**

Station (m)	Wheel Path	Dial Reading (mm)	Rebound (mm)	Seasonal and Temperature Corrected Rebound (mm)	Comments
Lane 3					
0+000	Inner	0.33	0.66	0.71	
0+005	Outer	0.41	0.81	0.88	
0+010	Inner	0.61	1.22	1.32	inside patch
0+015	Outer	0.10	0.20	0.22	
0+020	Inner	0.48	0.97	1.04	at edge of patch
Lane 4					
0+000	Inner	0.28	0.56	0.60	
0+006	Outer	0.20	0.41	0.44	
0+009	Inner	0.20	0.41	0.44	
Lane 5					
0+000	Inner	0.13	0.25	0.27	
0+005	Outer	0.86	1.73	1.87	inside patch
0+010	Inner	0.64	1.27	1.37	inside patch
0+015	Outer	0.66	1.32	1.43	inside patch
0+020	Inner	0.46	0.91	0.99	

Average corrected rebound **0.89 mm**
 Standard deviation **0.50 mm**
Most Probable Spring Rebound (MPSR) 1.90 mm

Note: LC: Longitudinal crack, TC: Transverse crack, TP: Trench patch, AC; Alligator cracking, PH: Pot-hole, MC: Minor crack





APPENDIX C

Record of Augerhole Sheets

PROJECT No.: 13-1447-0497 / 11000 / 2200

RECORD OF AUGERHOLE: AH16-02

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
 PROJECT: Abbotsford Huntingdon Port of Entry
 LOCATION: Abbotsford, BC

DRILLING DATE: August 26, 2016
 DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM:

DEPTH SCALE METRES	DRILLING RIG	DRILLING METHOD	SOIL PROFILE		SAMPLES				DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	ADDITIONAL COMMENTS		
			DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	10	20	30	40	10 ⁶	10 ⁵	10 ⁴			10 ³	
0			Ground Surface CONCRETE. (270 mm)		0.00														No Groundwater seepage above sloughed material.	
			FILL - (GW) CRUSHED GRAVEL; grey; moist, compact.		0.27															
1	Track Mounted Auger Drill Solid Stem Auger		(ML) SILT, trace sand to sandy, trace gravel; grey; wet, soft.		0.00														Walls sloughed at 1.95 m depth	
					1	GS														
						2	GS													
						3	GS													
						4	GS													
2			- sand becomes fine at 2.1 m depth																	
3			End of Augerhole.		3.00															

National Soil Survey Centre, National Unique Project ID: 13-1447-0497, BOREHOLE (AUTO) 15/11/16

DEPTH SCALE

1 : 30



SOIL CLASSIFICATION SYSTEM: GACS

LOGGED: NC

CHECKED: MAK

CLIENT: Public Works and Government Services Canada
 PROJECT: Abbotsford Huntingdon Port of Entry
 LOCATION: Abbotsford, BC

DRILLING DATE: August 26, 2016
 DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM:

DEPTH SCALE METRES	DRILLING RIG DRILLING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k. cm/s				ADDITIONAL LAB. TESTING	ADDITIONAL COMMENTS		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	10	20	30	40	10 ⁻⁶			10 ⁻⁵	10 ⁻⁴
0	Track Mounted Auger Drill Solid Stem Auger	Ground Surface		0.00												No Groundwater	
		ASPHALT. (150 mm)		0.15													
		FILL - (GW) CRUSHED GRAVEL; brown-grey; moist, compact.		0.60	1	GS											102
		TOPSOIL.		1.15	2	GS											220
		(CL-ML) CLAYEY SILT to SILTY CLAY, some sand, trace gravel; grey; soft.			3	GS											
		(ML) SILT, some sand; grey; wet, soft.		2.10	4	GS											
		- sand becomes fine at 2.45 m depth		5	GS												
				6	GS												
3		End of Augerhole.		3.00													

National MI Service/INT_GAL NATIONAL Unique ProjectID: Output From BC_BOREHOLE (AUTO) #wood 15/11/16





APPENDIX D

Laboratory Test Results

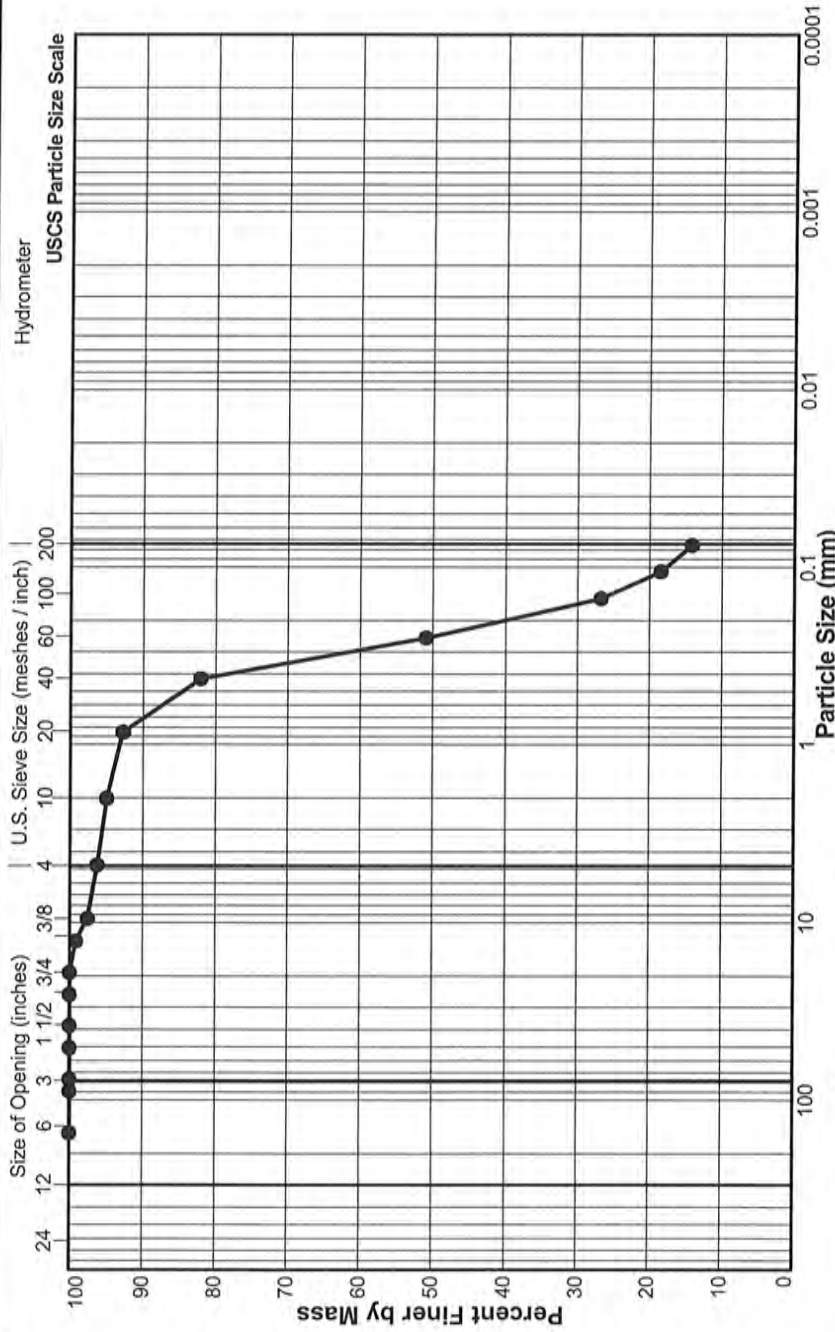


SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM C136

Client: Public Works and Government Services Canada
 Project: Abbotsford Huntingdon Port of Entry
 Location: Abbotsford, BC
 Project No.: 13-1447-0497 Phase: 11000 Task: 2200

Sample Location: AH16-01
 Sample No.: 2
 Depth Interval (m): 0.75 to 0.85
 Lab Schedule No.:



