



Public Works and Government Services Canada

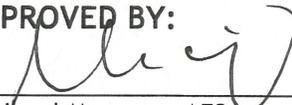
Requisition No: EZ899-172401/A

DRAWINGS & SPECIFICATIONS
for

Esquimalt Veterans Cemetery Expansion
Veterans Dr. (Gorge Vale)
Victoria, B.C.
V9A 4P7

Project R.080256.003

APPROVED BY:



Regional Manager, AES

2016-12-12
Date



Construction Safety Coordinator

2016-12-12
Date

TENDER:



Project Manager

Dec/12/2016
Date

Client: Public Works and Government Services Canada
Real Property Branch, Professional and Technical Services, Pacific Region
#219 – 800 Burrard Street, Vancouver, BC V6Z 2V8

Project: Esquimalt Cemetery Expansion
Address: Veterans Road, Esquimalt BC

Authority Having Jurisdiction: City of Esquimalt

Seals:

Structural:	Landscape:
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END OF SECTION

1.1 CODES

- .1 Perform work to CURRENT Codes, Construction Standards and Bylaws, including Amendments up to the TENDER closing date.

1.2 DESCRIPTION OF WORK

- .1 Work under this Contract covers the expansion of the existing God's Acre Veterans Cemetery, located on Veterans Drive within Gorge Vale Golf Course, Victoria, BC V9A 4P7.
- .2 Work to be performed under this Contract includes, but is not limited to, the following items covered further in the Contract documents.
 - .1 Selective clearing of an existing woodland, including tree removals;
 - .2 Removal and stockpiling of existing ornamental metal fencing;
 - .3 Installation of subsurface drainage and a water supply line;
 - .4 Construction of a concrete plaza with stone clad retaining walls;
 - .5 Construction of footings for future columbaria;
 - .6 Construction of a gravel path;
 - .7 Supply and installation of new perimeter fencing to match existing;
 - .8 Supply and installation of growing medium, and
 - .9 Supply and planting of trees, shrubs and groundcover.
 - .10 Use only environmentally responsible green materials/products with no VOC emissions or minimum VOC emissions of indoor off-gassing contaminants for improved indoor air quality – subject of Departmental Representative's approval of submitted MSDS Product Data.
 - .11 Use materials/products containing highest percentage of recycled and recovered materials practicable – consistent with maintaining cost effective satisfactory levels of competition.
 - .12 Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.
 - .13 Provide soils report if needed.
- .3 Work not included in Contract comprises such work and services specifically listed as:
Supply and installation of stone columbaria walls.

1.3 CONTRACT DOCUMENTS

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

1.4 DIVISION OF SPECIFICATIONS

- .1 The specifications are subdivided in accordance with the current 6-digit National Master Specifications System.
- .2 A division may consist of the work of more than one subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.
- .3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern.

1.5 TIME OF COMPLETION

- .1 Complete the project in one continuous operation within 112 days (16 weeks) after Contract Award.

1.6 HOURS OF WORK

- .1 Restrictive as follows:
 - .1 Schedule deconstruction, removal and construction work during normal working hours. Normal weekday working hours are Monday to Friday 7:00 am to 5:00 pm.
 - .2 Notify Departmental Representative of all after hours work, including weekends and holidays.

1.7 WORK SCHEDULE

- .1 Carry on work as per indicated "PHASES" and as follows:
 - .1 Within 10 working days after Contract award, provide a "phasing bar 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 trade for each phase as outlined.
 - .3 Final completion date within the time period required by the Contract documents.
 - .2 Do not change approved Schedule – without notifying Departmental Representative.
 - .3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

1.8 COST BREAKDOWN

- .1 Before submitting the first progress claim, submit a breakdown of the Contract lump sum prices in detail as directed by the Departmental Representative and aggregating Contract price.

1.9 CODES, BYLAWS, STANDARDS

- .1 Perform work in accordance with the National Building Code of Canada (NBC) 2010, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application.
- .2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.
- .3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.
- .4 In any case of conflict or discrepancy, the most stringent requirements shall apply.

1.10 DOCUMENTS REQUIRED

- .1 Maintain 1 copy each of the following at the job site:
 - .1 Contract drawings.
 - .2 Contract specifications.
 - .3 Addenda to Contract documents.
 - .4 Copy of approved work schedule.
 - .5 Reviewed/approved shop drawings.
 - .6 Change orders.
 - .7 Other modifications to Contract.
 - .8 Field test reports.
 - .9 Reviewed/approved samples.
 - .10 Manufacturers' 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.

1.11 REGULATORY REQUIREMENTS

- .1 Obtain and pay for – Building Permit, Certificates, Licenses and other permit required by regulatory municipal, provincial or federal authorities to complete the work.
- .2 Provide inspection authorities with plans and information required for issue of acceptance certificates.
- .3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.

1.12 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 such as columbaria suppliers.

- .2 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with indicated phasing.
- .3 Do not unreasonably encumber site with material or equipment.
- .4 Upon completion of work, patch, repair and make good all roads and adjacent landscaping damaged by construction activities and equipment.

1.13 EXAMINATION

- .1 Examine site and be familiar and conversant with existing conditions likely to affect work
- .2 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

1.14 EXISTING SERVICES

- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by the authorities having jurisdiction.

1.15 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 locations.
- .4 Submit field drawings or shop drawings to indicate the relative position of various services and equipment when required by the Departmental Representative.

1.16 SETTING OUT OF WORK

- .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .2 Provide devices needed to lay out and construct work.
- .3 Supply such devices as templates required to facilitate Departmental Representative's inspection of work.

1.17 ACCEPTANCE OF SUBSTRATES

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

1.18 QUALITY OF WORK

- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
- .2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2010 and BC Building Code 2012 Construction Standards.

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

1.19 WORKS COORDINATION

- .1 Coordinate work of subtrades.
 - .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
- .2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
 - .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.
 - .2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
 - .1 Pay particular close attention to overhead work and within or near to structural elements, including on the surrounding golf course property.
 - .2 Identify on coordination drawings service lines and indicate location of entrances and access routes into the site.
 - .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
 - .4 Publish minutes of each meeting.
 - .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
 - .6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
- .3 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.
- .4 Work coordination:
 - .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.
- .5 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.

1.20 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- .1 In accordance with Section 013300, 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.

1.21 RELICS AND ANTIQUITIES

- .1 Relics and antiquities and items of historical or scientific interest shall remain property of Department. Protect such articles and request directives from Departmental Representative.
- .2 Give immediate notice to Departmental Representative if evidence of archeological finds are encountered during excavation/construction, and await Departmental Representative's written instructions before proceeding with work in this area.

1.22 PROJECT MEETINGS

- .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

1.23 TESTING AND INSPECTION

- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative.
- .2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 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 correct work.
- .4 Contractor shall furnish labour and facilities to:
 - .1 Notify Departmental Representative in advance of planned testing.
- .5 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .6 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.
- .7 The Departmental Representative may require, and pay for, additional inspection and testing services not included in Paragraph 27.1.
- .8 Provide Departmental Representative with 2 copies of testing laboratory reports as soon as they are available.

1.24 AS-BUILT DOCUMENTS

- .1 The Departmental Representative will provide 2 sets of drawings, 2 sets of specifications, and 2 copies of the original AutoCAD files for "as-built" purposes.
- .2 As 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.

1.25 CLEANING

- .1 Daily conduct cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.
- .2 **Ensure cleanup of the work areas each day after completion of work.**
- .3 In preparation for interim and final inspections:
 - .1 Examine all visible surfaces.
 - .2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed exterior finished surfaces.
- .4 Use cleaning materials and methods in accordance with instructions of the manufacturer of the surface to be cleaned.

1.26 DUST CONTROL

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

1.27 ENVIRONMENTAL PROTECTION

- .1 Prevent extraneous materials from contaminating air beyond construction area, by providing temporary enclosures during work.
- .2 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers.
- .3 Ensure proper disposal procedures in accordance with all applicable territorial regulations.

1.28 ADDITIONAL DRAWINGS

- .1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with plans referred to in the Contract documents.
- .2 Upon request, Departmental Representative may furnish up to a maximum of 10 sets of Contract documents for use by the Contractor at no additional cost. Should more than 10 sets of documents be required the Departmental Representative will provide them at additional cost.

1.29 BUILDING SMOKING ENVIRONMENT

- .1 Smoking within the vicinity of the work site is not permitted.

1.30 SYSTEM OF MEASUREMENT

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

1.31 FAMILIARIZATION WITH SITE

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

1.32 SUBMISSION OF TENDER

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

END OF SECTION

1.1 APPROVALS

- .1 Approval of shop drawings and samples: refer to Section 01 11 55.

1.2 GENERAL

- .1 This Section specifies general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and other requested submittals to Departmental Representative for review. Additional specific requirements for submissions are specified in individual technical sections.
- .2 Present shop drawings, product data and samples in SI Metric units.
- .3 Where items or information is not produced in SI Metric units, converted values are acceptable.
- .4 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submissions.
- .5 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract documents and stating reasons for deviations.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Departmental Representative's review of submission unless Departmental Representative gives written acceptance of specific deviations.
- .7 Make any changes in submissions which Departmental Representative may require consistent with Contract documents and resubmit as directed by Departmental Representative.
- .8 Notify Departmental Representative in writing, when resubmitting, of any revisions other than those requested by Departmental Representative.
- .9 **Do not proceed with work until relevant submissions are reviewed and approved by the Departmental Representative.**

1.3 SUBMISSION REQUIREMENTS

- .1 Coordinate each submission with the requirements of the work and the Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Allow (5) five days for Departmental Representative's review of each submission, unless noted otherwise.
- .3 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.
- .4 Submissions shall 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 Relationship to adjacent work.
- .6 After Departmental Representative's review, distribute copies.

1.4 SHOP DRAWINGS

- .1 Shop drawings: original drawings or modified standard drawings provided by Contractor to illustrate details of portion of work which are specific to project requirements.
- .2 Maximum sheet size: 850 x 1050mm.
- .3 Submit 6 prints of shop drawings for each requirement requested in the specification sections and/or as requested by the Departmental Representative.
- .4 Cross-reference shop drawing information to applicable portions of the Contract documents.

1.5 SHOP DRAWINGS REVIEW

- .1 Review of shop drawings by Public Works and Government Services Canada is for the sole purpose of ascertaining conformance with the general concept.
- .2 This review shall not mean that Public Works and Government Services Canada approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same.
- .3 This review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and Contract documents.
- .4 Without restricting the generality of the foregoing, the Contractor is responsible for:
 - .1 Dimensions to be confirmed and correlated at the job site.
 - .2 Information that pertains solely to fabrication processes or to techniques of construction and installation.
 - .3 Coordination of the work of all sub-trades.

1.6 PRODUCT DATA

Product data: manufacturers' catalogue sheets, MSDS sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products or any other specified information.

- .1 Delete information not applicable to project.
- .2 Supplement standard information to provide details applicable to project.
- .3 Cross-reference product data information to applicable portions of Contract documents.
- .4 Submit 6 copies of product data.

1.7 SAMPLES

- .1 Samples: examples of materials, equipment, quality, finishes and workmanship.
- .2 Where colour, pattern or texture is a criterion, submit a full range of samples.
- .3 **Reviewed and accepted samples will become the standard of workmanship and material against which installed work will be verified.**

1.8 PROGRESS SCHEDULE

- .1 Submit work schedule and cost breakdown as required in Section 01 11 55 General Instructions.

1.9 TEST RESULTS AND INSPECTION REPORTS

Submit in duplicate test results and inspection reports as required.

END OF SECTION

1. REFERENCES

- .1 Government of Canada:
 - .1 Canada Labour Code – Part II
 - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC):
 - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 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 Yukon Territory:
 - .1 Occupational Health and Safety Act, R.S.Y.

2. RELATED SECTIONS

- .1 Refer to the following current NMS sections as required:
 - .1 Submittals procedures: Section 013300
 - .2 Temporary utilities: Section 015100
 - .3 Construction facilities: Section 015200
 - .4 Temporary barriers and enclosures: Section 015600

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.

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

5. SUBMITTALS

- .1 Submit to Departmental Representative submittals listed for review in accordance with Section 013300.
- .2 Work effected by submittal shall not proceed until review is complete.
- .3 Submit the following:
 - .1 Health and Safety Plan.
 - .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
 - .3 Copies of incident and accident reports.
 - .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
 - .5 Emergency Procedures.
- .4 The Departmental Representative will review the Contractor's site-specific project Health and Safety Plan and emergency procedures, and provide comments to the Contractor within five 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.

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 and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan

7. 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.

8. 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 provisions 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 taken.

9. HEALTH AND SAFETY PLAN

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
 - .1 Primary requirements:
 - .1 Contractor's safety policy.
 - .2 Identification of applicable compliance obligations.
 - .3 Definition of responsibilities for project safety/organization chart for project.
 - .4 General safety rules for project.
 - .5 Job-specific safe work, procedures.
 - .6 Inspection policy and procedures.
 - .7 Incident reporting and investigation policy and procedures.
 - .8 Occupational Health and Safety Committee/Representative procedures.
 - .9 Occupational Health and Safety meetings.
 - .10 Occupational Health and Safety communications and record keeping procedures.
 - .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
 - .3 List hazardous materials to be brought on site as required by work.
 - .4 Indicate engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
 - .5 Identify personal protective equipment (PPE) to be used by workers.
 - .6 Identify personnel and alternates responsible for site safety and health.

- .7 Identify personnel training requirements and training plan, including site orientation for new workers.
- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
- .4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review: the review of 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.

10. 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.
- .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.
- .3 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

11. HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
 - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 013300.

12. 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.

13. FIRE SAFETY REQUIREMENTS

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

14. 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.

15. 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 the qualified coordinator responsible for the coordination of health and safety activities" in accordance with Section 118 of the Workers' Compensation Act.
- .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.

16. MEETINGS

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

17. 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

1.1 ACCESS AND DELIVERY

- .1 Only the designated entry and access routes may be used to enter the site.
 - .1 Maintain for duration of Contract.
 - .2 Make good damage resulting from Contractor's use.
- .2 Use of the Gorge Vale Golf Course property will be granted to the Contractor through the Departmental Representative.
 - .1 The Gorge Vale Golf Course property is to be used for loading and unloading purposes.
 - .2 The storage or stockpiling of materials is permitted only within the area(s) designated on the plans.
 - .3 Parking is not permitted on Gorge Vale Golf Course property. Security has been instructed to have unauthorized vehicles towed at the Contractor's expense.

1.2 STORAGE FACILITIES

- .1 Storage space will be limited to the area of construction and the area specifically designated on the plans.

1.3 POWER

- .1 Electrical power and lighting at the existing God's Acre Veterans Cemetery chapel building may be used for construction purposes at no extra cost, provided that warranties are not affected thereby and electrical components used for temporary power are replaced when damaged. Do not use emergency power or UPS panels for this purpose.

1.4 WATER SUPPLY

- .1 Water supply is available at existing building and may be used for construction purposes at no cost.

1.5 SANITARY FACILITIES

- .1 Existing designated washroom facilities at the existing God's Acre Veterans Cemetery may be used on approval of Departmental Representative. Clean and stock washroom daily and before final completion.

1.6 REMOVAL OF TEMPORARY FACILITIES

- .1 Remove temporary facilities from site when directed by the Departmental Representative.

1.7 SIGNS AND NOTICES

- .1 Signs and notices for safety and instruction shall be in either official languages or graphic symbols conforming to CAN/CSA-Z321.
- .2 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or when directed by Departmental Representative.

END OF SECTION

1.1 PRODUCTS/MATERIAL AND EQUIPMENT

- .1 Use NEW products/material and equipment unless otherwise specified. The term “products” is referred to throughout the specifications.
- .2 Use products of 1 manufacturer for material and equipment of the same type or classification unless otherwise specified.
- .3 Unless otherwise specified, comply with manufacturer’s latest printed instructions for materials and installation methods.
- .4 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer’s instructions. Departmental Representative will designate which document is to be followed.
- .5 Provide metal fastenings and accessories in the same texture, colour and finish as base metal in which they occur.
 - .1 Prevent electrolytic action between dissimilar metals.
 - .2 Use non-corrosive fasteners, anchors and spacers for securing exterior work.
- .6 Fastenings which cause spalling or cracking are not acceptable.
- .7 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .8 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .9 Bolts may not project more than 1 diameter beyond nuts.
- .10 Types of washers as follows:
 - .1 Plain type washers: use on equipment and sheet metal.
 - .2 Soft gasket lock type washers: use where vibrations occur.
 - .3 Resilient washers: use with stainless steel.
- .11 Deliver, store and maintain packaged material and equipment with manufacturer’s seals and labels intact.
- .12 Prevent damage, adulteration and soiling of products during delivery, handling and storage. Immediately remove rejected products from site.
- .13 Store products in accordance with suppliers’ instructions.
- .14 Touch up damaged factory finished surfaces to Departmental Representative’s satisfaction:
 - .1 Use primer or enamel to match original.
 - .2 Do not paint over nameplates.

1.2 QUALITY OF PRODUCTS

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

- .1 Inspection does not relieve responsibility, but is precaution against oversight or error.
- .2 Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Retain purchase orders, invoices and other documents to prove that all products utilized in this Contract meet the requirements of the specifications. Produce documents when requested by the Departmental Representative.
- .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 building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY OF PRODUCTS

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

1.4 MANUFACTURER'S INSTRUCTIONS

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

1.5 CONTRACTOR'S OPTIONS FOR SELECTION OF PRODUCTS FOR TENDERING

- .1 Products are specified by "**Prescriptive**" specifications: select any product meeting or exceeding specifications.
- .2 Products specified by performance and referenced standard: select any product meeting or exceeding the referenced standard.

- .3 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".
- .4 When products are specified by a referenced standard or by Performance specifications, upon request of Departmental Representative obtain from manufacturer and independent laboratory report showing that the product meets or exceeds the specified requirements.

1.6 SUBSTITUTION AFTER CONTRACT AWARD

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2- 94, Stipulated Price Contract.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide and use marked separate bins for recycling. Refer to Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .5 Dispose of waste materials and debris off site.
- .6 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.3 FINAL CLEANING

- .1 Refer to CCDC 2, GC 3.14.
- .2 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for use.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris including that caused by Owner or other Contractors.
- .6 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.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .9 Remove dirt and other disfiguration from exterior surfaces.
- .10 Sweep and wash clean paved areas.

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

1.4 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

1.1 RELATED WORK

- .1 Refer to every technical section for waste management and disposal.

1.2 DEFINITIONS

- .1 Waste Audit (WA): relates to projected waste generation. Involves controlled separation of waste.
- .2 Waste Reduction Workplan (WRW): a written report which addresses opportunities for reduction, re-use or recycling of materials.
- .3 Materials Source Separation Program (MSSP): consists of a series of ongoing activities to separate re-usable and recyclable waste material into material categories from other types of waste at point of generation.

1.3 MATERIALS SOURCE SEPARATION

- .1 Before project start-up, prepare Materials Source Separation Program. Provide separate containers for re-usable and/or recyclable materials of the following:
 - .1 Metals.
 - .2 Wood.
 - .3 Plastics
 - .4 Other materials as indicated in technical sections.
- .2 Implement Materials Source Separation Program for waste generated on project in compliance with approved methods and as approved by Departmental Representative.
- .3 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .4 Locate separated materials in areas which minimize material damage.

1.4 DIVERSION OF MATERIALS

- .1 Create a list of materials to be separated from the general waste stream and stockpiled in separate containers, to the approval of the Departmental Representative and consistent with applicable fire regulations.
 - .1 Mark containers.
 - .2 Provide instruction on disposal practices.

1.5 STORAGE, HANDLING AND APPLICATION

- .1 Do work in compliance with Waste Reduction Workplan.
- .2 Handle waste materials not re-used, salvaged, or recycled in accordance with appropriate regulations and codes.
- .3 Materials in separated condition: collect, handle, store on site, and transport off-site to an approved and authorized recycling facility.
- .4 Materials must be immediately separated into required categories for re-use or recycling.
- .5 Unless specified otherwise, materials for removal become the Contractor's property.
- .6 On-site sale of salvaged/recyclable material is not permitted.

- .7 **Provide Departmental Representative with receipts** indicating quantity of material delivered to landfill.
- .8 **Provide Departmental Representative with receipts** indicating quantity and type of materials sent for recycling.

END OF SECTION

1.1 SUBMISSION

- .1 Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- .2 Revise content of documents as required before final submittal.
- .3 Phasing of submission:
 - .1 2 weeks before substantial performance of the work, submit to Departmental Representative 4 final copies of operation and maintenance manuals.
- .4 Ensure spare parts, maintenance materials and special tools provided are new, neither damaged nor defective, and of same quality and manufacture as products provided in work.
- .5 If requested, furnish evidence as to type, source and quality of products provided.
- .6 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

1.2 FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 "D" ring, loose leaf 219x279 mm with spine and face pockets.
- .3 Cover: identify each binder with typed or printed title "Project Record Documents"; list title of project and identify subject matter of contents.
- .4 Arrange content by systems under section numbers and sequence of Table of Contents.
- .5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Text: manufacturer's printed data, or typewritten data.
- .7 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 CONTENTS, EACH VOLUME

- .1 Table of contents – provide the following:
 - .1 Title of project.
Date of submission.
 - .2 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system, 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 products and component parts, and data applicable to installation. Delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.4 AS-BUILT DOCUMENTS

- .1 **Contract drawings** and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured locations of internal utilities and appurtenances; referenced to visible and accessible features of construction.
 - .2 Field changes of dimension and detail.
 - .3 Changes made by change orders.
 - .4 Details not on original Contract drawings.
 - .5 References to related shop drawings and modifications.
- .2 **Contract Specifications:** legibly mark each item to record actual "Workmanship of Construction", including:
 - .1 Manufacturer, trade name, and catalogue number of each "Product/Material" actually installed, particularly optional items and substitute items.
 - .2 Changes made by addenda and change orders.
- .3 **As-built information:**
 - .1 Record changes in red ink.
 - .2 Mark on 1 set of drawings, specifications and shop drawings at completion of project and, before final inspection, neatly transfer notations to second set.
 - .3 Provide 1 set of CDs in AutoCAD dwg file format with all as-built information on the CDs.
 - .4 Submit all sets for the Departmental Representative.

1.5 EQUIPMENT AND SYSTEMS

- .1 Operating procedures – include the following:
 - .1 Start-up and routine normal operating instructions and sequences.
 - .2 Regulation, control, stopping, shutdown, and emergency instructions.
 - .3 Summer, winter, and any special operating instructions.
- .2 Provide Contractor's coordination drawings with installed colour-coded piping diagrams.
- .3 Additional requirements: as specified in individual specification Sections.

1.6 MANUFACTURER'S DOCUMENTATION REPORTS

- .1 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.7 SPARE PARTS

- .1 Provide spare parts in quantities specified in individual specification Sections.
- .2 Provide items of same manufacture and quality as items in work.
- .3 Deliver to on-site location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to the Departmental Representative. Include approved listings in maintenance manual.
- .5 Obtain receipt for delivered products and submit to Departmental Representative.

1.8 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in work.
- .3 Deliver to on-site location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to the Departmental Representative. Include approved listings in maintenance manual.
- .5 Obtain receipt for delivered products and submit to Departmental Representative.

1.9 SPECIAL TOOLS

- .1 Provide special tools in quantities specified in individual specification Sections.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items:
 - .1 Submit inventory listing to the Departmental Representative.
 - .2 Include approved listings in maintenance manual.

1.10 WARRANTIES, BONDS, TEST REPORTS, INSPECTION REPORTS

- .1 Separate each Document 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, Bonds, Test Results, Inspection Reports executed in duplicate by subcontractors, suppliers, manufacturers, and inspection agencies within 10 days after completion of the applicable item of work.
- .4 Except for items put into use with the Departmental Representative'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.

1.11 COMPLETION

- .1 Submit a written certificate that the following have been performed:
 - .1 Work has been completed and inspected for compliance with the Contract documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Operation of systems has been demonstrated to the personnel indicated by the Departmental Representative.
 - .4 Work is complete and ready for final inspection.

END OF SECTION

1.1 SECTION INCLUDES

- .1 Includes general requirements for commissioning facilities and facility systems.

1.2 DEFINITIONS

- .1 Acronyms:
 - .1 Cx – Commissioning.
 - .2 O&M – Operation and Maintenance.
 - .3 PI – Product Information.
- .2 Cx – a required program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.

1.3 QUALITY ASSURANCE

- .1 Testing organization: current member in good standing of AABC certified to perform specified services.
- .2 Comply with applicable procedures and standards of the certification sponsoring association.
- .3 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

1.4 SUBMITTALS

- .1 Prior to start of Work, submit name of organization proposed to perform services. Designate who has managerial responsibilities for coordination of entire testing, adjusting and balancing.
- .2 Submit documentation to confirm organization compliance with quality assurance provision.
- .3 Submit 3 preliminary specimen copies of each of report forms proposed for use.
- .4 Ten (10) days prior to Substantial Performance, submit 3 copies of final reports on applicable forms.
- .5 Submit reports of testing, adjusting and balancing postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1.5 PROCEDURES – GENERAL

- .1 Comply with procedural standards of certifying association under whose standard services will be performed.
- .2 Notify Departmental Representative 3 days prior to beginning of operations.
- .3 Accurately record data for each step.
- .4 Report to Departmental Representative any deficiencies or defects noted during performance of services.

1.6 CONTRACTOR'S RESPONSIBILITIES

- .1 Prepare each system for testing and balancing.
- .2 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.
- .3 Notify testing organization 7 days prior to time project will be ready for testing, adjusting, and balancing.

1.7 PREPARATION

- .1 Provide instruments required for testing, adjusting, and balancing operations.
- .2 Verify systems installation is complete and in continuous operation.

1.8 FINAL REPORTS

- .1 Organization having managerial responsibility shall make reports.
- .2 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.

1.9 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx deliverables have been submitted and accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 93 43.01 Tree Pruning

1.2 DEFINITIONS

- .1 Clearing:
 - .1 General clearing: consists of cutting off trees, brush and shrub vegetative growth to within specified height above ground and disposing of felled trees, live or dead plant material, previously uprooted trees and stumps, exposed visible boulders and surface debris and rubbish.
 - .2 Clearing isolated trees: consists of cutting off to within specified height above ground of designated trees, and disposing of felled trees and debris.
 - .3 Underbrush clearing: consists of removal from treed areas of undergrowth, deadwood and trees smaller than specified trunk diameter and disposing of fallen timber and surface debris.
- .2 Grubbing:
 - .1 General grubbing: consists of excavation and disposal of stumps, roots, exposed visible boulders, and rock fragments of specified size to minimum specified depth below existing ground surface.
- .3 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .4 Waste Reduction Workplan (WRW): written report, which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Site Meetings:
 - .1 Convene pre-installation meeting 2 weeks prior to beginning work of this Section, with Consultant, contractor's representative, and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .2 Hold project meetings every week.
 - .3 Ensure key personnel and subcontractor representatives attend.
 - .4 Review site with Departmental Representative and Consultant and verify extent of stripping, clearing, grubbing, and removal and items designated to remain.
 - .5 Locate, identify and protect existing utilities designated to remain.
 - .6 Identify site features, planting and buildings designated to remain.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Field Reports: submit site clearing written report, within 3 days of review, verifying compliance of Work, as described in PART 3.
 - .1 Submit letter of competence as described in Source Quality Control in PART 2.
- .3 Identify on-site stock-pile area available for soils and mulches for future use.
- .4 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.
 - .2 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.5 SITE CONDITIONS

- .1 Provide traffic control as required, in accordance with applicable regulations.
- .2 Access project site only from access points shown on plans and pre-approved in writing by Departmental Representative.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Cut timber greater than 400 mm diameter to lengths as determined at progress meetings and confirmed in writing by Departmental Representative.

Part 2 Products

2.1 SITE CLEARING

- .1 Site clearing: as required to achieve specified performance criteria; functionally compatible with adjacent materials and components and to achieve intended outcomes as indicated on plans.
- .2 Do not allow subgrade material to contaminate topsoil.

Part 3 Execution

3.1 CLEARING EXPERIENCE

- .1 Provide letter of competence indicating minimum 5 years' experience related to the clearing of native vegetation on sites to be managed as natural park space.
- .2 Provide a letter of competence indicating a minimum of 5 years' experience related to the safe removal of trees in confined areas.

3.2 EXAMINATION

- .1 Review site with Departmental Representative and Consultant and verify items designated to remain.
- .2 Locate and protect utility lines.
 - .1 Preserve in operating condition active utilities traversing site.
- .3 Notify utility authorities before beginning work to clear site.

3.3 PREPARATION

- .1 Prevent damage to natural features, fencing, surrounding trees and root systems of trees to be preserved, existing pavement, site appurtenances including adjacent cemetery monuments, and surrounding golf course landscaping, which are to remain.
- .2 Protect benchmarks, property corners, and survey monuments from damage or displacement. If marker needs to be removed, reference and replace it by licensed land surveyor.
- .3 Ensure adequate surface drainage in affected area is maintained.
- .4 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.4 CLEARING

- .1 Site clearing work in accordance with submittals to assure compliance with specified requirements.
- .2 Sod stripping and removal: strip sod to topsoil.
- .3 Clear rock outcrops to expose surface as directed by Consultant.
- .4 General clearing:
 - .1 Remove trees, brush, shrubs, down timber, rotten wood, rubbish, and other vegetation as specified on plans and as outlined by Consultant.
 - .2 Clear as indicated by cutting to height 300 mm above ground.
 - .3 In areas to be subsequently grubbed, height of stumps left from clearing operations to be more than 300 mm above ground surface.
- .5 Clearing isolated trees: cut trees indicated and grub out tree stump by Consultant.
- .6 Underbrush clearing: clear underbrush indicated according to species and as directed by Consultant. Clear trees less than 50 mm trunk diameter to ground level.
- .7 Restrict clearing work to area within construction limits as indicated.

- .8 Grubbing:
 - .1 Grub out stumps and roots to minimum depth 300 mm below ground surface.
 - .2 Grub out exposed visible boulders and rock fragments greater than 300 mm but less than 1 m in diameter. Retain for placement on-site.
- .9 Use only hand methods and for grubbing inside the drip lines of all trees which are to remain.
- .10 Chipping:
 - .1 Chip woody debris suitable for creating wood mulch to be used as a weed suppression layer.
 - .2 Stockpile mulch under cover until ready for application per plans.
Wood mulch to be approved by Consultant and Departmental Representative prior to installation.
- .11 Log salvage: stockpile log sections as directed by consultant for placement on site.