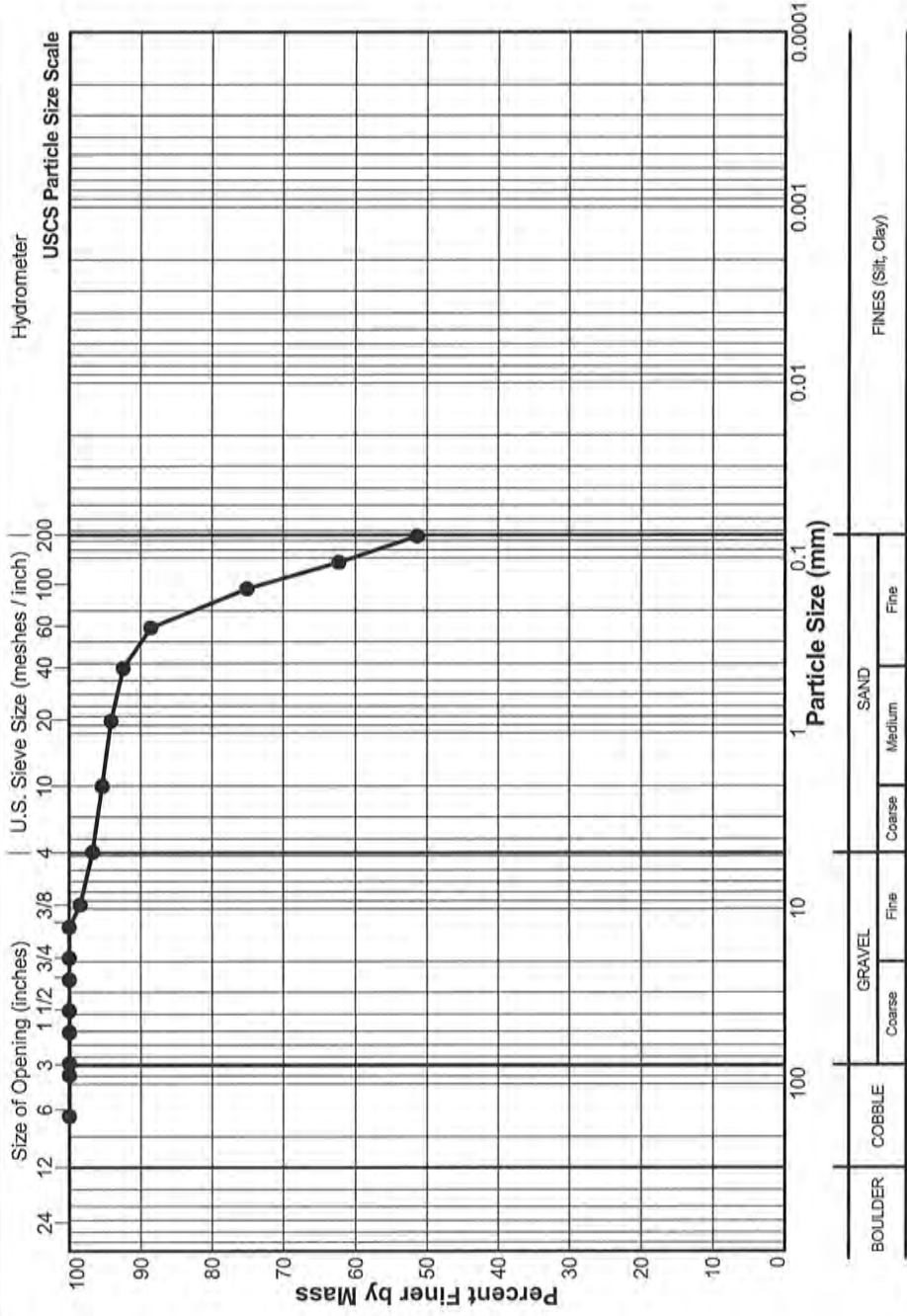


SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM C136

Client: Public Works and Government Services Canada
Project: Abbotsford Huntingdon Port of Entry
Location: Abbotsford, BC
Project No.: 13-1447-0497 Phase: 11000 Task: 2200

Sample Location: AH16-01
Sample No.: 4
Depth Interval (m): 1.95 to 2.05
Lab Schedule No.:



Legend

Sieve Size (USS)	Particle Size (mm)	Percent Passing
6"	152.4	100.0
3.5"	88.9	100.0
3"	76.2	100.0
2"	50.8	100.0
1 1/2"	38.1	100.0
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.5	98.5
#4 US MESH	4.75	96.7
#10 US MESH	2	95.4
#20 US MESH	0.85	94.1
#40 US MESH	0.425	92.4
#60 US MESH	0.25	88.6
#100 US MESH	0.15	75.1
#140 US MESH	0.106	62.3
#200 US MESH	0.075	51.3

JP/DC **9/2/2016** **LH** **9/7/2016**
 Tech Date Checked Date

Metric to Standard: CAL. NATIONAL UNITS: Sieve Size (mm) to Sieve Size (inches) and Gradations (mm) to Gradations (inches)

Golder Associates Ltd.
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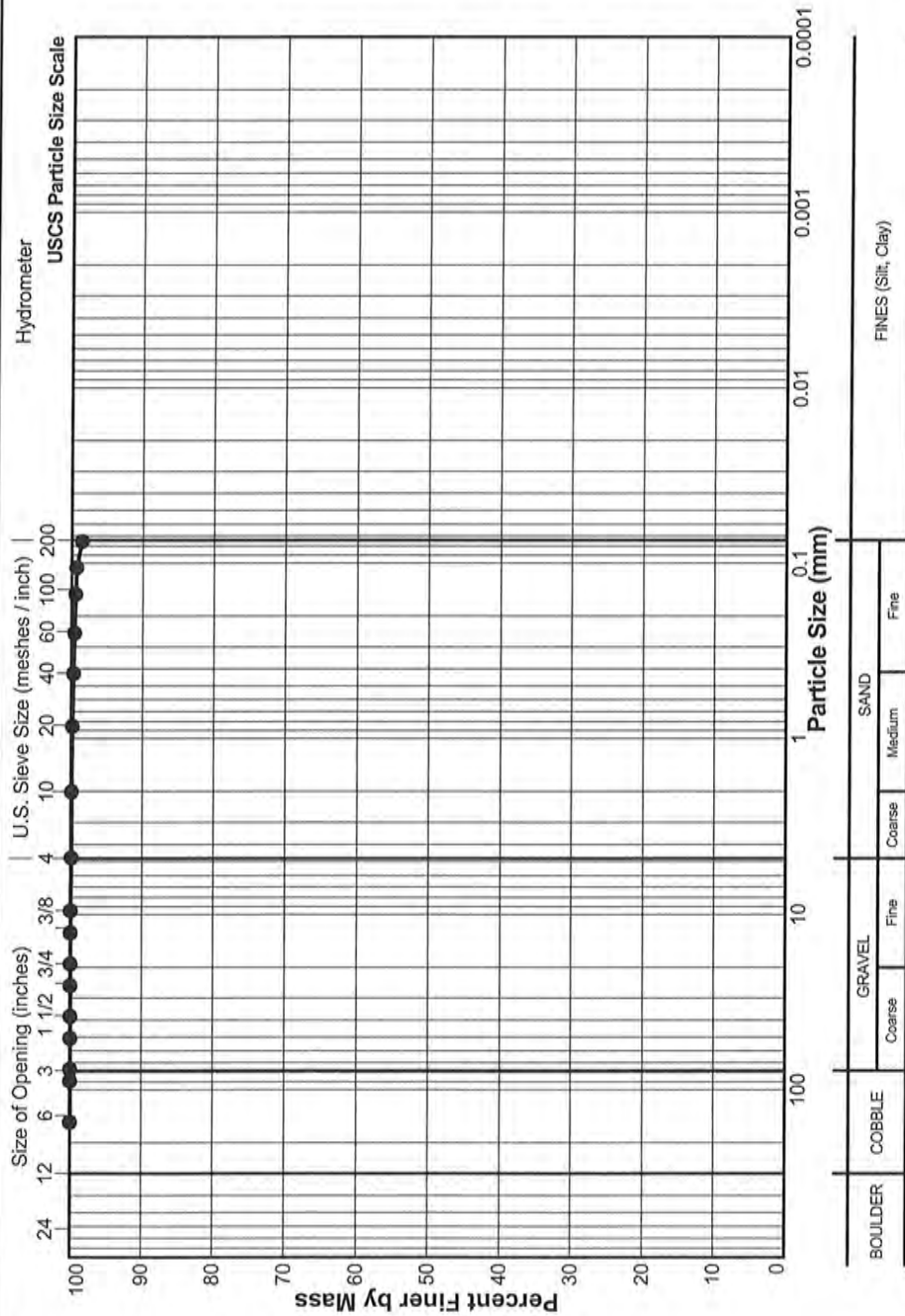


SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM C136

Client: Public Works and Government Services Canada
Project: Abbotsford Huntingdon Port of Entry
Location: Abbotsford, BC
Project No.: 13-1447-0497 **Phase:** 11000 **Task:** 2200

Sample Location: AH16-03
Sample No.: 3
Depth Interval (m): 1.40 to 1.50
Lab Schedule No.:



Legend

Sieve Size (US)	Particle Size (mm)	Percent Passing
5"	152.4	100.0
3.5"	88.9	100.0
3"	76.2	100.0
2"	50.8	100.0
1 1/2"	38.1	100.0
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.5	100.0
#4 US MESH	4.75	99.9
#10 US MESH	2	99.9
#20 US MESH	0.85	99.8
#40 US MESH	0.425	99.7
#60 US MESH	0.25	99.6
#100 US MESH	0.15	99.5
#140 US MESH	0.106	99.3
#200 US MESH	0.075	98.5

JP/DC **9/2/2016** **LH** **9/7/2016**
 Tech Date Checked Date

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NATIONAL MUSEUM - GOLDER ASSOCIATES LTD. PARTICLE SIZE (ASTM C136) - 2015



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

ASTM D 4318-10

Client: Public Works and Government Services Canada
 Project: Abbotsford Huntingdon Port of Entry
 Location: Abbotsford, BC
 Project No.: 13-1447-0497 Phase: 11000 Task: 2200

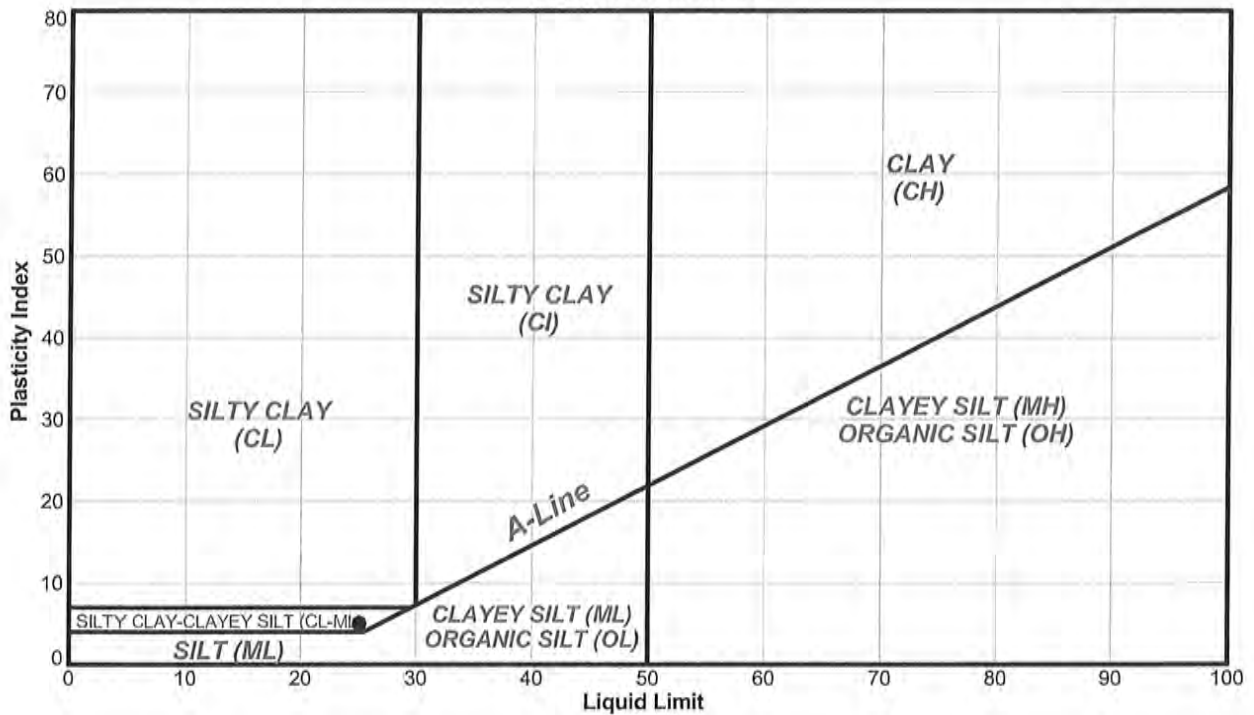
Augerhole ID: AH16-01
 Sample No.: 4
 Depth Interval (m): 1.95 to 2.05
 Lab Schedule No.:

Other Remarks: N/A

Test Method: A-Multi Point

Preparation Method: Air Dried

PLASTICITY CHART



National IT Services/INT_GAL_MANTICULUM Unisa Project ID: Unisa Project ID: LAB ATTERBERG CASAGRANDE (SINGLE) 2015 9/06 16/11/16

Sym.	Sample Location	Sample / Specimen Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	AH16-01	4	1.95	2.05	92	25	20	5.0	27.2	1.4

NP - NON-PLASTIC RESULT ND - NOT DETERMINED

Note: The test data given herein pertain to the sample provided only. This report constitutes a testing service only.

RRT	9/2/2016	LH	9/7/2016
Tech	Date	Checked	Date

WATER CONTENT DETERMINATION

 Reference(s)
ASTM D 2216

Client: Public Works and Government Services Canada	Project No.: 13-1447-0497 Phase: 11000 Task: 2200
Project: Abbotsford Huntingdon Port of Entry	Lab Schedule No.:
Location: Abbotsford, BC	

Sample Location	Sample No.	Specimen No.	Depth Interval		Water Content (%)
			Depth (m)	Bottom (m)	
AH16-01	1		0.30	0.40	4.6
AH16-01	2		0.75	0.85	2.9
AH16-01	3		1.25	1.35	27.2
AH16-01	4		1.95	2.05	27.2
AH16-01	6		2.75	2.85	25.9
AH16-02	1		1.15	1.25	23.0
AH16-02	2		1.75	1.85	34.2
AH16-02	3		2.25	2.35	30.9
AH16-02	4		2.85	2.95	49.5
AH16-03	1		0.65	0.75	101.9
AH16-03	2		1.10	1.15	220.3
AH16-03	3		1.40	1.50	41.3
AH16-03	4		2.15	2.25	44.3
AH16-03	5		2.55	2.65	35.3
AH16-03	6		2.85	2.95	40.6

National IM SurveyGINT_GAL_NATIONAL/Unique Project ID:Golder Form: LAB_WATER CONTENT (REPORT)_ghm 161116

LH	9/7/2016
Checked	Date

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**PACIFIC HIGHWAY PORT OF ENTRY
AND
ABBOTSFORD-HUNTINGTON PORT OF ENTRY
REPAVING**

**APPENDIX B
Geotechnical Investigation
Pacific Highway Port of Entry – Surrey, BC**



17 November 2016

GEOTECHNICAL INVESTIGATION

Pacific Highway Port of Entry, Surrey, BC Project No. R.078171.001

Submitted to:
Mr. Biren Juttun
Civil Design Manager
Public Works and Government Services Canada
219, 800 Burrard Street
Vancouver, BC V6Z 0B9



REPORT



Report Number: 1314470497-051-R-Rev0-11000

Distribution:

1 copy - Public Works and Government Services
Canada
1 copy - Golder Associates Ltd.