3.5 FINISH

- .1 Leave ground surface in condition suitable for review and approval by Departmental Representative and Consultant.

3.6 FIELD QUALITY CONTROL

- .1 Provide verification and review of site clearing and submit reports, in acceptable format, to verify compliance of work with contract.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
 - .2 Keep golf course property clean and free from mud, dirt, and debris at all times.
 - .3 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Clean and reinstate areas affected by Work.
- .3 Salvage objects removed from site.
- .4 Waste Management: separate waste materials for reuse on site as directed.
 - .1 Remove recycling and compost containers and bins from site and dispose of materials at appropriate facility.
- .5 Materials:
 - .1 Remove excess site clearing, grubbing and stripping materials to appropriate recycling facility or landfill site.
 - .2 Obtain signed certificate from authorized recycling facility or landfill site with details of locations where materials are to be disposed in accordance with WRW.

Include each disposal site and type of material, operator's name and type of license and criteria used by site to assess suitability of material for disposal.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CSA O121 - Douglas Fir Plywood.
 - .4 CSA O151 - Canadian Softwood Plywood.
 - .5 CSA O153 - Poplar Plywood.
 - .6 CAN/CSA-O325.0 - Construction Sheathing.
 - .7 CSA O437 Series - Standards for OSB and Waferboard.
 - .8 CSA S269.1 - Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3 - Concrete Formwork, National Standard of Canada

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of B.C., Canada.
- .3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, and materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.
- .4 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .5 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for recycling, reuse or disposal.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling facility as approved by the Departmental Representative.
 - .4 Divert plastic materials from landfill to a recycling facility as approved by the Departmental Representative.

- .5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, or CSA-O153.
- .2 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.
 - .1 Spiral pattern to show in hardened concrete.
- .3 Form ties:
 - .1 For concrete not designated Architectural, use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .4 Form liner:
 - .1 Plywood: Douglas Fir to CSA O121 square edge.
 - .2 Waferboard: to CAN/CSA-O325.0.
- .5 Form release agent: biodegradable, low VOC, non-toxic.
- .6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, flashpoint minimum 150 degrees C, open cup.
- .7 Falsework materials: to CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.

- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .9 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.
- .10 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes.
- .13 Line forms for following surfaces:
 - .1 Outer face of and vertical edge of bridge sidewalk slab.
 - .2 Exposed faces of abutments, wing walls, piers and pylons: do not stagger joints of form lining material and align joints to obtain uniform pattern.
 - .3 Secure lining taut to formwork to prevent folds.
 - .4 Pull down lining over edges of formwork panels.
 - .5 Ensure lining is new and not reused material.
 - .6 Ensure lining is dry and free of oil when concrete is poured.
 - .7 Application of form release agents on formwork surface is prohibited where drainage lining is used.
 - .8 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
 - .9 Cost of textile lining is included in price of concrete for corresponding portion of Work.
- .14 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 7 days for walls and sides of beams.
 - .2 14 days for beam soffits, slabs, decks and other structural members, or 7 days when replaced immediately with adequate shoring to standard specified for falsework.
 - .3 7 days for footings and abutments.
- .2 Remove formwork when concrete has reached 70% of its design strength or minimum period noted above, whichever comes later.

- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 3000 Cast-in-place concrete.

1.2 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A82/A82M, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .3 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .4 ASTM A775/A775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International
 - .1 CSA-A23.1, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3, Design of Concrete Structures.
 - .3 CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .6 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC, Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of B.C., Canada.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.

- .2 Lists.
- .3 Quantities of reinforcement.
- .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
- .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
 - .1 Provide type B unless otherwise indicated.
- .4 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

1.4 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Structural Engineer.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A1064M/A1064M.

- .5 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M.
- .6 Welded steel wire fabric: to ASTM A185/A185M.
 - .1 Provide in flat sheets only.
- .7 Welded deformed steel wire fabric: to A1064/A1064M.
 - .1 Provide in flat sheets only.
- .8 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .9 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m².
 - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
 - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
 - .1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
 - .3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
 - .1 In this case, no restriction applies to temperature of solution.
 - .4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
 - .1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .10 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .11 Mechanical splices: subject to approval of Structural Engineer.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .1 SP-66 unless indicated otherwise.
- .2 Obtain Structural Engineer's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Structural Engineer, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
 - .1 Ship epoxy coated bars in accordance with ASTM A775A/A775M.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

Upon request, inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 PREPARATION

- .1 Galvanizing to include chromate treatment.
 - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

3.2 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Structural Engineer.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Protect epoxy coated portions of bars with covering during transportation and handling.

3.4 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 10 00 - Concrete Forming and Accessories.
- .2 Section 03 20 00 - Concrete Reinforcing.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C260/C260M, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .5 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .6 ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .7 ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .8 ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .3 CSA International
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ABBREVIATIONS AND ACRONYMS

- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
 - .1 Type GU, GUb and GUL - General use cement.

- .2 Type MS and MSb - Moderate sulphate-resistant cement.
 - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
 - .4 Type HE, HEb and HEL - High early-strength cement.
 - .5 Type LH, LHb and LHL - Low heat of hydration cement.
 - .6 Type HS and HSb - High sulphate-resistant cement.
- .2 Fly ash:
 - .1 Type F - with CaO content less than 15%.
 - .2 Type CI - with CaO content ranging from 15 to 20%.
 - .3 Type CH - with CaO greater than 20%.
 - .3 GGBFS - Ground, granulated blast-furnace slag.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure Departmental Representative and key personnel attend.
 - .1 Verify project requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 At least 4 weeks prior to beginning Work, provide Departmental Representative with Engineer manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials.
 - .4 Grout.
 - .5 Admixtures.
 - .6 Aggregates.
 - .7 Water.
 - .8 Waterstops.
 - .9 Waterstop joints.
 - .10 Joint filler.
- .3 Provide testing reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

- .5 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .6 Provide two copies of WHMIS MSDS in accordance with Section 01 35 33.10 Health and Safety Requirements.

1.6 **QUALITY ASSURANCE**

- .1 Provide Departmental Representative minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .2 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.
- .3 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7 **DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Structural Engineer and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.2 MATERIALS

- .1 Portland Cement: to CSA A3001, Type GU.
- .2 Portland-limestone cement: Type GUL to CSA A23.1.
- .3 Water: to CSA A23.1.
- .4 Aggregates: to CSA A23.1/A23.2.
- .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Calcium chloride shall not be used as an admixture in any concrete.
- .6 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 20 MpA.
- .7 Premoulded joint fillers:
 - .1 Bituminous impregnated fibre board: to ASTM D1751.
- .8 Weep hole tubes: plastic.

2.3 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Consultant performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below.
 - .2 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: F-2.
 - .2 Compressive strength at 28 days age: 25 Mpa minimum.
 - .3 Aggregate size 20 mm.
 - .3 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.
 - .4 Air content: 4%.
 - .5 Slump: at time and point of discharge: 100mm (4").

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.

- .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete, obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, and air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Structural Engineer before the placing of concrete.
 - .2 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .3 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
 - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
 - .1 Formed holes: 100 mm minimum diameter.
 - .2 Drilled holes: to manufacturers' recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with epoxy grout.

- .4 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .5 Dovetail anchor slots: in accordance with Section 04 05 00 - Common Work Results for Masonry.
 - .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
 - .2 Install continuous vertical anchor slots at 800 mm on centre where concrete walls are masonry faced.
- .6 Finishing and curing:
 - .1 Finish concrete to CSA A23.1/A23.2.
 - .2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: troweled finish, lightly sandblasted.
 - .4 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .7 Waterstops:
 - .1 Install waterstops to provide continuous water seal.
 - .2 Do not distort or pierce waterstop in way as to hamper performance.
 - .3 Do not displace reinforcement when installing waterstops.
 - .4 Use equipment to manufacturer's requirements to field splice waterstops.
 - .5 Tie waterstops rigidly in place.
 - .6 Use only straight heat sealed butt joints in field.
 - .7 Use factory welded corners and intersections unless otherwise approved by Departmental Representative.
- .8 Joint fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
 - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form expansion, isolation or construction joints as indicated.
 - .4 Install joint filler.

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1 Straightedge Method.

3.4 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .6 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 7419 Waste Management and Disposal.
 - .1 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative.
 - .2 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
 - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
 - .7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 3000 Cast-in-place Concrete
- .2 Section 04 05 19 Masonry Anchorage and Reinforcement
- .3 Section 04 43 16 Granite Veneer Cladding

1.2 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A179, Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .2 International Masonry Industry All-Weather Council (IMIAC)
 - .1 Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Shop drawings, Product Data and Samples.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for masonry mortar and grout and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 33.10 Health and Safety Requirements. Indicate VOC's mortar, grout, parging, colour additives and admixtures. Expressed as grams per litre (g/L).
- .3 Samples:
 - .1 Submit confirmation of source or product data sheet, prior to mixing or preparation of mortars, to Departmental Representative of:
 - .1 Aggregate: sand.
 - .2 Cement.
 - .3 Lime.
 - .4 Colour pigment samples.
 - .2 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports including sand gradation tests in accordance with CAN/CSA-A179 showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect masonry mortar and grout from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer and return] of pallets, and packaging materials as specified in Construction Waste Management Plan.

1.6 SITE CONDITIONS

- .1 Ambient Conditions: maintain materials and surrounding air temperature to:
 - .1 Minimum 10 degrees C prior to, during, and 48 hours after completion of masonry work.
 - .2 Maximum 32 degrees C prior to, during, and 48 hours after completion of masonry work.
- .2 Weather Requirements: CAN/CSA-A371 International Masonry Industry All-Weather Council (IMIAC) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

Part 2 Products

2.1 MATERIALS

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Cement:
 - .1 Portland Cement: to CAN/CSA-A3000, HE - High-early-strength hydraulic cement (Type 30)] white.
 - .2 Masonry Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type N.

- .3 Mortar Cement: to CAN/CSA-A3002 and CAN/CSA-A179, Type N, WITH integral water repellents.
 - .1 Use low VOC products.
- .4 Packaged Dry Combined Materials for mortar: to CAN/CSA-A179, Type N, using white colour cement.
- .3 Aggregate: supplied by one supplier.
 - .1 Fine Aggregate: to CAN/CSA-A179, natural sand.
 - .2 Coarse Aggregate: to CAN/CSA-A179.
- .4 Water: clean and potable.
- .5 Lime:
 - .1 Quick Lime: to CAN/CSA-A179, Type N.
 - .2 Hydrated Lime: to CAN/CSA-A179, Type S.
- .6 Bonding Agent: latex type.
- .7 Polymer Latex: organic polymer latex admixture of butadiene-styrene type non-emulsifiable bonding admixture.

2.2 COLOUR ADDITIVES

- .1 Use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample. Admixtures to be approved prior to use. Use in accordance with the specific manufacturer's recommendations.

2.3 MORTAR MIXES

- .1 Mortar for exterior masonry above grade:
 - .1 Non-Load Bearing: N.
- .2 Stain Resistant Pointing Mortar: one part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate to 2 percent of Portland cement by weight.
- .3 Mortar for foundation walls, manholes, sewers, pavements, walks, patios and other exterior masonry at or below grade: type M.
- .4 Following applies regardless of mortar types and uses specified above:
 - .1 Mortar for stonework: type N.

2.4 MORTAR MIXING

- .1 Use pre-blended, pre-coloured mortar prepackaged under controlled factory conditions. Ingredients batching limitations to be within 1% accuracy.
- .2 Mix mortar ingredients in accordance with CAN/CSA-A179 in quantities needed for immediate use.
- .3 Maintain sand uniformly damp immediately before mixing process.

- .4 Add mortar colour in accordance with manufacturer's instructions. Provide uniformity of mix and colouration.
- .5 Do not use anti-freeze compounds including calcium chloride or chloride based compounds.
- .6 Do not add air entraining admixture to mortar mix.
- .7 Use a batch type mixer in accordance with CAN/CSA-A179.
- .8 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour no more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.
- .9 Re-temper mortar only within two hours of mixing, when water is lost by evaporation.
- .10 Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures under 10 degrees C.

2.5 GROUT MIXES

- .1 Grout: Minimum compressive strength of 12.5 MPa at 28 days. Maximum aggregate size and grout slump: CAN/CSA-A179.

2.6 GROUT MIXING

- .1 Mix batched and delivered grout in accordance with CSA A23.1/A23.2 transit mixed.
- .2 Mix grout ingredients in quantities needed for immediate use in accordance with CAN/CSA-A179 fine grout.
- .3 Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- .4 Do not use calcium chloride or chloride based admixtures.

2.7 MIX TESTS

- .1 Testing Mortar Mix:
 - .1 Test mortar to requirements of Section 01 45 00 - Quality Control, and in accordance with CAN/CSA-A179, for mortar based on property specification. Test prior to construction for:
 - .1 Compressive strength.
 - .2 Consistency.
 - .3 Mortar aggregate ratio.
 - .4 Sand/cement ratio.
 - .5 Water content and water/cement ratio.
 - .6 Air content.
 - .7 Splitting tensile strength.
- .2 Testing Grout Mix:
 - .1 Test grout to requirements of Section 01 45 00 - Quality Control, and in accordance with CAN/CSA-A179, for proportion specification. Test prior to construction for:

- .1 Compressive strength.
- .2 Sand/cement ratio.
- .3 Water content and water/cement ratio.
- .4 Slump.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for masonry installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Apply bonding agent to existing concrete surfaces.
- .2 Plug clean-out holes with masonry units. Brace masonry for wet grout pressure.

3.3 CONSTRUCTION

- .1 Do masonry mortar and grout work in accordance with CAN/CSA-A179 except where specified otherwise.
- .2 Apply parging in uniform coating not less than 10 mm thick.

3.4 MIXING

- .1 All pointing mortar can be mixed using a regular paddle mixer. Only electric motor mixers are permissible. Mixers run on hydrocarbons are not permitted, due to fumes. Mixing by hand must be pre-approved by the Departmental Representative.
- .2 Clean all mixing boards and mechanical mixing machine between batches.
- .3 Mortar must be weaker than the units it is binding.
- .4 Contractor to appoint one individual to mix mortar, for duration of project. In the event that this individual must be changed, mortar mixing must cease until the new individual is trained, and mortar mix is tested.

3.5 MORTAR PLACEMENT

- .1 Install mortar to manufacturer's instructions.
- .2 Install mortar to requirements of CAN/CSA-A179.
- .3 Remove excess mortar from grout spaces.

3.6 GROUT PLACEMENT

- .1 Install grout in accordance with manufacturer's instructions.
- .2 Install grout in accordance with CAN/CSA-A179.
- .3 Work grout into masonry cores and cavities to eliminate voids.
- .4 Do not install grout in lifts greater than 400 mm, without consolidating grout by rodding.
- .5 Do not displace reinforcement while placing grout.