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Important Information and Limitations of this Report

APPENDIX B

Traffic Data

APPENDIX C

Benkelman Beam Test data

APPENDIX D

Record of Augerhole Sheets

APPENDIX E

Laboratory Test Results



1.0 INTRODUCTION

Further to our work plan of July 22, 2016, Golder Associates Ltd. (Golder) has conducted a geotechnical investigation at Pacific Highway Port of Entry in Surrey, BC for assessment of select asphalt pavements as a part of the repaving project. The following presents the results of the investigation, and our geotechnical comments and recommendations on the proposed repaving.

The following should be read in conjunction with the *Important Information and Limitations of this Report* presented in Appendix A for the proper use and interpretation of this report.

2.0 BACKGROUND INFORMATION

Golder understands that it is proposed to improve drainage and asphalt pavements at the Pacific Highway Port of Entry in Surrey. RF Binnie and Associates (Binnie) conducted a site review on September 02, 2015. Based on the site review, Binnie has identified asphalt pavements areas for improvement just north of CBSA booths for light vehicles and an exit lane.

The Port of Entry for light vehicles has seven CBSA booths; six booths service light passenger vehicles and one booth on the far-east side caters to bus traffic. Public Works and Government Services Canada (PWGSC) has provided bus traffic data for August 2016 (Appendix B).

There is also an exit lane from a vehicle Inspection Area which services light vehicular traffic.

The area to be repaved is shown in Figure 1.

Chernoff Thompson Architect (CTA) drawing (CTA Ref: R.078169.001) provided to Golder show the following repaving provisions:

- 100 mm thick asphalt
- 150 mm thick granular base (as required)
- 250 mm thick granular subbase (as required)

This report includes pavement assessment and recommendations for repaving.

3.0 SCOPE OF WORK

The accepted work plan provided for the following tasks:

- i) Task 1 - Geotechnical investigation and recommendations
- ii) Task 2 - Geotechnical Design Review, input
- iii) Task 3 - Construction Services – Geotechnical Field and QC Review

This report includes works carried out under Task 1. Drainage improvement design is by others.



4.0 GEOTECHNICAL INVESTIGATION

4.1 Desktop Review

Golder reviewed the drawings provided and noted the pavement repaving provisions made. Golder also reviewed the available web imagery to understand the existing site conditions.

4.2 Site Visit

Golder conducted a site visit along with a PWGSC representative on August 16, 2016 to review the site conditions and plan the field works. The following provides comments on the condition of subject pavements.

The pavement just north of the CBSA booths shows distress in the form of longitudinal cracks and alligator cracking of asphalt at certain locations. However, cracks in the asphalt pavement along the bus exit route (shown in Figure 1) show greater intensity. Asphalt cracking was also visible along the north side curbs. The asphalt pavement profile generally appeared intact without any signs of significant depression. Photos 1 to 6 show asphalt pavement distress in the above area.

Photo 1: Longitudinal and alligator cracks





Photo 2: Longitudinal cracks and alligator cracking of asphalt



Photo 3: Longitudinal crack and alligator cracking of asphalt





Photo 4: Cracking of asphalt along bus travel path



Photo 5: Cracking of asphalt along bus travel path





Photo 6: Cracking along curb



In the exit lane of the Inspection Area, a long partial width patch showed that the pavement had been repaired in the recent past. The details of repair were not available. In addition, isolated longitudinal and transverse cracks were also visible at isolated locations in remainder of the pavement. Photos 7 to 8 show asphalt pavement distress in the above area.

Photo 7: Long patch in the exit lane after inspection area





Photo 8: Transverse crack in pavement



4.3 Traffic Data

The subject asphalt pavements generally service light passenger vehicles except for pavement at one booth which services bus traffic. As such the pavement is not subjected to heavy traffic except the bus exit route. The daily bus traffic details provided by PWGSC are included in Appendix B.

4.4 Asphalt Pavement Deflection Testing

The structural strength of asphalt pavements was assessed on August 22, 2016 using a Benkelman beam apparatus which utilizes a single rear axle truck loaded with 80kN on its rear axle. For testing purpose, the asphalt pavement area north of CBSA booths was divided into five lanes (Lanes 1 through 5). The bus traffic from the most eastern CBSA booth follows a diagonal route through the asphalt area cutting through Lanes 3 and 4.

The lane exiting the Inspection Area was named Lane 6 which is used by light vehicles only.

The lane configuration is shown on Figure 1.

Pavement deflections were obtained at 5 m intervals. Asphalt pavement temperature was noted. The pavement deflection data was corrected by applying seasonal and temperature correction factors. The corrected data was subjected to statistical analysis to obtain the Most Probable Spring Rebound (MPSR). Table 1 presents summary of the statistical analysis.



Table 1: Summary of Pavement Deflection Analysis

Lane	Number of Readings	Deflection (mm)				
		Minimum	Maximum	Mean	Standard Deviation	MPSR
Asphalt pavement north of CBSA booths (Lanes 1 to 5)	26	0.22	0.55	0.35	0.10	0.54
Lane exiting the Inspection Area (Lane 6)	10	0.33	0.78	0.49	0.13	0.76

The individual Benkelman beam deflection readings and reports are included in Appendix C.

The MPSR of 0.56 mm and 0.76 mm are low which are indicative of good structural strength of the pavement.

4.5 Geotechnical Test Holes

The geotechnical investigation consisting of three augerholes (AH16-01 through AH16-03) was carried out on August 29, 2016. Auger holes AH16-01, AH16-02 were located in the area north of the CBSA booths and AH16-03 was located in the exit lane of the Inspection Area as shown in Figure 1. All augerholes were advanced to a depth of 3.0 m. A dynamic cone penetration test to evaluate relative density of subsurface soils was conducted to a depth of 5.7 m in the vicinity of AH16-01.

A truck-mounted solid stem continuous auger drill rig provided by Downrite Drilling was utilized to advance the augerholes. The augerhole advancement was conducted under full-time supervision of a Golder engineer who logged the soils and groundwater conditions encountered. Representative soil samples were retrieved from auger flights and taken to Golder’s Burnaby, BC laboratory for visual classification and testing.

Upon completion, the augerholes were backfilled with soil cuttings and closed in accordance with BC Provincial Guidelines on Groundwater Protection. The augerholes were sealed at the surface with asphalt patch mix.

Prior to conducting augerholes, Golder initiated a BC1 Call to obtain buried utility information. Thereafter, services of western Utility Locate Services were utilized to locate the augerholes in areas considered to be free of buried utilities.

Services of traffic control subcontractor were utilized during utility location as well as augerhole advancement.

Records of Augerhole Sheets are presented in Appendix D.

4.6 Laboratory Testing Program

Select soil samples were subjected to laboratory testing which included natural water content determinations, and grain size distribution analyses.

Laboratory test results are presented in Appendix E.



5.0 SUBSURFACE CONDITIONS

The soil descriptions presented in this report are based on accepted standard methods of classification and identification routinely used in current geotechnical state-of-practice. The stratigraphic boundaries discussed herein are inferred from visual observations only. These boundaries represent general transitions between soil types, rather than discrete planes of contact between different soil materials. Care should be exercised when extrapolating soil conditions between augerholes as soil conditions may vary both laterally and with depth.

The subsurface conditions encountered at the discrete augerholes are summarized in Table 2.