3.7 FIELD QUALITY CONTROL

- .1 Site Tests, Inspection:
 - .1 Test and evaluate mortar prior to construction in accordance with CAN/CSA-A179.
 - .2 Test and evaluate grout prior to construction to CAN/CSA-A179; test in conjunction with masonry unit sections specified.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Clean masonry with low pressure clean water and soft natural bristle brush.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .5 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

- .1 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 040512 Concrete Mortar and Grout
- .2 Section 044316 Granite Veneer Cladding

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A36/A36M-12, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .2 CSA Group
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A179-04(R2009), Mortar and Grout for Unit Masonry.
 - .3 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .3 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Shop drawings, Product Data and Samples.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for anchorage and reinforcing materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of B.C., Canada.
 - .2 Submit drawings detailing bar bending details, anchorage details, lists and placement drawings
 - .3 On placement drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .4 Samples:
 - .1 Submit 2 samples of: masonry anchors and related fittings.
- .5 Manufacturers' Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control and requirements of Section 04 05 00 - Common Work Results for Masonry.

1.5 SITE MEASUREMENTS

- .1 Make site measurements necessary to ensure proper fit of members.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect anchorage and reinforcing materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse by manufacturer of packaging materials, pallets, and padding, as specified in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Bar reinforcement: Steel to CAN/CSA-A371 and CSA G30.18, Grade stainless steel to ASTM A167.
- .2 Connectors: to CAN/CSA-A370 and CSA S304.1.
- .3 Corrosion protection: to CSA S304.1, galvanized to CSA S304.1 and CAN/CSA-A370.
- .4 Fasteners: installed post-construction:
 - .1 Screw Shields and Plugs: nylon placed directly into solid masonry units.
 - .2 Bolts and Screws: size and type to suit application, locate where indicated.
 - .3 Nails: case-hardened cut or spiral nails, size and type to suit fastening application.

- .4 Powder-Driven Fasteners: pin styles and lengths to suit fastening application in accordance with manufacturers use, load and hold recommendations.
- .5 Adhesives: epoxies, mastics and contact cements for fastening applications, use in accordance with manufacturers' recommendations.
- .5 Ties: hot dip galvanized to CAN/CSA-A370 Table 5.2 steel finish.
 - .1 Corrugated to: CAN/CSA-A370.
- .6 Anchors: to CAN/CSA-A370:
 - .1 Conventional Anchors: type plate anchors or steel bolts with bent bar anchors, sized to suit application.
 - .2 Wedge Anchors: expansion anchors type wedge, sized to suit application.
 - .3 Sleeve Anchors: type sleeve and bolt, sized to suit application.
 - .4 Stone Anchors: series 300 stainless steel conforming to ASTM A666. Anchors to be manufactured.
 - .5 Anchor Bolts: galvanized to CAN/CSA-A370 Table 5.2 finish.
- .7 Conventional Bolts:
 - .1 Bolts: to ASTM A36, bar stock shop threaded, straight bolts with square or hex-headed nuts.
 - .2 Plate anchors: steel to ASTM A36, weld square of circular steel plate perpendicular to axis of steel bar threaded on opposite end.
 - .3 Through bolt rods: to ASTM A307 threaded rod or threaded ASTM A36 bar stock.
- .8 Adhesive Anchors: proprietary systems, measure and mix system where epoxy materials are hand-measured and mixed in accordance with manufacturers' written instructions.

2.2 FABRICATION

- .1 Fabricate reinforcing in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Fabricate connectors in accordance with CAN/CSA-A370.
- .3 Obtain Structural Engineer's approval for locations of reinforcement splices other than shown on placing drawings.
- .4 Upon approval of Structural Engineer, weld reinforcement in accordance with CSA W186.
- .5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.
- .2 Upon request, inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for anchorage and reinforcing materials installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

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

3.3 INSTALLATION

- .1 Supply and install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371, CSA A23.1/A23.2 and CSA S304.1 unless indicated otherwise.
- .2 Prior to placing grout and mortar, obtain Departmental Representative's approval of placement of reinforcement and connectors.
- .3 Supply and install additional reinforcement to masonry as indicated.

3.4 GROUTING

- .1 Grout masonry in accordance with CSA S304.1, CAN/CSA-A371 and CAN/CSA-A179 and as indicated.

3.5 ANCHORS

- .1 Supply and install metal anchors in accordance with CAN/CSA-A370 and CAN/CSA-A371.

3.6 LATERAL SUPPORT AND ANCHORAGE

- .1 Supply and install lateral support and anchorage in accordance with CSA S304.1 and as indicated.

3.7 MOVEMENT JOINTS

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.8 FIELD BENDING

- .1 Do not field bend reinforcement and connectors except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

- .3 Replace bars and connectors which develop cracks or splits.

3.9 FIELD QUALITY CONTROL

- .1 Site inspections in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Obtain Departmental Representative approval of placement of reinforcement and connectors, prior to placing mortar and grout.

3.10 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 033000 Cast-in-place concrete
- .2 Section 040512 Concrete Mortar and Grout
- .3 Section 040519 Masonry Anchorage and Reinforcement

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A108.1, Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, A136.1).
- .2 ASTM International
 - .1 ASTM C144-[11], Standard Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207-[06(2011)], Standard Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C615/C615M-[11], Standard Specification for Granite Dimension Stone.
 - .4 ASTM C920-[11], Standard Specification for Elastomeric Joint Sealants.
- .3 CSA Group
 - .1 CAN/CSA-A370-04(R2009), Connectors for Masonry.
 - .2 CAN/CSA-A3000-[08], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for granite veneer cladding and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of B.C., Canada.
 - .2 Indicate sizes and sections of granite, arrangements of joints and bonding, anchoring, dowelling, and cramping.
 - .3 Each section of granite indicated on shop drawings must bear corresponding number marked on its back or bed.
- .4 Samples:
 - .1 Submit sample for each finish product specified, 2 complete sets of colour chips representing manufacturer's full range of available colours, textures, and patterns.

- .2 Submit verification samples for each finish product specified, 2 samples, approximately 300 mm square, representing actual product, colour, texture, and patterns.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Provide extra materials to requirements of Section 01 78 00 - Closeout Procedures.
 - .2 Extra materials: 4 m² or 2%, whichever is greater, of each type and colour of material; clearly marked to identify:
 - .1 Manufacturer's name.
 - .2 Product's name.
 - .3 Product colour and pattern.
 - .3 Package materials neatly in original containers, to prevent damage.

1.5 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports [including sand gradation tests in accordance with CAN/CSA-A179 showing compliance with specified performance characteristics and physical properties, and in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .1 Construct mock-up panel of exterior granite veneer construction 1200 x 1800 mm, showing colors and textures, use of reinforcement, ties, through wall flashing, weep holes, jointing, coursing, mortar and quality of work.
 - .2 Mock-up used:
 - .1 To judge quality of work, substrate preparation, operation of equipment and material application.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect granite veneer cladding from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Do not install at temperatures below 12 degrees C or above 38 degrees C.
 - .2 Maintain temperatures at or above 12 degrees C until cementitious materials have fully cured.
 - .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.
- .2 Field Measurements:
 - .1 Make field measurements necessary to ensure proper fit of members.

Part 2 Products

2.1 MATERIALS

- .1 Granite: to ASTM C615, colour and texture to match approved sample No. 1.
- .2 Anchors: galvanized to CAN/CSA-A370, Table 5.2.
- .3 Sealants: Section 07 92 00 - Joint Sealants.

2.2 MORTAR AND ADHESIVE MATERIALS

- .1 Portland cement: to CAN/CSA-A3000, type GU.
- .2 Sand: to ASTM C144, passing 16 mesh.
- .3 Hydrated lime: to ASTM C207, Type N.
- .4 Latex additive: formulated for use in Portland cement mortar and thin set bond coat.
- .5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.
- .6 Dry set Portland cement mortar: to ANSI A108.
- .7 Latex Portland cement mortar: to ANSI A108.
- .8 Bond Breaker: preformed, compressible, resilient, non-staining, non-waxing, closed-cell polyethylene foam pad, non-absorbent to liquid and gas, 3.2 mm thick or polyethylene sheet, 6 mil thick.

2.3 GROUT

- .1 Portland cement grout: to ANSI A108.
 - .1 Use low VOC products [in compliance with SCAQMD Rule 1168].
- .2 Grout preparation: to manufacturer's written instructions.
- .3 Latex-Portland Cement Grout: to ANSI A108.
- .4 Furan Mortars and Grout: to ANSI A108.
 - .1 Use low VOC products [in compliance with SCAQMD Rule 1168].

2.4 ACCESSORIES

- .1 Sealant: in accordance with Section [07 92 00 - Joint Sealants].
 - .1 Use low VOC products [in compliance with SCAQMD Rule 1168].

2.5 FINISHES

- .1 Polished.
- .2 Honed.
- .3 Sawn, 5 cut.
- .4 Split face.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for granite veneer cladding installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Cut granite to shape and dimensions and full to square with jointing as indicated.
- .2 Join and bed granite pieces as indicated. Make joints maximum 6 mm thick.
 - .1 Saw or cut beds and joints full square back from face at least two thirds of piece thickness. From that point bed may fall under square 20 mm in 300 mm maximum.
 - .2 Make bed joints free of large depressions.
- .3 Saw or roughly dress backs of granite pieces to approximately true plane. Maximum acceptable variation in thickness may not exceed 10 mm on pieces less than 75 mm thick or 12 mm on thicker pieces.
- .4 Supply granite pieces with scabbled or natural quarry split backs which may not vary more than 25 mm in 300 mm from true plane and not more than 25 mm from specified thickness.
- .5 Clean sawn backs and beds of rust stains and iron particles.
- .6 Execute moulded work from full size details. Make exposed arrises in true alignment and ease slightly to prevent snipping.
- .7 Cut granite for anchors, cramps, dowels. Provide Lewis pin holes in pieces which cannot be manually handled. Do not cut holes in exposed surfaces.

- .8 Back-check granite coming in contact with structural members as indicated. Allow minimum of 25 mm clearance between back of stone and steel and concrete structural members. Shape beds of stone resting on structural work to fit supports.
- .9 Cut-in reglets for flashings where indicated.

3.3 **INSTALLATION**

- .1 Construction in accordance with CAN/CSA-A371.
- .2 Clean granite removing dirt or foreign matter from edges and surfaces. Do not use a wire brush.
- .3 Set granite plumb and accurately in position with anchors securely placed, as indicated on shop drawings. Orient stone veining in direction indicated on shop drawings.
- .4 Set slabs firmly against mortar spots located at or near anchors and spaced at 500 mm maximum apart over back of slab.
- .5 Install 6 mil polyethylene sheet to prevent bond between back of stone facing and concrete substrate or install 3 mm polyethylene-foam bond breaker. Maintain minimum projection requirements of stone anchors into concrete substrate.
- .6 Attach anchors to back-up wall and to granite. Fill anchor holes and encase anchors in mortar.
- .7 Make joints uniform and of indicated width. Place non-staining resilient cushions at least one joint width back from face to maintain joint width. Keep edges and faces aligned to respect indicated tolerances.
- .8 Use plastic weep hole vents.
- .9 Prevent soiling, chipping or defacing granite. Remove mortar droppings and wash clean.
- .10 Pointing: remove dirt and loose mortar from joints by using pressure air stream.
 - .1 Wet joints for mortar pointing. Dry joints for sealant pointing.
 - .2 Point joints with pointing mortar in 2 stages. Rub smooth with plastic tool to slightly concave joint.

3.4 **SITE TOLERANCES**

- .1 Maximum variation in dimensions of granite pieces may not exceed one-fourth of specified bed and joint width.
- .2 Maximum flatness variations on polished, honed and fine rubbed surfaces at bed and joint arris line may not exceed one-sixth of specified joint width and one-fourth of joint width on surfaces having other finishes. Determine flatness with 1.2 m long straight edge applied in any direction of surface.

3.5 **CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 At completion wash granite with soft fibre brushes, soap powder and clean water.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 GRANITE SCHEDULE

- .1 Type of stone material: G633 Granite: offshore, white, salt-and-pepper coloured in finishes specified.

END OF SECTION

Part General

1.1 RELATED REQUIREMENTS

Section 03 30 00 Cast-in-place Concrete

Section 32 93 10 Trees, Shrubs and Groundcover Planting

1.2 SUBMITTALS

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

.2 Product Data:

.1 Maintenance Instructions.

.2 Storage and handling requirements and recommendations.

.3 Installation instructions.

.3 Shop Drawings:

.4 Samples:

.1 Submit powder coat finish samples.

.2 Submit HDPC finish samples.

1.3 QUALITY ASSURANCE

.1 Manufacturer Qualifications:

.1 Manufacturing of site furnishings for at least 10 years.

.2 Manufactured in North America.

.2 Product Support:

.1 Products are supported with CAD drawings.

.2 Warranty documentation is provided.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in manufacturer's original packaging, with order information and shipping documents.

.2 Store products in manufacturer's original packaging in a clean, dry environment until ready to be installed.

.3 Handle products in accordance with manufacturer's instructions.

1.5 WARRANTY

.1 Provide manufacturer's standard warranty.

.1 Products will be free from defects in components, standard finishes or workmanship for a period of five (5) years from date of manufacture.

Part 2 Products

2.1 BENCHES

- .1 Dimensions:
 - .1 Height: 32.38" (82.2 cm)
 - .2 Length: 70.00" (177.8 cm)
 - .3 Depth: 24.50" (62.2 cm)
- .2 Weight:
 1. 135lbs (61kg)
- .3 Options:
 - .1 MLB870-PCC – "Charcoal" Paper Composite seat and back
 - .2 MLB870-PCS – "Sandstone" Paper Composite seat and back
- .4 Mounting:
 - .1 Surface Mount
- .5 Acceptable Products:
 - .1 Maglin MLB870-L-PCC Fine Text Silver Legless Bench (8)
 - .2 Maglin MLB870-PCS Fine Text Silver Bench with legs (5)
 - .3 Products that meet the following criteria are also acceptable:
 - .1 available in the dimensions indicated
 - .2 available as free-standing and wall-mounted options
 - .3 available with silver coloured metal finish on frame
 - .4 available with composite slats, brown and charcoal colour

2.2 MATERIALS

- .1 Bench frame made from solid cast aluminum (95% recycled material).
- .2 Seat and back employs High Density Paper Composite (HDPC).
- .3 Stainless Steel Fasteners.
- .4 Finishes
 - .1 UV Resistant Powdercoat
 - .2 HDPC colors: brown, charcoal
 3. Metal finish: FineTex Silver

2.4 RECYCLED CONTENT

- .1 Recycled material: 95%
- .2 Post-consumer material: 57%

- .3 Post-industrial material: 38%
- .4 HDPC contains 100% recycled material.

Part 3 Execution

3.1 EXECUTION

- .1 Do not begin installation until substrates are properly prepared.
- .2 Verify that substrates are stable and capable of supporting the weight of the product.

3.2 INSTALLATION

- .1 Install benches in accordance with manufacturer's installation instructions.
- .2 MLB870-PC benches are delivered pre-assembled. Holes (0.5") are provided in each foot for securing to base.
- .3 Bolt and anchor benches securely in place.

3.3 ADJUSTING

- .1 Any loose or missing hardware should be tightened or replaced immediately.
- .2 If any part is found to be cracked or broken it is recommended that the product be taken out of service until the appropriate repairs can be made.

3.4 CLEANING

- .1 Metal Components
 - .1 Should dirt from the environment build-up on this surface a wipe with a soft cloth and mild detergent will do the trick.
 - .2 Abrasive cleaners, brushes and steel wool should be avoided.
 - .3 If the finish is marred by a sharp object and the steel is exposed take a fine abrasive material to the area to improve the adhesion of the primer and touch-up paint. A quality grade exterior metal primer and top coat of matching color enamel should then be applied over the prepared surface.

3.5 PROTECTION

- .1 Protect installed benches until completion of project.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 311413 Soil Stripping and Stockpiling
- .2 Section 31 22 13 Rough Grading
- .3 Section 32 01 90.33 Tree and Shrub Preservation

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
- .2 CSA International
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA A3000-08, Cementitious Materials Compendium.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work.
 - .1 Pay costs of relocating services.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Site Quality Control Submittals: submit in accordance with Section 01 45 00 - Quality Control.
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article.
 - .2 Submit inspection results as described in PART 3 - FIELD QUALITY CONTROL.

Part 2 Products

2.1 MATERIALS

- .1 Granular Select Subgrade A, B Type I.
- .2 Crushed Granular.

Part 3 Execution

3.1 EXAMINATION

- .1 Evaluation and Assessment:
 - .1 Examine soil report to be provided by Departmental Representative.
 - .2 Before commencing work verify locations of buried services on and adjacent to site.

3.2 PREPARATION

- .1 Temporary erosion and sedimentation control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .2 Keep excavations clean, free of standing water, and loose soil.
 - .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
 - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .5 Protect buried services that are required to remain undisturbed.
- .3 Removal:
 - .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
 - .2 Remove stumps and tree roots below footings, slabs, and paving, and to 300 mm below finished grade elsewhere.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

3.3 EXCAVATION

- .1 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .1 Stockpile topsoil on site for later use.
- .2 Excavate as required to carry out work.

- .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Departmental Representative when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
 - .4 Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .3 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
 - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
 - .4 Excavate for slabs and paving to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Departmental Representative.
- .2 Not later than 1 week minimum before backfilling or filling, submit to designated testing agency, samples of backfill as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative to allow compaction tests to be carried out by designated testing agency.

3.5 BACKFILLING

- .1 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .2 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .3 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as fill.
 - .1 Fill excavated areas with selected subgrade material compacted as specified for fill.
- .4 Placing:
 - .1 Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
- .5 Compaction: compact each layer of material to following densities for material to ASTM D698:

- .1 To underside of base courses: 95%.
- .2 Base courses: 100%.
- .3 Elsewhere: 90%.
- .6 In trenches:
 - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
 - .2 Over 300 mm above pipe or conduit: native material approved by Departmental Representative.
- .7 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .8 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material
- .9 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

3.6 GRADING

- .1 Grade so that water will drain away from walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative.
 - .1 Grade to be gradual between finished spot elevations shown on drawings.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Dispose of cleared and grubbed material off site daily.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and organics for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 3100 00.01 Earthwork Short Form
- .2 Section 3123 33.01 Excavation, Trenching and Backfill

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Allow continual sampling by Departmental Representative during production.
 - .2 Provide Departmental Representative with access to source and processed material for sampling.
 - .3 Provide front end loader or other suitable equipment including trained operator for stockpile sampling as necessary. Move samples to storage place as directed by Departmental Representative.
 - .4 Supply new or clean sample bags or containers according appropriate to aggregate materials.
 - .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
 - .2 Reclaimed concrete material.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.
 - .4 Reclaimed concrete material.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative 2 week's minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with topsoil stripping only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant and Departmental Representative.

3.2 PREPARATION

- .1 Topsoil stripping:
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Begin topsoil stripping of areas as indicated after area has been cleared of turf and removed from site.
 - .3 Strip topsoil to depths as directed by Consultant. Avoid mixing topsoil with subsoil.
 - .4 Stockpile in locations as [indicated] [directed by Departmental Representative. Stockpile height not to exceed 2 m.
 - .5 Dispose of topsoil off site as directed by Departmental Representative.
- .2 Stockpiling:
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
 - .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
 - .6 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
 - .7 Do not cone piles or spill material over edges of piles.
 - .8 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

- .5 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .6 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.
- .7 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 91 19.13 Topsoil placement and grading

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 Ensure that procedures are conducted in accordance with applicable Provincial requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Handle topsoil only when it is dry and warm.
- .4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal such as to a composting facility.
- .5 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal such as to a composting facility.
- .6 Strip topsoil to depths as directed by Consultant.
 - .1 Avoid mixing topsoil with subsoil.
- .7 Pile topsoil by mechanical hoe in berms in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2 m.
- .8 Dispose of unused topsoil in location as indicated by Departmental Representative.
- .9 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF GRADE

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.
 - .1 Grade area only when soil is dry to lessen soil compaction.
 - .2 Grade soil with scrapers establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

- .1 Place topsoil only after Departmental Representative has accepted subgrade.
- .2 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.
- .3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .4 Cultivate soil following spreading procedures.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 00.01 Earthwork
- .2 Section 32 91 19.13 Topsoil Placement and Grading

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D698-07e1, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .2 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

1.4 EXISTING CONDITIONS

- .1 Examine subsurface investigation report which is bound into specification as Appendix A.
- .2 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3 Refer to dewatering in Section 31 23 33.01 - Excavating, Trenching and Backfilling.

Part 2 Products

2.1 MATERIALS

- .1 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for rough grading installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 STRIPPING OF TOPSOIL

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.
- .2 Commence topsoil stripping of areas as directed by Departmental Representative and Consultant after area has been cleared of turf and removed from site.
- .3 Strip topsoil to depths as directed by Consultant and Departmental Representative. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
- .5 Dispose of unused topsoil as directed by Departmental Representative and Consultant.

3.3 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .3 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:
 - .1 85% under landscaped areas.
 - .2 95 - 100% under paved and walk areas.
- .4 Do not disturb soil within branch spread of trees or shrubs to remain.

3.4 TESTING

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by ULC. Costs of tests will be paid by Departmental Representative in accordance with Sections 01 29 83 - Payment Procedures for Testing Laboratory Services and 01 45 00 - Quality Control.
- .2 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to Departmental Representative for review.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Protect all trees designated to remain, fencing, golf course landscaping, natural features, structures, including cemetery monuments, pavement, surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 33 46 13.01

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63 2002, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 ASTM C136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45
 - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.
 - .3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
 - .4 Submit to Departmental Representative written notice when bottom of excavation is reached.

- .5 Submit to Departmental Representative inspection results report as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

1.5 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of B.C., Canada.
- .4 Keep design and supporting data on site.
- .5 Engage services of qualified professional Engineer who is registered or licensed in Province of B.C., Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .6 Do not use soil material until written report of soil test results are approved by Departmental Representative and Consultant.
- .7 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 33.10 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Divert excess materials from landfill to local recycling facility for reuse as directed by Departmental Representative.

1.7 EXISTING CONDITIONS

- .1 Examine Geotechnical Report to be provided by Departmental Representative.
- .2 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .3 Prior to beginning excavation Work, notify Departmental Representative of location and state of use of buried utilities and structures. Departmental

- Representative to clearly mark such locations to prevent disturbance during Work.
- .4 Confirm locations of buried utilities by careful test excavations.
- .5 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .6 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing. Costs for such Work to be paid by Departmental Representative.
- .7 Record location of maintained, re-routed and abandoned underground lines.
- .8 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing structures and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as directed by Consultant and Departmental Representative in accordance with Section 32 01 90.33 - Tree and Shrub Preservation.

Part 2 Products

2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.2.
 - .3 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of turf and this has been removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil to location as directed by Departmental Representative.

3.5 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 33.10 - Health and Safety Requirements and Health and Safety Act for the Province of B.C.
- .2 During backfill operation:
 - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .3 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .4 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site as directed Departmental Representative.

3.7 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for review by Departmental Representative details of proposed dewatering methods.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in a manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.8 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Do not disturb soil within branch spread of trees or shrubs that are to remain unless approved by Consultant.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

- .3 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .4 Restrict vehicle operations directly adjacent to open trenches.
- .5 Dispose of surplus and unsuitable excavated material off site.
- .6 Do not obstruct flow of surface drainage or natural watercourses.
- .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .8 Notify Departmental Representative when bottom of excavation is reached.
- .9 Obtain Departmental Representative approval of completed excavation.
- .10 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .11 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with Type 2 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected Standard Proctor maximum dry density.
- .12 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Structural Engineer.

3.9 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698..
 - .1 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100 %.
 - .2 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 300 mm from wall and compact to 95 %. For remaining portion, use Type 3 fill compacted to 95 %.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as specified.
- .2 Place bedding and surround material in unfrozen condition.

3.11 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.

- .3 Inspection, testing, approval, and recording location of underground utilities.
- .4 Removal of concrete formwork.
- .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading.
- .6 Consolidate and level unshrinkable fill with internal vibrators.
- .7 Install drainage system in backfill as indicated.

3.12

RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 - Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as directed by Consultant.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Section 32.15 40 Crushed Stone Surfacing

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D4491-99a (2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .2 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .3 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .4 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-2004
 - .2 Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .3 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2- M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3- M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
 - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 CSA Group
 - .1 CSA G40.20/G40.21- 04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Provide manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Provide following samples 2 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
 - .2 Methods of joining.
- .4 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 2 weeks prior to start of Work.
- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Provide project Waste Management Plan highlighting recycling and salvage requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse by manufacturer of pallets, and dispose of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: 3800mm
 - .2 Length: 110m
 - .3 Composed of: polypropylene minimum 85% by mass with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
- .2 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No.3.
 - .2 Mass per unit area: to CAN/CGSB-148.1, No.2.

- .3 Tensile strength and elongation (in any principal direction): to ASTM D4632.
 - .1 Tensile strength: minimum 700N.
 - .2 Elongation at break: 50 %.
- .4 Grab tensile strength and elongation: to ASTM D4632.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751.
 - .2 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10.
 - .3 Transmissivity: to ASTM D4491
 - .4 Permittivity: to ASTM D4491.
- .4 Securing pins and washers: to CSA G40.21 Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to ASTM A123/A123M.
- .5 Factory seams: sewn in accordance with manufacturer's recommendations.
- .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with rock or other heavy objects.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Join successive strips of geotextile by pinning.
- .6 Pin successive strips of geotextile with securing pins at 1500 mm interval and at mid-point of lap.

- .7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .8 After installation, cover with overlying layer within 6 hours of placement.
- .9 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .10 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling or reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.
- .2 Do not overload soil or aggregate covering on geotextile.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 93 43.01 Tree Pruning

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A1064/A1064M-13, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .2 CSA Group
 - .1 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .3 Health Canada - Pest Management Regulatory Agency (PMRA)
 - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .2 Fertilizers Act (R.S. 1985, c. F-10).
 - .3 Fertilizers Regulations (C.R.C., c. 666).
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 DEFINITIONS

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 33.10 Health and Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect tree and shrub preservation materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19 Waste Management and Disposal.

1.7 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative prior to application.
 - .3 Remove dead, broken or hazardous branches from plant material. Dispose of debris through composting or mulching.

Part 2 Products

2.1 MATERIALS

- .1 Fill:
 - .1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
 - .2 Type (B): excavated soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by Departmental Representative before use as fill.
- .2 Coarse washed stones: 35-75mm diameter clean round hard stone.
- .3 Unamended Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous.

- .3 Free of wood and deleterious material which could prohibit growth.
- .4 Shredded minimum particle size: 5mm.
- .5 To have a natural pH and is not to be amended with lime.
- .4 Fertilizer:
 - .1 To Canada Fertilizer Act and Fertilizers Regulations.
 - .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.
 - .3 Mycorrhizae to be applied during planting operations. Use as directed by Departmental Representative, according to manufacturer's instructions.
- .5 Filter Cloth:
 - .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m²mass.
 - .2 Type 2: biodegradable burlap.
- .6 Wood posts: 38 x 89x 2400 mm length, untreated wood.
- .7 Welded wire fabric (WWF): 100 x 100 mm.
- .8 Board Cladding: to consist of 50 x 100 mm lumber secured around the perimeter of tree trunks with plastic strapping or other means which will not damage the tree.
- .9 Tree Barriers: steel T-rail posts 40 x 40 x 5 x 2440 mm, at 1800 mm o.c., with plastic snow fencing attached to posts with 9 gauge wire, 13 per post.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for tree and shrub preservation installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 IDENTIFICATION AND PROTECTION

- .1 Tree protection to be installed prior to the start of any on site work.
- .2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.
- .3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

- .4 Ensure no root pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 TRUNK PROTECTION

- .1 Install board cladding vertically around the perimeter of designated deciduous trees within the active work zone.

3.4 ROOT CURTAIN SYSTEM

- .1 Identify limits for required construction excavation as approved by Departmental Representative.
- .2 Prior to construction excavation, dig trench minimum 500 mm wide x 1500mm deep, along perimeter of excavation limits.
- .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
- .4 Install wooden posts and welded wire fabric against construction edge of trench.
- .5 Securely attach Type 2 filter fabric on plant side of wire mesh.
- .6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
 - .1 Add organic matter to mixture to achieve 10% organic matter content by weight.
- .7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.
- .8 Protect root curtain from damage during construction operations.
- .9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
- .10 Remove root curtain before backfill operations.

3.5 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

- .1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.
- .4 Minimum acceptable depth to top of tunnel: 1000 mm.
- .5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

3.6 LOWERING GRADE AROUND EXISTING TREE

- .1 Begin Work in accordance with schedule approved by Departmental Representative.
- .2 Cut slope not less than 500 mm from tree trunk to new grade level.
- .3 Excavate to depths as indicated. Protect root zone designated to remain from damage.
- .4 When severing roots at excavation level, cut roots with clean, sharp tools.
- .5 Cultivate excavated surface manually to 15 mm depth.
- .6 Prepare homogeneous soil mixture consisting by volume of:
 - .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
 - .2 25% coarse, clean sterile sand.
 - .3 15% organic matter.
 - .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m³.
- .7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.
- .8 Water entire root zone to optimum soil moisture level.

3.7 PRUNING

- .1 Prune in accordance with Section 32 93 43.01- Tree Pruning.
- .2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through mulching or composting.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 Aggregates Materials
- .2 Section 32 15 40 Crushed Stone Surfacing.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C136-13, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Colored Concrete.
- .2 CSA Group
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A179- 04 (R2009), Mortar and Grout for Unit Masonry.
 - .3 CSA A231.1/A231.2-06 (R2010), Precast Concrete Paving Slabs/Precast Concrete Pavers.
 - .4 CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for precast concrete unit paving and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of BC, Canada.
 - .2 Indicate on drawings layout, pattern and relationship of paving joints to fixtures and project formed details.
- .4 Samples:
 - .1 Submit full size sample of each type of pavers.
- .5 Test and Evaluation Reports:
 - .1 Submit following sampling and testing data:
 - .1 Sieve analysis for gradation of bedding and joint material.
 - .2 Unit paver sampling and testing.
 - .3 Evaluation of sealing compound.

- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in precast concrete paver installations with 5 years of documented experience.
- .2 Mock-ups:
 - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct 3 x 3m area mock-up.
 - .3 Mock-up will be used:
 - .1 To judge quality of work, substrate preparation, operation of equipment and material application.
 - .2 To determine surcharge of bedding layer, joint sizes, lines, laying pattern, colours and texture.
 - .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. Remove mock-up and dispose of materials when no longer required and when directed by Departmental Representative Approved mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect precast concrete units from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 CONCRETE PAVERS

- .1 Concrete pavers: to CSA A23.1/A23.2 and as follows:
 - .1 Size: mix of 600mm (Type 1) and 40mm (Type 2) length units, 100 mm wide.
 - .2 Shape: elongated rectangle.
 - .3 Colour: Granite.
 - .4 Standard end, corner, border units as required.
- .2 Pigment in concrete pavers: to ASTM C979/C979M.

2.2 BEDDING AND JOINT MATERIAL

- .1 Determine bedding sand hardness as follows:
 - .1 Randomly select single 1.4 kg sample from sand source.
 - .2 Dry sample for 24 hours at 115 degrees C to 121degrees C.
 - .3 Obtain 3 sub-samples each weighing 0.2kg by passing original sample several times through riffle box.
 - .4 Carry out sieve analysis test on each sub-sample in accordance with CSA A23.1/A23.2.
- .2 Remix each sub-sample and place in nominal litre capacity porcelain jar with two 25 mm diameter steel ball bearings weighing 75+/-5 g each. Rotate each jar at 50 rpm for six 6 hours. Repeat sieve analysis. Record individual and average sieve analysis.
- .3 For each sample tested, maximum increase in percentages passing each sieve and maximum individual percent passing is in accordance with table as follows:

Sieve Size	Maximum Increase	Maximum Passing
0.075 mm	2%	2%
0.150 mm	5%	15%
0.300 mm	5%	35%

- .4 Bedding and joint sand: clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock or gravel. Do not use limestone screenings or stone dust.
- .5 Gradation: to CSA A23.1/A23.2, Table 4 - Grading Limits for Fine Aggregate, and CAN/CSA-A179 as follows:

Sieve Designation	% Passing for Bedding Sand	Joint Sand
10 mm	100	
5 mm	95-100	100
2.5 mm	80-100	95-100
1.25 mm	50-90	60-100

630 microns	25-65	
600 microns	35-80	
315 microns	10-35	
300 microns	15-20	
160 microns	2-10	
150 microns	2-15	

2.3 EDGE RESTRAINTS

- .1 Edge restraints shall be concrete.

2.4 CLEANING COMPOUND

- .1 Clear, organic solvent, designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.
- .2 Acid based chemical detergent, designed and recommended by manufacturer for removal of contamination encountered on pavers.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for precast concrete unit paving installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 STRUCTURAL SURFACE

- .1 Verify that structural surfaces conform to levels and compaction required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3m straightedge.
- .3 Ensure that structural surface is not frozen or standing water is present during installation.

3.3 STRUCTURAL CURBS

- .1 Verify that structural curbs conform to elevations and alignments required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

3.4 PLACING OF BEDDING MATERIAL

- .1 Ensure bedding material is not saturated or frozen at all times until installation is complete.
- .2 Spread and screed material on structural surface to achieve 25mm compacted thickness after vibrating pavers in place. Do not use joint sand for bedding sand.
- .3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

3.5 INSTALLATION OF CONCRETE PAVERS

- .1 Lay pavers to pattern indicated. Joints between pavers: as recommended by manufacturer.
- .2 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures.
- .3 Installation by mechanical equipment:
 - .1 Prepare installation sequence and obtain approval of sequence by Departmental Representative.
 - .2 Place paver pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.
 - .3 Run equipment approved for installation only on paving surfaces vibrated in place.
 - .4 Complete installation after placing each 5 m width of installation.
 - .5 Inspect pavers and remove chipped, broken or otherwise damaged pavers if structural performance or aesthetics is adversely compromised or as directed by Departmental Representative.
 - .6 Replace pavers removed without altering layout and structural quality.
- .4 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.
- .5 Inspect, remove, and replace chipped, broken and damaged pavers.
- .6 Sweep dry joint sand material into joints.
- .7 Settle sand by vibrating pavers with plate compactor.
- .8 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.
- .9 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.
- .10 Sweep off excess joint material when installation is complete.
- .11 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.
- .12 Final surface elevations not to exceed plus or minus 10 mm under 3m long straightedge.
- .13 Surface elevation of pavers: 3 to 4 mm above adjacent drainage inlets, concrete collars or channels.

- .14 Ensure conformance of final elevations.

3.6 PRECAST CONCRETE UNIT CLEANING

- .1 Carry out cleaning at times and conditions recommended by manufacturer of cleaning compound, and as directed by Departmental Representative.
- .2 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.
- .3 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.
- .4 Final surface to be free of contamination.

3.7 FIELD QUALITY CONTROL

- .1 Retain concrete testing laboratory accredited in accordance with CSA A283.
- .2 Sample and test in accordance CSA A23.1/A23.2.
- .3 Do sampling and testing for each 5,000 square metres of material on site, as directed by Departmental Representative.
- .4 Departmental Representative will select 10 pavers for testing from material on site for each sampling.
- .5 Submit test results to Departmental Representative for approval of precast concrete pavers.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 Aggregate Materials
- .2 Section 31 23 33.01 Excavation, Trenching and Backfill
- .3 Section 32 14 13 Precast Concrete Unit Pavers

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM D4318-05, Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - .4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Store crushed stone as and where directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Granular base: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

- .1 Crushed stone or gravel: hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Gradations: within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.
- .3 Table:

Sieve Designation	% Passing
19 mm	100
12.5 mm	70-100
4.75 mm	40-70
2.00 mm	23-50
0.425 mm	7-25
0.075 mm	3-8

- .4 Liquid limit: ASTM D4318 maximum 25.
- .5 Plasticity index: ASTM D4318 maximum 6.
- .2 Granular topping:
 - .1 Screenings: crushed or decomposed granite particles, free from organics or other deleterious materials.
 - .2 Gradations: within limits specified when tested to ASTM C136.
 - .3 Table:

Sieve Designation	% Passing
9.5 mm	100
4.75 mm	50-100
2.00 mm	30-65
0.425 mm	10-30
0.075 mm	5-10

- .3 Edging: plywood strip edger as indicated on plans.
- .4 Geotextile filter: Nonwoven soil separator in accordance with Section 31 31 19.16.

Part 3 Execution

3.1 SUBGRADE

- .1 Ensure subgrade preparation conforms to levels and compaction required, to allow for installation of granular base.

3.2 GEOTEXTILE FILTER

- .1 Install geotextile filter as indicated Section 31 32 19.16 - Geotextile soil stabilization.

3.3 GRANULAR BASE

- .1 Granular base material thickness: as indicated.
- .2 Spread and compact granular base material in uniform layers not exceeding 100 mm compacted thickness.

- .3 Compact to a density of not less than 95% Standard Density in accordance with ASTM D698.

3.4 EDGING

- .1 Install edging true to grade, in location, layout as indicated.

3.5 GRANULAR TOPPING

- .1 Place granular topping to compacted thickness as indicated.
- .2 Place material in uniform layers not to exceed 75 mm compacted thickness.
 - .1 Compact layer to 95% Standard Density in accordance with ASTM D698.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of crushed stone paving: carried out by designated testing laboratory.
- .2 Costs of tests: paid by Contractor.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

- .1 Prevent damage to landscaping, fences, paving and adjacent property.
 - .1 Repair damages incurred.
- .2 Provide access to building at all times. Co-ordinate paving schedule to minimize interference with normal use of premises.

END OF SECTION

Part General

1.1 RELATED REQUIREMENTS

- Section 03 30 00 Cast-in-place Concrete
- Section 31 00 00.01 Earthwork

1.2 REFERENCES

- .1 ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- .2 ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
- .3 ASTM D523 - Test Method for Specular Gloss.
- .4 ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- .5 ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- .6 ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- .7 ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- .8 ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Maintenance Instructions.
 - .2 Storage and handling requirements and recommendations.
 - .3 Installation instructions.
- .3 Shop Drawings:
 - .1 Submit drawings in accordance with Section 01 33 00.

1.4 QUALITY ASSURANCE

- .1 Manufacturer Qualifications:
 - .1 Manufacturing and installation of fencing for at least 10 years.
- .2 Product Support:
 - .1 Products are supported with CAD drawings.
 - .2 Warranty documentation is provided.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in manufacturer's original packaging, with order information and shipping documents.
- .2 Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling.
- .3 Store products in manufacturer's original packaging in a clean, dry environment until ready to be installed.
- .4 Protect materials against damage, vandalism, weather and theft.
- .3 Handle products in accordance with manufacturer's instructions.

1.5 WARRANTY

- .1 Provide manufacturer's standard warranty.
 - .1 Products will be free from defects in components, standard finishes or workmanship for a period of five (5) years from date of manufacture.

Part 2 Products

2.1 ALUMINUM FENCING AND GATES

- .1 Fencing will extend and therefore is to match the existing perimeter fencing currently installed at the adjacent "God's Acre Cemetery" site.

2.2 MATERIALS

- .1 Aluminum material for fence framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221.
- .2 Aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T52.
- .3 Aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T52.
- .3 Pickets shall be 19mm (3/4") square x 1.43mm (.045") thick.
- .4 Horizontal rails shall be 31.75mm x 36.5mm (1-1/4" x 1-7/16") channel with 15.24mm (.060") thick top & internal web wall, and 22.86mm (.090") thick side walls and shall be punched to allow picket to pass through the top of the rail.
- .5 Rails shall be constructed with an internal web insert providing a raceway for the pickets to be retained with a 1/8" retaining rod.

2.3 ACCESSORIES

- .1 Aluminum castings shall be used for all post caps, scrolls, finials, and other miscellaneous hardware.
- .2 Hinges and latches shall be fabricated from aluminum, stainless steel or composite materials.

2.3 FABRICATION

- .1 Pickets, rails and posts shall be pre-cut to specified lengths.

- .2 Rails shall be pre-punched to accept pickets.
- .3 Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal upper raceway of the rails.
- .3 Retaining rods shall be inserted into each rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.
- .4 Topcoat shall be a polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm).

.1 Finish:

- .1 Framework shall be subjected to the manufacturer's thermal stratification coating process including a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish a minimum thickness of 2-4 mils.
- .2 Colour shall be black.

.2 Performance

- .1 Completed panels shall be capable of supporting a 200 lb. load (applied at midspan) without permanent deformation. Panels without rings shall be biasable to a 12.5% change in grade.

.3 Gates

- .1 Swing gates shall be fabricated using 1-1/4" x 1-7/16" Forerunner rail, 1.75" sq. x .125" gate ends, and 3/4" sq. x .080 pickets.
- .2 Gates that exceed 1828mm in width will have a 45mm x 31.75mm (1.75" sq. x .125") intermediate upright.
- .3 All rail and upright intersections shall be joined by welding.
- .4 All picket and rail intersections shall also be joined by welding.

Part 3 Execution

.1 Installation

- .1 Preparation
 - .1 All new installation shall be laid out by the contractor in accordance with the construction plans.

.2 Fence Installation

- .1 Fence panels shall be attached to posts with brackets supplied by the manufacturer.

- .2 Posts shall be set in concrete footers (800mm depth recommended).
- .3 When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces.
- .4 Remove all metal shavings from cut area.
- .5 Apply custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1 & 2 above will negate warranty.

.3 Gate Installation

- .1 Gate posts shall be spaced according to the manufacturers' gate drawings.
- .2 Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles.
- .3 Gate drawings shall identify the necessary gate hardware required for the application.
- .4 Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

.5 Cleaning

- .1 The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from post

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 14 13 Topsoil stripping and stockpiling
- .2 Section 32 93 10 Trees, Shrubs and Groundcover Planting

1.2 PAYMENT

- .1 Testing of topsoil: Testing of topsoil, Contractor to pay the cost.

1.3 REFERENCE STANDARDS

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
 - .1 PN1340- 2005, Guidelines for Compost Quality.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth and contain no toxic or growth inhibiting contaminants.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

- .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 TOPSOIL

- .1 Topsoil for planting beds: mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 25 % sand, minimum 7 % clay, and contain 15 to 25% organic matter by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .6 Ph value: 6.0 to 7.0.
- .2 Peat moss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to course textured.
- .4 Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Limestone:
 - .1 Ground agricultural limestone.

- .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .6 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of manufactured topsoil or topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2 m.
- .4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as directed by Departmental Representative.
- .5 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.

- .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than 50 mm above surface.
 - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 150 mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement.
 - .1 135 mm for sodded areas.
 - .2 500 mm for shrub and flower beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

- .1 For planting beds, apply and thoroughly mix soil amendments into full specified depth of topsoil at following rates:
 - .1 Compost. 1000 m² of existing soil 100 m³ of topsoil

3.6 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
 - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.7 ACCEPTANCE

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.8 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required off site where directed by [Departmental Representative.

3.9 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .1 Section 32 91 19.13 - Topsoil Placement and Grading.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule sod laying to coincide with preparation of soil surface.
 - .2 Schedule sod installation when frost is not present in ground.
 - .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 19 - Project Meetings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sod and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples.
 - .1 Submit:
 - .1 Sod for each type specified.
 - .1 Install approved samples in 1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
 - .2 0.5 kg container of each type of fertilizer used.
 - .2 Obtain approval of samples by Consultant and Departmental Representative.
 - .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.
 - .5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Landscape Contractor: to be a Member in Good Standing of BCLNA (BC Landscape and Nursery Association).

- .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
- .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with supplier's recommendations.
 - .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return of pallets as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
 - .2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivar[s].
 - .3 Number One Named Cultivars: Nursery Sod grown from certified seed.
 - .2 Turf Grass Nursery Sod quality:
 - .1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
 - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
 - .3 Mowing height limit: 35 to 65 mm.
 - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Water:

- .1 Supplied by Departmental Representative at designated source.
- .3 Fertilizer:
 - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.
 - .2 Complete, synthetic, slow release with 65% of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL

- .1 Obtain written approval from Departmental Representative or Consultant of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Consultant or Departmental Representative.

Part 3 Execution

3.1 INSTALLERS

- .1 Use installers who are Member in Good Standing of BCLNA.

3.2 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sod installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 25 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site as directed by Departmental Representative in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

3.4 SOD PLACEMENT

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.

- .2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Roll sod as directed by Consultant or Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.5 FERTILIZING PROGRAM

- .1 Fertilize monthly during establishment and warranty periods with slow release turf fertilizer, applied at a rate of 500 g N per 100 m².

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Clean and reinstate areas affected by Work.
- .3 Waste Management: separate waste materials for recycling by composting in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling and compost containers and bins from site and dispose of materials at appropriate facility.
 - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.

3.7 PROTECTION BARRIERS

- .1 Protect newly sodded areas from deterioration with snow fence on rigid frame as directed by Departmental Representative.
- .2 Remove protection 2 weeks after installation, after inspection, as directed by Departmental Representative.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of installation until acceptance.
 - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
 - .2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.
 - .3 Maintain sodded areas weed free 100%.
 - .4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
 - .5 Temporary barriers or signage where required to protect newly established sod.