Table 2: Summary of Subsurface Conditions

Auger Hole #	Depth (from – to), m	Soil Type
AH16-01	0.00 – 0.75	Road Fill
	0.75 – 3.00	Clay, trace gravel, moist, stiff
AH16-02	0.00 – 0.70	Road Fill
	0.70 – 1.00	Organic silt, firm
	1.00 – 3.00	Clay, trace gravel, moist, stiff
AH16-03	0.00 – 0.50	Road Fill
	0.50 – 1.00	Organic silt, firm
	1.00 – 3.00	Clay, trace gravel, moist, stiff

A total of 12 natural water content determinations were conducted on soil samples. Natural water contents in fine grained soils ranged 25% to 39%.

Atterberg Limits determination was conducted on one fine-grained sample from AH16-01. The test results are summarized in Table 3.

Table 3: Atterberg Limits Results - Augerhole AH16-01

Augerhole	Sample	Depth (m)	Natural Water Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Classification
AH16-01	2	1.35 – 1.45	33.6	29	65	36	CH

A grain size distribution analysis was carried out on one sample of the road fill (subbase material). The results are summarized in Table 4 below.

Table 4: Grain Size Distribution - Augerhole AH16-03

Augerhole	Sample	Depth (m)	Gravel Content (%)	Sand Content (%)	Fines Content (%)
AH16-03	1	0.35 – 0.45	10	79	11



5.1 Existing Pavement Structure

The existing pavement structure inferred at the three auger hole locations is shown in Table 5.

Table 5: Existing Pavement Structure Details

Pavement Course	AH16-01	AH16-02	AH16-03
Asphalt	75	65	65
Granular base	95	105	115
Granular subbase	580	530	320
Total (mm)	750	700	500

5.2 Groundwater and Seepage Observations

Groundwater seepage was not encountered at any of the auger holes during the time they remained open. However, perched groundwater conditions atop relatively less permeable fine-grained soils are likely to emerge during and periods immediately after wet weather conditions.

6.0 GEOTECHNICAL RECOMMENDATIONS

6.1 General

Low MPSR is indicative of good structural strength of pavements. Organic silt at subgrade elevation encountered in AH16-02 and AH16-03 was evaluated to be firm. Although minor softening of firm organic silt is anticipated during wet weather conditions, but the seasonally corrected deflection test data indicates that the composite pavement structure is robust for the traffic imposed on the pavements. While the pavement structure, in general, is considered sufficient for the subgrade and traffic conditions, the 65 mm thickness of asphalt is considered to be thin for the bus traffic and would require augmenting.

6.2 Repaving Asphalt Pavement

Based on the traffic information, the average daily bus traffic is 54 for the month of August 2016. We have assumed the bus traffic to be 1% of total daily traffic. Assuming 1% annual traffic growth, the 20 year design lane traffic is estimated to be 1.28 million ESALs.

Allowing for minor softened subgrade, a resilient modulus of 40 MPa is considered appropriate. Accordingly, the minimum pavement structure required for the pavement north of CBSA booths is as follows:

- Asphalt: 100 mm
- Crushed granular Base: 100 mm
- Granular subbase: 500 mm



Compared to the above, the existing pavement structure as observed at AH16-01 and AH16-02 (shown in Table 5) appears to be adequate for the area north of booths.

The exit lane from inspection area generally serves light passenger vehicles only. For this area, a design traffic equal to 25% of the traffic on area north of CBSA booths would be appropriate. Accordingly, the minimum pavement structure for the exit lane would be as follows:

- Asphalt: 100 mm
- Crushed granular Base: 100 mm
- Granular subbase: 300 mm

Compared to the above, the existing pavement structure as observed in AH16-03 (shown in Table 5) appears to be adequate for the exit lane.

As per Chernoff Thompson Architect drawings, it is proposed to remove the existing asphalt pavement and replace it with new asphalt with a minimum thickness of 100 mm. Keeping the minimum pavement structure requirement as above, we consider the provision of 100 mm thick asphalt as replacement of the existing 65 mm to 75 mm asphalt thickness to be sufficient for the anticipated traffic. The asphalt pavement can be installed in two lifts consisting of 60 mm Lower Course and 40 mm Surface Course to National Master Specifications Section 32 12 16.

The granular surface exposed upon removal of existing asphalt should be recompact before installation of new asphalt pavement

It is also recommended that upon removal of the existing asphalt, the exposed granular surface be reviewed for any signs of base failure, particularly at the locations of alligator cracking. At base failure locations sub-excavation to a competent subgrade will be required. Over-excavation, if any, should be restored by placing granular base material.

6.3 Groundwater Control

The recommended pavement rehabilitation involves shallow excavation as such groundwater seepage is not a concern. However, surface water should be prevented from entering the asphalt stripped granular courses during construction by constructing suitable barriers around the asphalt stripped areas.



7.0 CLOSURE

We trust the foregoing is sufficient for your immediate needs. Should you have any questions, please contact the undersigned.

GOLDER ASSOCIATES LTD.

REVIEWED BY:

Nirmal Chander, PEng
Senior Geotechnical Engineer

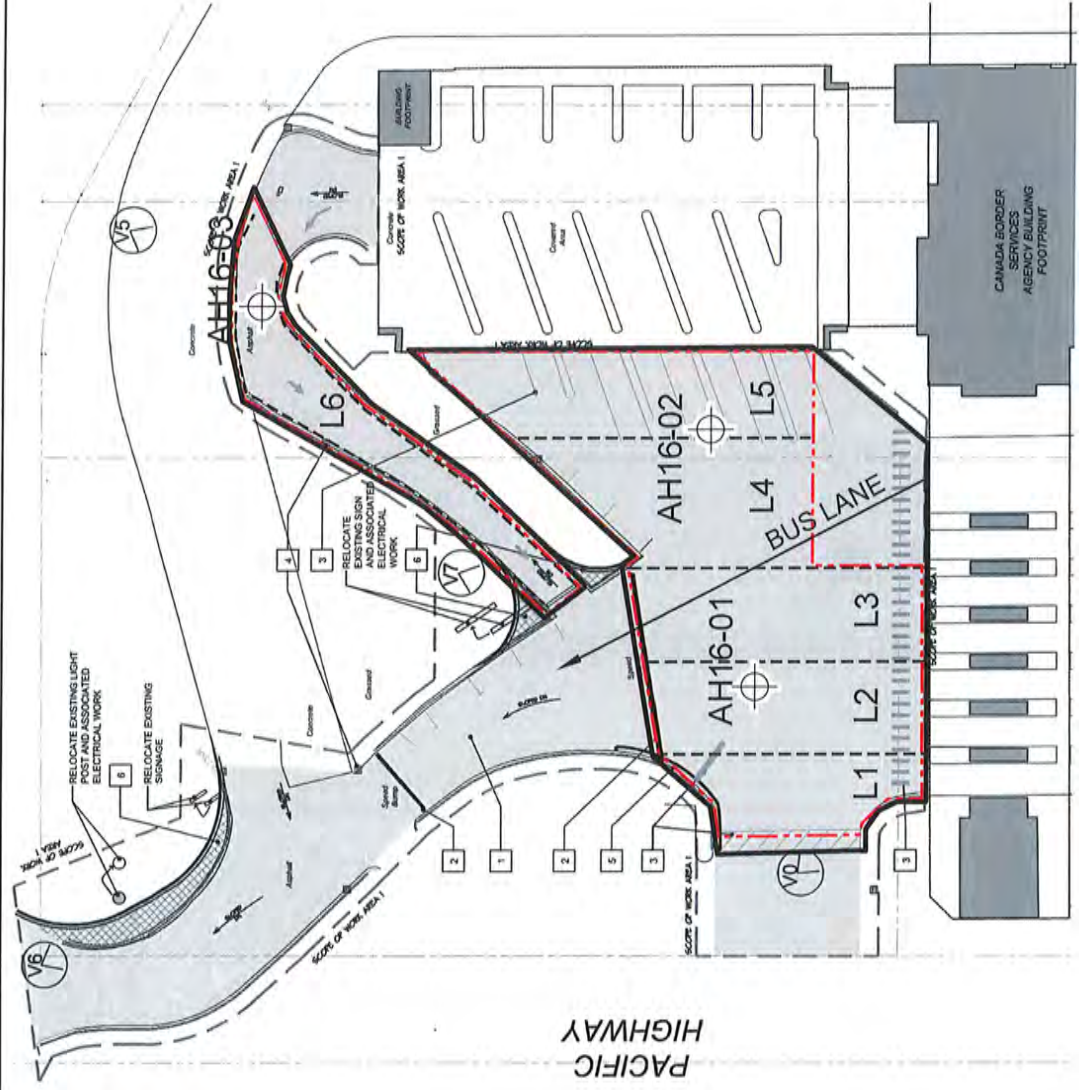


Maureen Kelly, PEng
Principal, Senior Geotechnical Engineer

NC/MAK/kn

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\\golder.gds\gal\victoria\final\2013\1447\13-1447-0497 pwgsc wood creek quarry\1314470497-051-r-rev0-11000\1314470497-051-r-rev0-pacificreport 17nov_16.docx



- LEGEND**
- BENKELMAN BEAM TEST AREA
 - L1 BENKELMAN BEAM TEST LANE
 - AH16-01 APPROXIMATE TEST HOLE LOCATION
 - GEOTECHNICAL TESTING AREA

REFERENCE(S)
 BASE DRAWING TAKEN FROM R.078169.001 SHEET A-01, DATED 2016-03-04 BY CHERNOFF THOMPSON ARCHITECTS.

CLIENT
 PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

CONSULTANT
 Golder Associates

PROJECT
 PACIFIC HIGHWAY PORT OF ENTRY
 SURREY, BC

TITLE
 TEST HOLE LOCATIONS AND BENKELMAN BEAM TEST LANES

PROJECT NO.
 1314470497

PHASE
 11000

REV.
 0

FIGURE
 1

YYYY-MM-DD	2016-03-03
DESIGNED	NC
PREPARED	JZ
REVIEWED	NC
APPROVED	MMK



APPENDIX A

Important Information and Limitations of this Report



Important Information and Limitations of this Report

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.



APPENDIX A

Important Information and Limitations of this Report

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



APPENDIX B

Traffic Data

Pac Hwy Traffic - BUS STATS	Bus Travellers	Buses
Monday, August 1, 2016	1,486	52
Tuesday, August 2, 2016	844	39
Wednesday, August 3, 2016	1,271	47
Thursday, August 4, 2016	919	38
Friday, August 5, 2016	893	55
Saturday, August 6, 2016	866	61
Sunday, August 7, 2016	1,523	62
Weekly Average	1,115	51
Monday, August 8, 2016	846	55
Tuesday, August 9, 2016	1,175	60
Wednesday, August 10, 2016	896	49
Thursday, August 11, 2016	938	38
Friday, August 12, 2016	861	52
Saturday, August 13, 2016	1,036	57
Sunday, August 14, 2016	1,460	64
Weekly Average	1,030	54
Monday, August 15, 2016	890	56
Tuesday, August 16, 2016	673	35
Wednesday, August 17, 2016	953	44
Thursday, August 18, 2016	1,094	46
Friday, August 19, 2016	1,045	59
Saturday, August 20, 2016	1,150	59
Sunday, August 21, 2016	1,420	59
Weekly Average	1,032	51
Monday, August 22, 2016	1,120	52
Tuesday, August 23, 2016	862	43
Wednesday, August 24, 2016	915	40
Thursday, August 25, 2016	1,090	44
Friday, August 26, 2016	899	59
Saturday, August 27, 2016	1,481	57
Sunday, August 28, 2016	1,929	80
Weekly Average	1,185	54
Monday, August 29, 2016	889	29
Tuesday, August 30, 2016	693	33
Wednesday, August 31, 2016	824	41
TOTAL	32,941	1,565
Monthly Average	1,063	50
TOTAL Weekday Average	960	46
TOTAL Weekend Average	1,358	62

	Travellers	Buses
Weekday Average:	1,083	46
Weekend Average:	1,195	62

	Travellers	Buses
Weekday Average:	943	51
Weekend Average:	1,248	61

	Travellers	Buses
Weekday Average:	931	48
Weekend Average:	1,285	59

	Travellers	Buses
Weekday Average:	977	48
Weekend Average:	1,705	69



APPENDIX C

Benkelman Beam Test data

Golder Associates Ltd.

Client: **PWGSC**
 Project Name: Pacific Highway Port of Entry, Surrey, BC
 Golder Project #: 1314470497

Benkelman Beam Testing

Description of work: Benkelman Beam Testing of asphalt pavement at Pacific Highway Port of Entry, Surrey

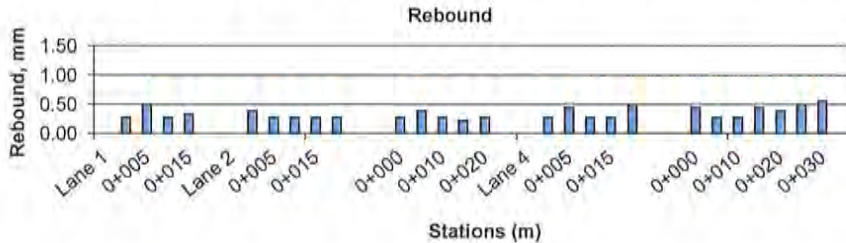
Location: Area north of CBSA Booths, STA 0+00 at 0 m north of CBSA Booths

Test date: 22-Aug-18 Report # 1
 Pavement Temperature: 25 °C Tested by: JZ
 Seasonal Correction: 1.120 Temperature Correction: 0.970

Station (m)	Wheel Path	Dial Reading (mm)	Rebound (mm)	Seasonal and Temperature Corrected Rebound (mm)	Comments
Lane 1					
0+000	Inner	0.13	0.25	0.28	
0+005	Outer	0.23	0.46	0.50	
0+010	Inner	0.13	0.25	0.28	
0+015	Outer	0.15	0.30	0.33	
Lane 2					
0+000	Inner	0.18	0.36	0.39	
0+005	Outer	0.13	0.25	0.28	
0+010	Inner	0.13	0.25	0.28	
0+015	Outer	0.13	0.25	0.28	
0+020	Inner	0.13	0.25	0.28	
Lane 3					
0+000	Inner	0.13	0.25	0.28	
0+005	Outer	0.18	0.36	0.39	
0+010	Inner	0.13	0.25	0.28	
0+015	Outer	0.10	0.20	0.22	
0+020	Inner	0.13	0.25	0.28	
Lane 4					
0+000	Inner	0.13	0.25	0.28	
0+005	Outer	0.20	0.41	0.44	
0+010	Inner	0.13	0.25	0.28	
0+015	Outer	0.13	0.25	0.28	
0+020	Inner	0.23	0.46	0.50	
Lane 5					
0+000	Inner	0.20	0.41	0.44	
0+005	Outer	0.13	0.25	0.28	
0+010	Inner	0.13	0.25	0.28	
0+015	Outer	0.20	0.41	0.44	
0+020	Inner	0.18	0.36	0.39	
0+025	Outer	0.23	0.46	0.50	
0+030	Inner	0.25	0.51	0.55	

Average corrected rebound: **0.35 mm**
 Standard deviation: **0.10 mm**
 Most Probable Spring Rebound Value: **0.54 mm**

Note: LC: Longitudinal crack, TC: Transverse crack, TP: Trench patch, AC: Alligator cracking, PH: Pot-hole, MC: Minor crack



Golder Associates Ltd.