3.9 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative or Consultant provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.
 - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.
- .4 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.10 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
- .2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.
- .3 Cut grass and remove clippings that will smother grass as directed by Consultant or Departmental Representative to height as follows:
 - .1 Turf Grass Nursery Sod:
 - .1 50 mm during normal growing conditions.
 - .2 Cut grass at 2 week intervals or as directed by Departmental Representative but at intervals so that approximately one third of growth is removed in single cut.
 - .3 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
 - .4 Eliminate weeds by mechanical means to extent acceptable to Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 91 19.13 Topsoil Placement and Grading

1.2 REFERENCE STANDARDS

- .1 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA)
 - .1 Canadian Standards for Nursery Stock-2006.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

- .1 Mycorrhiza: fungal organisms that live in association with roots of plants and can enhance plant establishment in imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling: obtain approval from Consultant and Departmental Representative of schedule 10 days in advance of shipment of plant material.
- .2 Schedule to include:
 - .1 Quantity and type of plant material.
 - .2 Shipping dates.
 - .3 Arrival dates on site.
 - .4 Planting Dates.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for trees, shrubs, groundcover, fertilizer, mycorrhiza, anchoring equipment, and mulch, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.
 - .2 Construction Waste Management:

- .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Landscape Contractor: to be a Member in Good Standing of the BCLNA (BC Landscape and Nursery Association).
 - .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
 - .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
 - .2 Protect plant material from damage during transportation:
 - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
 - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
 - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .3 Storage and Handling Requirements:
 - .1 Immediately store and protect plant material which will not be installed within 8 hours in accordance with supplier's written recommendations and after arrival at site in storage location approved by Consultant and Departmental Representative.
 - .2 Protect stored plant material from frost, wind and sun and as follows:
 - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
 - .2 For pots and containers, maintain moisture level in containers. Heel-in fibre pots.
 - .3 For balled-and-burlap and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
 - .3 Store and manage hazardous materials in accordance with manufacturer's written instructions.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

- .5 Packaging Waste Management: remove for reuse and return of pallets, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.8 WARRANTY

- .1 For plant material over 75 mm caliper, the 12 months warranty period is extended to 24 months.
- .2 Contractor hereby warrants that plant material over 75 mm caliper will remain free of defects in accordance with General Conditions but for 1 full growing season, providing adequate maintenance has been provided.
- .3 End-of-warranty inspection will be conducted by Consultant.
- .4 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

Part 2 Products

2.1 PLANT MATERIAL

- .1 Type of root preparation, sizing, grading and quality: comply with Canadian Standards for Nursery Stock.
 - .1 Source of plant material: grown in Zone 8 (or cooler).
 - .2 Plant material must be planted in zone specified as appropriate for its species.
 - .3 Plant material in location appropriate for its species.
- .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .3 Trees: with straight trunks, well and characteristically branched for species.
- .4 Bare root stock: nursery grown, in dormant stage, not balled-and-burlapped or container grown.
- .5 Collected stock: maximum 40 mm in caliper, with well-developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.
 - .1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.
 - .2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER

- .1 Free of impurities that would inhibit plant growth.

2.3 STAKES

- .1 Wood, pointed one end, 38 x 38 x 2300mm.

- 2.4 WIRE TIGHTENER**
- .1 Type 1: galvanized steel, stamped plate type.
 - .2 Type 2: turnbuckle, galvanized steel, 9.5 mm diameter with 270 mm open length.
- 2.5 GUYING WIRE**
- .1 Type 1: steel, 3 mm wire.
 - .2 Type 2: 1.5 mm diameter multi-wire steel cable.
 - .3 Type 3: 3 mm diameter multi-wire steel cable.
- 2.6 CLAMPS**
- .1 U-bolt: galvanized, 13 mm diameter, c/w curved retaining bar and hex nuts.
 - .2 Crimp type.
- 2.7 ANCHORS**
- .1 Wood:
 - .1 Type 1: 38 x 38 x 460 mm.
 - .2 Type 2: 38 x 67 x 600 mm.
 - .2 Drive-in type:
 - .1 Type 1: 13 mm diameter x 75 mm long.
 - .2 Type 2: 18 mm diameter x 120 mm long.
 - .3 Screw-in type:
 - .1 Type 1: 100 mm diameter steel disc.
- 2.8 GUYING COLLAR**
- .1 Tube: plastic, 13 mm diameter, nylon reinforced.
- 2.9 TRUNK PROTECTION**
- .1 Plastic: perforated spiralled strip.
- 2.10 MULCH**
- .1 Bark chip: varying in size from 25 to 50 mm in diameter, from bark of coniferous trees harvested on-site.
 - .2 Wood chip: varying in size from 50 mm to 65 mm and 5 to 15 mm thick, free of bark, small branches and leaves, from trees harvested on-site.
 - .3 Compost: 100% organic compost mulch, from municipal composting operations.
- 2.11 SOURCE QUALITY CONTROL**
- .1 Obtain approval from Consultant and Departmental Representative of plant material prior to planting.

- .2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for planting installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant and Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PRE-PLANTING PREPARATION

- .1 Proceed only after receipt of written acceptability of plant material from Consultant.
- .2 Remove damaged roots and branches from plant material.
- .3 Locate and protect utility lines.
- .4 Notify and acquire written acknowledgement from utility authorities before beginning excavation of planting pits for trees and shrubs.
- .5 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Establishment of sub-grade for planting beds in accordance with Section 31 22 13 - Rough Grading.
- .2 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .3 For individual planting holes:
 - .1 Stake out location and obtain approval from Departmental Representative prior to excavating.

- .2 Excavate to depth and width as indicated.
- .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
- .4 Scarify sides of planting hole.
- .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.4 PLANTING

- .1 For bare root stock, place 50 mm backfill soil in bottom of hole.
 - .1 Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
 - .1 Do not pull burlap or rope from under root ball.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated.
 - .1 Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:
 - .1 Backfill soil in 150 mm lifts.
 - .1 Tamp each lift to eliminate air pockets.
 - .2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
 - .3 After water has penetrated into soil, backfill to finish grade.
 - .2 Form watering saucer as indicated.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.
- .8 After soil settlement has occurred, fill with soil to finish grade.

3.5 TRUNK PROTECTION

- .1 Install trunk protection on deciduous trees as indicated.
- .2 Install trunk protection before installation of tree supports.

3.6 TREE SUPPORTS

- .1 Install tree supports as indicated.
- .2 Use single stake tree support for deciduous trees less than 3 m in height and evergreens less than 2 m in height.
 - .1 Place stake on prevailing wind side and 300 mm minimum from trunk.

- .2 Drive stake 200 mm minimum into undisturbed soil beneath roots.
 - .1 Ensure stake is secure, vertical and unsplit.
- .3 Install 150 mm long guying collar 1500 mm above grade.
- .4 Thread Type 1 guying wire through guying collar tube.
 - .1 Twist wire to form collar and secure firmly to stake. Cut off excess wire.
- .3 Use 3 guy wires and anchors for deciduous trees greater than 3 m in height and evergreens greater than 2 m in height.
 - .1 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
 - .2 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.
 - .3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
 - .4 Guying collars to be of sufficient length to encircle tree plus 100 mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
 - .5 Install anchors at equal intervals about tree and away from trunk so guy wire will form 45 degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
 - .6 Attach guy wire to anchors. Tension wire and secure by installing clamps.
 - .7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
 - .8 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by Departmental Representative.
- .4 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.7 MULCHING

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
 - .2 Remove weeds monthly.
 - .3 Replace or respread damaged, missing or disturbed mulch.

- .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
- .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
- .6 Remove dead or broken branches from plant material.
- .7 Keep trunk protection and guy wires in proper repair and adjustment.
- .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.9 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative and Consultant to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Reform damaged watering saucers.
 - .3 Remove weeds monthly.
 - .4 Replace or respread damaged, missing or disturbed mulch.
 - .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
 - .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
 - .7 Apply fertilizer in early spring as indicated by soil test.
 - .8 Remove dead, broken or hazardous branches from plant material.
 - .9 Keep trunk protection and tree supports in proper repair and adjustment.
 - .10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
 - .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
 - .12 Submit monthly written reports to Departmental Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

- .3 Waste Management: separate waste materials for recycling or reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Divert discarded burlap, wire and plastic plant containers materials from landfill to plastic recycling facility approved by Departmental Representative.
 - .3 Dispose of unused fertilizer at official hazardous material collection site approved by Departmental Representative.
 - .4 Divert unused wood and mulch materials from landfill to composting facility approved by Departmental Representative.

3.11

CLOSEOUT ACTIVITIES

- .1 Submit maintenance reports for trees, shrubs, and other plantings.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 01 90.033 Tree and Shrub Preservation
- .2 Section 32 93 10 Trees, Shrubs and Groundcover Planting

1.2 REFERENCES

- .1 American National Standard Institute (ANSI)
 - .1 ANSI A300 (Part 1)-2001, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (revision and re-designation of ANSI A300-1995) (includes supplements).
 - .2 ANSI A300 (Part 2)-1998, Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization.
 - .3 ANSI A300 (Part 3)-2000, Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - Tree Support Systems (a. Cabling, Bracing, and Guying) (supplement to ANSI A300-1995).
- .2 Canadian Nursery Landscape Association (CNLA)
- .3 International Society of Arboriculture (ISA)
- .4 Ontario Ministry of Agriculture, Food and Rural Affairs
 - .1 Publication 483-2004 Pruning Ornamentals.

1.3 DEFINITIONS

- .1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.
- .2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.
- .3 Crown Raising: consists of removal of lower tree branches to provide clearance.
- .4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.
- .5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.
- .6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.4 QUALITY ASSURANCE

- .1 Certification: provide International Society of Arboriculture certification.
- .2 Regulatory requirements: provide safety certificate as approved by local hydro utility.
- .3 Field Samples: do sample pruning in manner to enable Consultant to identify:
 - .1 Knowledge of target areas including branch bark ridge and branch collars.

- .2 Technique for selection process and pruning used to establish desired form and shape for each species.
- .4 Acceptance of Work will be determined by Consultant from field sample.
- .5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33.10 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Divert wood materials from landfill to facility for composting as directed by Departmental Representative.

1.6 TOOL MAINTENANCE

- .1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.
- .2 Disinfect tools before each tree is pruned.
- .3 On diseased plant material disinfect tools before each cut.

Part 2 Products

2.1 DISINFECTANT

- .1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

Part 3 Execution

3.1 APPLICATION

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

3.2 GENERAL

- .1 Prune in accordance with ANSI A300, and as directed by Consultant. Where discrepancies occur between standard and specifications, specifications govern.
- .2 Notify immediately Consultant of conditions detrimental to health of plant material or operations.

- .3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.
- .4 Do not prune Oak (*Quercus* sp.) when in full leaf.
- .5 Retain natural form and shape of plant species.
- .6 Do not:
 - .1 Flush cut branches.
 - .2 Crush or tear bark.
 - .3 Cut behind branch bark ridge.
 - .4 Damage branch collars.
 - .5 Damage branches to remain.

3.3 PRUNING

- .1 Remove dead, dying, diseased and weak growth from plant material to provide crown reduction, crown thinning, crown restoration, vista pruning, crown raising and crown cleaning, as directed by Consultant.
- .2 Remove live branches that:
 - .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
 - .2 Are of weak structure including narrow crotches.
 - .3 Obstruct development of more important branches.
 - .4 Are broken.
- .3 Remove live branches to re-establish natural species form including:
 - .1 One or more developing leaders.
 - .2 Multiple growth due to previous topping.
 - .3 Branches extending outward from natural form.
 - .4 Undesirable sucker growth.
- .4 Remove loose branches, twigs and other debris lodged in tree.
- .5 Remove vines, notably English Ivy, from all trees.
- .6 For branches under 50 mm in diameter:
 - .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
 - .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
 - .3 Do not cut lead branches unless directed by Consultant.
- .7 For branches greater than 50 mm in diameter:
 - .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.

- .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
- .3 Make final cut adjacent to and outside branch collar.
- .8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.
- .1 Repair areas which are damaged, or remove damaged area back to next branch collar.
- .9 Remove additional growth designated by Departmental Representative.

3.4 ROOT GIRDLING

- .1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.
- .2 Remove exposed portion of girdling root as directed by Consultant after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

- .1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEAN-UP

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Collect and compost/recycle whenever applicable and dispose of pruned material daily.
- .3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 Aggregate Materials
- .2 Section 31 23 33.01 Excavation trenching and Backfilling

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³(600 kN-m/m³)).
- .2 CSA International
 - .1 CSA B1800-[11], Thermoplastic Non-Pressure Pipe Compendium (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8, B182.11 and B182.13).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for drainage products and materials, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect drainage material from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 19 - Waste Management and Disposal.

1.5 SITE CONDITIONS

- .1 **Examine sub-surface investigation report, which is bound into Project Manual in the Appendices.**
- .2 Known underground utility lines and buried objects are as indicated on plans.

Part 2 Products

2.1 BEDDING AND SURROUND MATERIALS

- .1 Coarse filter aggregate: to in accordance with Section 31 05 16 - Aggregate Materials.
- .2 Fine filter aggregate: to in accordance with Section 31 05 16 - Aggregate Materials.
- .3 Flexible plastic tubing and fittings: corrugated, perforated nominal inside diameter 100 mm.
- .4 Rigid plastic pipe to CSA B182.2.
- .5 Plastic (UV stabilized HDPE) fittings to CSA B182.2.
- .6 Geotextile filter: see Section 31 32 19.16- Geotextile soil stabilization.
- .7 Prefabricated drainage system with long term flow capacity of 12.5mm of head: 25.15 GPM; 25mm of head: 35.56 GPM.

2.2 BACKFILL MATERIAL

- .1 Type 2, in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .2 Excavated or graded material existing on site may be suitable to use if approved by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for drainage materials installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- .2 Make sure graded base and subgrade conforms to required drainage pattern before placing bedding material.
- .3 Make sure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of Departmental Representative.

- .4 Make sure foundation wall has been installed and approved by Departmental Representative before placing bedding material.

3.2 BEDDING PREPARATION

- .1 Cut trenches in base and place bedding material in uniform layer not exceeding 150mm compacted thickness.
- .2 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe and related drainage system fittings.
- .3 Shape transverse depressions, as required, to suit joints.
- .4 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.
- .5 Fill excavation below design elevation of bottom of specified bedding with common backfill.

3.3 PIPE OR TUBING INSTALLATION

- .1 Make sure pipe interior and coupling surfaces are clean before laying.
- .2 Lay perforated pipe as indicated. Place pipe and fittings perforations and coupling slots downward.
- .3 Grade bedding to establish pipe slope.
- .4 Install end plugs at ends of collector drains to protect pipe ends from damage and ingress of foreign material.
- .5 Provide flush cleanouts where directed by Departmental Representative.

3.4 PIPE OR TUBING SURROUND MATERIAL

- .1 Upon completion of pipe laying and after Departmental Representative has inspected and approved Work in place, surround and cover pipe as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness, as indicated. Do not drop material within pipe or drainage system fittings.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Compact each layer from pipe invert to mid-height of pipe to at least 95% maximum density to ASTM D698.
- .5 Compact each layer from mid-height of pipe to underside of backfill to at least 90% maximum density to ASTM D698.
- .6 Place low strength unshrinkable fill where compaction cannot be achieved using mechanical methods.

3.5 BACKFILL MATERIAL

- .1 Place backfill material above pipe surround in uniform layers not exceeding 150mm compacted thickness.
- .2 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698. In other areas, compact to at least 90% maximum density to ASTM D698.