Client: **PWGSC**
 Project Name: Pacific Highway Port of Entry, Surrey, BC
 Golder Project #: 1314470497

Benkelman Beam Testing

Description of work: Benkelman Beam Testing of asphalt pavement at Pacific Highway Port of Entry, Surrey, BC

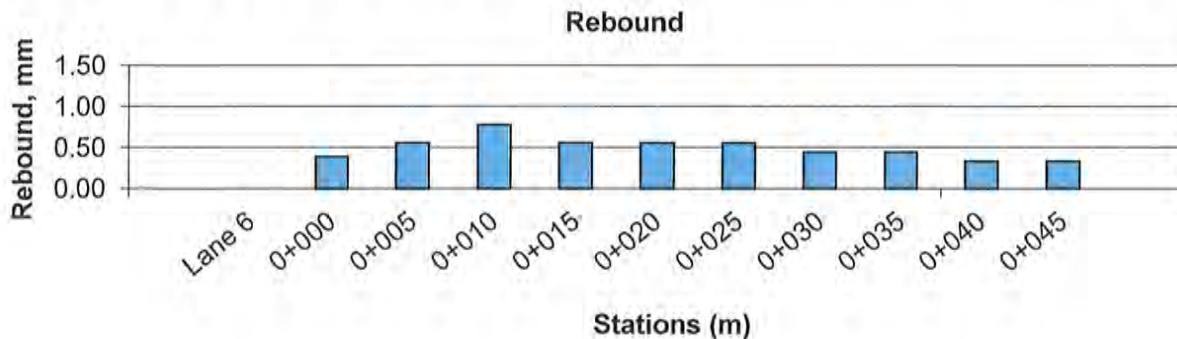
Location: Exit Lane of Vehicle Inspection Area, STA 0+00 at start of exit lane

Test date: 22-Aug-16 Report # 2
 Pavement Temperature: 25 °C Tested by: JZ
 Seasonal Correction: 1.120 Temperature Correction: 0.970

Station (m)	Wheel Path	Dial Reading (mm)	Rebound (mm)	Seasonal and Temperature Corrected Rebound (mm)	Comments
Lane 6					
0+000	Inner	0.18	0.36	0.39	
0+005	Outer	0.25	0.51	0.55	
0+010	Inner	0.36	0.71	0.78	
0+015	Outer	0.25	0.51	0.55	
0+020	Inner	0.25	0.51	0.55	
0+025	Outer	0.25	0.51	0.55	
0+030	Inner	0.20	0.41	0.44	
0+035	Outer	0.20	0.41	0.44	
0+040	Inner	0.15	0.30	0.33	
0+045	Outer	0.15	0.30	0.33	

Average corrected rebound **0.49 mm**
 Standard deviation **0.13 mm**
Most Probable Spring Rebound Value 0.76 mm

Note: LC: Longitudinal crack, TC: Transverse crack, TP: Trench patch, AC; Alligator cracking, PH: Pot-hole, MC: Minor crack





APPENDIX D

Record of Augerhole Sheets

CLIENT: Public Works and Government Services Canada
 PROJECT: Pacific Highway Port of Entry
 LOCATION: Surrey, BC

DRILLING DATE: August 29, 2016
 DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM:

DEPTH SCALE METRES	DRILLING RIG	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	ADDITIONAL COMMENTS	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	20	40	60	80	10 ⁻⁴			10 ⁻³
0	Track Mounted Auger Drill Solid Stem Auger	Ground Surface		0.00												No Groundwater Seepage
		ASPHALT, (75 mm)		0.08												
		FILL - (GW) CRUSHED GRAVEL and SAND; grey, damp, compact.		0.17												
		FILL - (SW) SAND; brown; damp, compact.														
		(CH) CLAY, trace gravel; brown-grey, mottled; moist, stiff.		0.75	1	GS										
1		- becomes firm at 1.5m depth														
					2	GS										
2																
3																
		End of Augerhole.		3.00												
4																
5																
6																

National BIM Standard - CANADA - NATIONAL BIM Usage Project ID: Output Form: EC_BOREHOLE (AUTO) - 151118

PROJECT No.: 13-1447-0497 / 11000 / 1200

RECORD OF AUGERHOLE: AH16-02

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
 PROJECT: Pacific Highway Port of Entry
 LOCATION: Surrey, BC

DRILLING DATE: August 29, 2016
 DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM:

DEPTH SCALE METRES	DRILLING RIG / DRILLING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	ADDITIONAL COMMENTS
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY %	20	40	60	80	10 ⁻⁴	10 ⁻³	10 ⁻²		
0	Track Mounted Auger Drill Solid Stem Auger	Ground Surface		0.00												No Groundwater Seepage
		ASPHALT, (65 mm)		0.07												
		FILL - (GW) CRUSHED GRAVEL and SAND; grey; compact.		0.17												
		FILL - (SW) SAND; some gravel; brown; compact.														
		(OL) ORGANIC SILT; dark brown; moist; firm.		0.70	1	GS										
1		(CH) CLAY, trace gravel; brown-grey; mottled; moist; stiff.		1.00	2	GS										
2					3	GS										
3					4	GS										
					5	GS										
3		End of Augerhole.		3.00												

National III Server:GNT_GAL_NATIONAL\NLM Unique Project:DC Output Form:BC_BORERHOLE (AUTO) .awood 15/11/16



PROJECT No.: 13-1447-0497 / 11000 / 1200

RECORD OF AUGERHOLE: AH16-03

SHEET 1 OF 1

CLIENT: Public Works and Government Services Canada
 PROJECT: Pacific Highway Port of Entry
 LOCATION: Surrey, BC

DRILLING DATE: August 29, 2016
 DRILLING CONTRACTOR: Downrite Drilling Ltd.

DATUM:

DEPTH SCALE METRES	DRILLING RIG DRILLING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k. cm/s				ADDITIONAL LAB. TESTING	ADDITIONAL COMMENTS
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY %	BLOWS/0.3m	20	40	60	80	10 ⁻⁶		
0	Track Mounted Auger Drill Solid Stem Auger	Ground Surface		0.00											No Groundwater Seepage
		ASPHALT. (65 mm)		0.07											
		FILL - (GW) CRUSHED GRAVEL and SAND; grey; damp, compact.		0.18	1	GS									
		FILL - (SW) SAND; brown; damp, compact.													
		(OL) ORGANIC SILT; dark brown; moist, firm.		0.50	2	GS									
1		(CH) CLAY, trace gravel; brown-grey, mottled; moist, stiff.		1.00	3	GS									
2				4	GS										
3				5	GS										
4				6	GS										
3		End of Augerhole.		3.00											

DEPTH SCALE

1 : 30



SOIL CLASSIFICATION SYSTEM: GACS

LOGGED: NC

CHECKED: MAK

National IM Services/CONT. G.L. WATSON/ALM U-Case Project/ID: Output Form/SC_BOREHOLE (AUTO) .docx 15/11/16



APPENDIX E

Laboratory Test Results

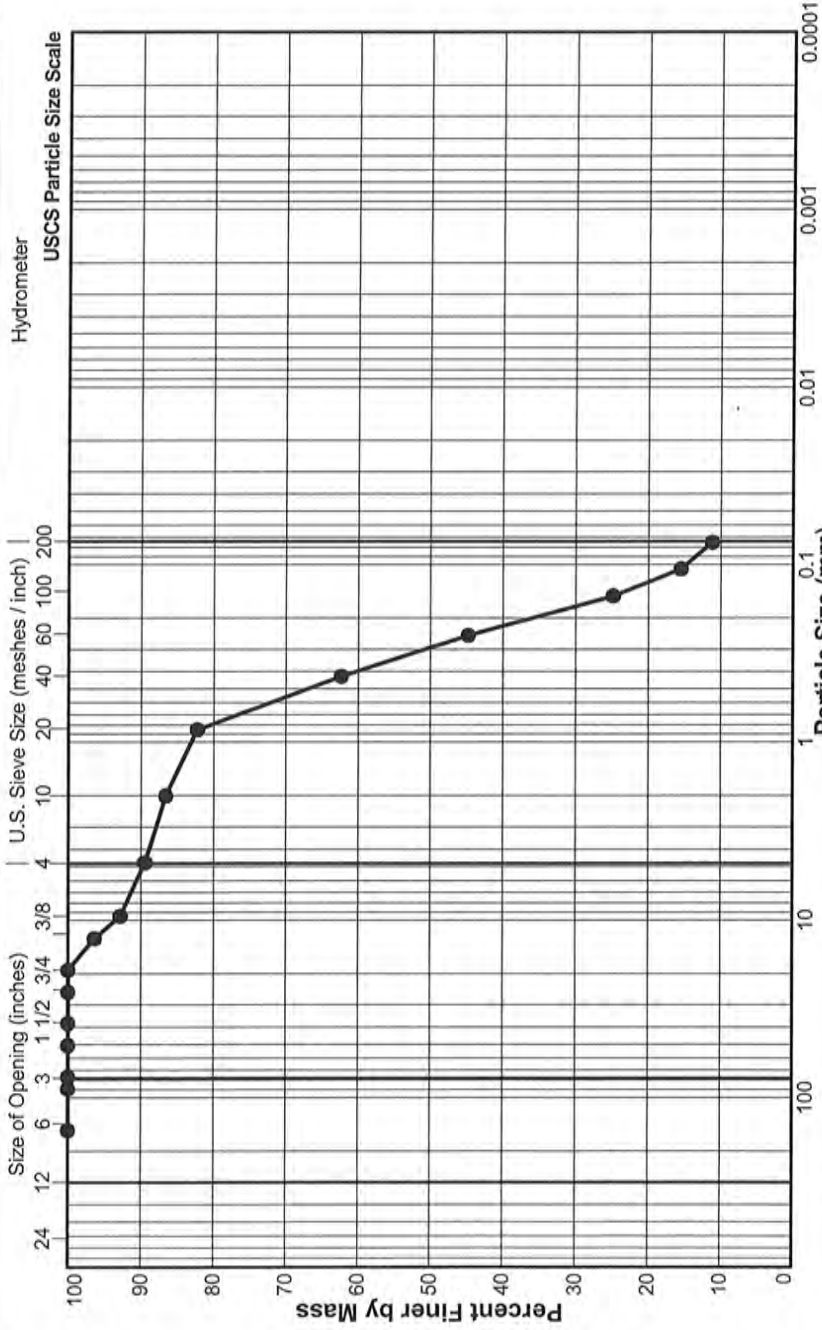


SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM C136

Client: Public Works and Government Services Canada
Project: Pacific Highway Port of Entry
Location: Surrey, BC
Project No.: 13-1447-0497 Phase: 11000 Task: 1200

Sample Location: AH16-03
Sample No.: 1
Depth Interval (m): 0.35 to 0.45
Lab Schedule No.:





LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

ASTM D 4318-10

Client: Public Works and Government Services Canada
 Project: Pacific Highway Port of Entry
 Location: Surrey, BC
 Project No.: 13-1447-0497 Phase: 11000 Task: 1200

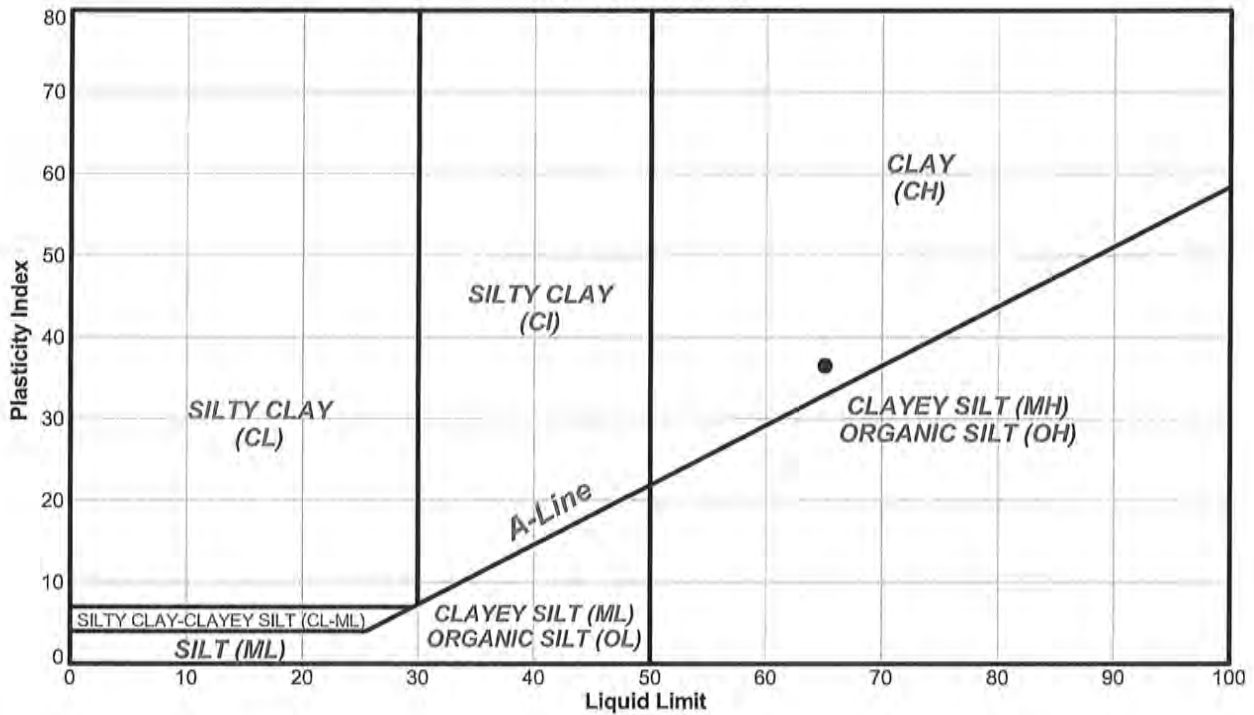
Augerhole ID: AH16-01
 Sample No.: 2
 Depth Interval (m): 1.35 to 1.45
 Lab Schedule No.:

Other Remarks: N/A

Test Method: A-Multi Point

Preparation Method: Air Dried

PLASTICITY CHART



Sym.	Sample Location	Sample / Specimen Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	AH16-01	2	1.35	1.45	ND	65	29	36.0	33.6	0.1

NP - NON-PLASTIC RESULT ND - NOT DETERMINED

Note: The test data given herein pertain to the sample provided only. This report constitutes a testing service only.

RRT

9/2/2016

LH

9/7/2016

Tech

Date

Checked

Date

WATER CONTENT DETERMINATION

 Reference(s)
ASTM D 2216

Client: Public Works and Government Services Canada	Project No.: 13-1447-0497 Phase: 11000 Task: 1200
Project: Pacific Highway Port of Entry	Lab Schedule No.:
Location: Surrey, BC	

Sample Location	Sample No.	Specimen No.	Depth Interval		Water Content (%)
			Depth (m)	Bottom (m)	
AH16-01	1		0.80	0.90	25.4
AH16-01	2		1.35	1.45	33.6
AH16-01	3		1.95	2.05	35.4
AH16-01	4		2.65	2.75	36.8
AH16-02	1		0.75	0.85	30.8
AH16-02	2		1.05	1.15	29.9
AH16-02	3		1.90	2.00	33.7
AH16-02	5		2.85	2.95	39.4
AH16-03	2		0.80	0.90	31.4
AH16-03	3		1.00	1.10	33.7
AH16-03	5		1.85	1.95	36.7
AH16-03	6		2.65	2.75	36.6

National IT Services - G:\MATHDAN\JUM Unload Project\Output Form_LAB WATER CONTENT (REPORT).qxd 15/11/15

LH

9/7/2016

Checked

Date

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Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

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