- .3 Use appropriate compaction equipment.
 - .1 Conduct hand tamping around confined areas of pipe.
 - .2 Do not use water or other hydraulic means to place or consolidate backfill material.

3.6 FOUNDATION

- .1 Make penetrations through foundation structures only after receipt of written approval from Departmental Representative.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning].
- .3 Waste Management: separate waste materials for recycling or reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION



PRELIMINARY HAZARD ASSESSMENT FORM

Project Number:	
Location:	
Date:	
Name of Departmental Representative:	
Name of Client:	
Name of Client Project Co-ordinator	PH: ()- -

Site Specific Orientation Provided at Project Location Yes No

Notice of Project Required Yes No

NOTE:

PWGSC requires "**A Notice of Project**" for all construction work related activities.

NOTE:

OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PWGSC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PWGSC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
	PWGSC, OGD's, or tenants		General Public or other contractors		
	Yes	No	Yes	No	
<p>Examples: Chemical, Biological, Natural, Physical, and Ergonomic</p> <p>Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.</p>					<p>Note: When thinking about this pre-construction hazard assessment, remember a hazard is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the risk is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.</p>

Typical Construction Hazards

Concealed/Buried Services (electrical, gas, water, sewer etc)					
Slip Hazards or Unsound Footing					
Working at Heights					
Working Over or Around Water					
Heavy overhead lifting operations, mobile cranes etc.					
Marine and/or Vehicular Traffic (site vehicles, public vehicles, etc.					



Fire and Explosion Hazards					
High Noise Levels					
Excavations					
Blasting					
Construction Equipment					
Pedestrian Traffic (site personnel, tenants, visitors, public)					
Multiple Employer Worksite					Example : Contractor working in a occupied Federal Employee space.

Electrical Hazards					Comments
Contact With Overhead Wires					
Live Electrical Systems or Equipment					
Other:					
Physical Hazards					
Equipment Slippage Due To Slopes/Ground Conditions					
Earthquake					
Tsunami					
Avalanche					
Forest Fires					
Fire and Explosion Hazards					
Working in Isolation					
Working Alone					
Violence in the Workplace					
High Noise Levels					
Inclement weather					
High Pressure Systems					
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces					Review and provide confined space assessment(s) from PWGSC or client confined space inventories. Refer to PWGSC Standard on Entry into Confined Spaces. Contact the Regional Construction Safety Coordinator.
Suspended / Mobile Work Platforms					
Other:					
Biological Hazards					
Mould Proliferations					
Accumulation of Bird or Bat Guano					
Bacteria / Legionella in Cooling Towers / Process Water					
Rodent / Insect Infestation					
Poisonous Plants					
Sharp or Potentially Infectious Objects in Wastes					



Wildlife					
Chemical Hazards					
Asbestos Materials on Site					If "yes" a pre-project asbestos survey report is required. Provide Contractor with DP - 057 ELF Form 16 "Contractor Notification and Acknowledgement"
Designated Substance Present					If "yes" a pre-project designated substance survey report is required.
Chemicals Used in work					
Lead in paint					If "yes" a pre-project lead survey report is required.
Mercury in Thermostats or Switches					If "yes" a pre-project mercury survey report is required.
Application of Chemicals or Pesticides					
PCB Liquids in Electrical Equipment					
Radioactive Materials in Equipment					
Other:					
Contaminated Sites Hazards					
Hazardous Waste					
Hydrocarbons					
Metals					
Other:					

Security Hazards					Comments
Risk of Assault					
Other:					
Other Hazards					

Other Compliance and Permit Requirements ¹	YES	NO	Notes / Comments ²
Is a Building Permit required?			
Is a Electrical permit required?			
Is a Plumbing Permit required?			
Is a Sewage Permit required?			
Is a Dumping Permit required?			
Is a Hot Work Permit required?			
Is a Permit to Work required?			Mandatory for ALL AFD managed work sites.
Is a Confined Space Entry Permit required?			Mandatory
Is a Confined Space Entry Log required?			Mandatory for all Confined Spaces
Discharge Approval for treated water required?			



Notes:

- (1) Does not relieve Service Provider from complying with all applicable federal, provincial, and municipal laws and regulations.
- (2) TBD means To Be Determined by Service Provider.

Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.			
Service Provider Name			
Signatory for Service Provider		Date Signed	
RETURN EXECUTED DOCUMENT TO PWGSC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING			

Environmental Protection Plan (EPP) – Checklist

Note: This checklist was developed to assist the Contractor in determining and mitigating environmental issues at site. It is considered a generic checklist and it is in the Contractor's best interest to review the PWGSC Environmental Effects Evaluation (EEE) and/or the Fish and Fish Habitat Report as supporting documents in the completion of the site Environmental Protection Plan (EPP). Applicable provincial and federal guidelines and regulations should be reviewed prior to submission of the EPP.

EPP Framework	Content Requirements	Yes	No	N/A
Project Setting and Site Activities				
<i>Project Description</i>	A brief description of the project and its location is provided.			
<i>Environmental Sensitivities</i>	Sensitive or protected features that could be impacted as a result of the Contractor's activities are described.			
<i>Site Activities</i>	A scope of work and a list of all construction or related activities to be undertaken during the project are provided.			
Project Schedule and Site Drawings				
<i>Project Schedule</i>	A project schedule is provided, including scheduled shut-downs and restricted work periods due to environmental requirements.			
<i>Site Drawing</i>	One or more site drawings(s) are provided, indicating the site location; site set-up and layout; erosion and sediment controls; in-stream work areas; and environmental sensitivities.			
Potential Environmental Impacts and Controls				
<i>Potential Environmental Issues and Impacts</i>	The potential environmental issues and impacts that may result from the construction activities are described. Environmental Reports (Environmental Effects Evaluation, Environmental Assessments; Fish and Fish Habitat and Compensation Reports, Aquatics Effects Evaluations etc) will be provided to the contractor especially with respect to any in-stream work procedures that will be required. For example, in-stream works will impact fish and fish habitat in the surrounding ecosystem and potentially upstream and downstream of proposed works. It is the Contractor's responsibility to ensure the work is completed in a manner that causes the least impact on the ecosystem (see section on Mitigation).			
<i>Permits, Approvals, and Authorizations</i>	List required permits, approvals and authorizations. As applicable, environmental mitigation measures prescribed by regulatory agencies and included in project permits, approvals and authorizations are described. NOTE: DFO, MOE and NWPA approvals and authorizations for in-stream works are PWGSC's responsibility however, the Contractor must be aware of the requirements of these approvals/authorizations. Permitting for water withdrawal from the water body as part of construction activities is part of the Contractor's responsibility. Scientific Collection Permits such as licences for Fish Salvage Permits are also the responsibility of the Contractor and are obtained by the Contractor's environmental monitor/consultant* who will be completing the salvage.			

Mitigation Strategies	Procedures, controls or best management practices (BMPs) to prevent or reduce adverse impacts on the environment are provided. For example, all work in BC must adhere to the BC MOE "Standards and Best Practices for Instream Works" for those works that are completed below the high water mark. DFO mitigation techniques under the Fisheries Act must also be followed. One useful document that contains information on Ministry of Environment's ecosystems, guidelines and mitigation techniques is from the MOE Ecosystems Branch – Develop With Care 2014 – Environmental Guidelines for Urban and Rural Land Development in BC.			
Erosion and Sediment Control	Erosion and sediment controls are provided, as appropriate for the jurisdiction.			
Waste Management and Hazardous Materials				
Waste Management and Hazardous Materials	Hazardous materials that will be used and/or stored on site are listed. Expected hazardous and non-hazardous waste materials along with proper handling, containment, storage, transportation and disposal methods are listed. As appropriate for the jurisdiction, estimated waste quantities and specific handling procedures are also provided. For example, re-fuelling of equipment will be conducted at least 30m away from any active drainage courses.			
EPP Implementation				
Site Representative	Name(s) and contact details for the person(s) who will be the Contractor's Site Representative(s) are provided.			
Training and Communication	Training and communication details are provided.			
Monitoring and Reporting	Monitoring and inspection procedures, including a schedule of monitoring activities and reporting procedures are provided. For example, this would include downstream monitoring activities for increased siltation during in-stream works.			
Documentation	Information and/or records that will be maintained relating to the EPP and end environmental matters on the project site are described.			
EPP Update	EPP review and update procedures are provided.			
Environmental Emergency Response Procedures				
Environmental Emergency Response Procedures	Potential incidents that may impact the environment are identified, and emergency response procedures to prevent and respond to incidents are provided. An environmental emergency response contact list is also provided.			

***Environmental Monitor/Qualified Professional as recognized by the province:** an applied scientist or technologist specializing in a relevant applied science or technology including, but not necessarily limited to, agronomy, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organization, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.



Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
Canada

Confirmation of Prime Contractor's Main Responsibilities Under the Worksafe B.C. Occupational Health and Safety Regulations and *Worker's Compensation Act*

Name of Project: Alaska Highway KM 742.5 – KM 750.3 HIGHWAY REALIGNMENT

Owner: Crown Owned

Contractor: Cobalt Construction Ltd.

Consulting Engineer: Tetra Tech

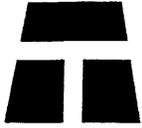
	YES	NO
1. The Contractor acknowledges appointment as Prime Contractor on the construction project noted below	<input type="checkbox"/>	<input type="checkbox"/>
2. The name of the Prime Contractor's Qualified Coordinator of occupational health and safety activities for this project has been submitted to the Owner and is as shown below.	<input type="checkbox"/>	<input type="checkbox"/>
3. The Prime Contractor understands that in any conflict of directions, WCB OH&S Regulations and/or the Worker's Compensation Act shall prevail.	<input type="checkbox"/>	<input type="checkbox"/>
4. The Prime Contractor understands and will direct that all supervisors/coordinators must immediately report any apparent conflict as described above.	<input type="checkbox"/>	<input type="checkbox"/>
5. The Prime Contractor agrees that their supervisor shall immediately notify the consulting Engineer's representative of any reported conflict.	<input type="checkbox"/>	<input type="checkbox"/>
6. The Prime Contractor has requested and received information from the Owner regarding any known hazards to the health and safety of persons pre-existing at the workplace.	<input type="checkbox"/>	<input type="checkbox"/>
7. The Prime Contractor has conducted an inspection of the workplace to verify the presence of any hazards.	<input type="checkbox"/>	<input type="checkbox"/>
8. The Prime Contractor will communicate hazards information to any persons who may be affected and ensure that appropriate measures are taken to effectively control or eliminate the hazards.	<input type="checkbox"/>	<input type="checkbox"/>
9. The Prime Contractor accepts that written documentation such as notes, records, inspections, meeting minutes, etc., on all health and safety issues must be available upon request to the PWGSC departmental representatives and/or to a WCB officer at the workplace.	<input type="checkbox"/>	<input type="checkbox"/>
10. The Prime Contractor will confirm that all workers are suitably trained and competent to perform the duties for which they have been assigned.	<input type="checkbox"/>	<input type="checkbox"/>
11. The Prime Contractor confirms that safety orientation of all new workers will be conducted.	<input type="checkbox"/>	<input type="checkbox"/>
12. The Prime Contractor's written Safety Program has been provided to the Owner's representative.	<input type="checkbox"/>	<input type="checkbox"/>
13. The Prime Contractor confirms that meetings to exchange information on any safety issues, concerns, hazards or safety directives will be conducted weekly or more often if required.	<input type="checkbox"/>	<input type="checkbox"/>
14. The Prime Contractor confirms that before the commencement of work, crews will attend a daily crew safety meeting.	<input type="checkbox"/>	<input type="checkbox"/>
15. The Prime Contractor confirms that their supervisor has assessed and will coordinate the workplace first-aid requirements	<input type="checkbox"/>	<input type="checkbox"/>
16. The Prime Contractor confirms that the procedure to transport injured workers is established	<input type="checkbox"/>	<input type="checkbox"/>

Prime Contractor Representative's Name: _____

Title: _____ Signature: _____ Date: _____

Prime Contractor's OH&S Coordinator Name: _____

Title: _____ Signature: _____ Date: _____



THURBER ENGINEERING LTD.

March 18, 2016

File: 11799

LEES+Associates
The Mercantile Building
#509-318 Homer Street
Vancouver, BC V6B 2V2

Attention: Catriona Hearn

VETERANS CEMETERY EXPANSION ESQUIMALT, BC PRELIMINARY GEOTECHNICAL INVESTIGATION

Dear Catriona:

This letter presents the results of a preliminary geotechnical investigation conducted by Thurber Engineering Ltd. (Thurber) for the proposed expansion at "God's Acre" Veteran's Cemetery in Esquimalt, BC. The scope of work was outlined in our proposal letter dated February 9, 2016, and authorization to proceed with the work was given by you in an e-mail on March 1, 2016.

It is a condition of this letter that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1. PROJECT AND SITE DESCRIPTION

We understand that the current "God's Acre" Veterans Cemetery, located within the Gorge Vale Golf Course, is to be expanded in the western direction. The expansion will include a foot path, a paved area with large columbaria plus other columbaria scattered along the footpath, shallow/in-ground cremation burial lots and perimeter fencing. Currently the site is heavily vegetated with brush and trees. We understand that healthy native vegetation (i.e. Douglas Fir and Garry Oak trees) will be retained as much as possible.

A test pit investigation using an excavator or backhoe was initially planned for the proposed site; however, due to the site access and wet conditions at the time of the investigation, a hand auger/probing investigation was completed instead.

2. INVESTIGATION

A Thurber field engineer and an arborist from Gye+Associates carried out a field investigation at the proposed expansion site on March 8, 2016. Prior to commencement of the field program, BC One Call was notified to identify utilities in the vicinity of the investigation area.

The field investigation consisted of three components:

- Locating visible bedrock outcrops within the site.
- Hand auger holes (HA16-1 to HA16-5).



- Hand probe holes (PH16-1 to PH16-9).

The bedrock outcrops visible on-site during the investigation were located relative to the surveyed tree locations. The approximate bedrock outcrop locations are shown on Drawing 11799-1 in the Appendix.

The hand auger holes were completed using 60 mm diameter hand augering equipment. Refusal depth was confirmed by driving a one inch (25 mm) pry bar at the base of the hole with a three pound sledge hammer until little advancement/no advancement was encountered. The hand auger holes were backfilled with excavated material and staked.

The hand probe holes were completed using a three foot (0.3 m) long, half inch (13 mm) diameter, steel rod and advanced into the ground using a three pound sledge hammer until little advancement/no advancement was encountered. The hand probe holes were staked after completion.

The approximate locations of the hand auger/probe holes were determined by measuring off-sets from known points and are shown on Drawing 11799-1 in the Appendix.

Disturbed samples were obtained at selected depths from the hand auger holes. All samples were returned to Thurber's Victoria laboratory where visual identification and moisture content tests were conducted. The results of the field and laboratory investigations were used to compile the soil logs which are also included in the Appendix.

No environmental sampling or testing was undertaken for this investigation.

3. SUBSURFACE CONDITIONS

A total of five hand auger holes (HA) and nine hand probe holes (PH) were completed during the field investigation. A detailed description of the soil conditions and refusal depths encountered at each of the hand auger/probe hole locations are provided on the logs in the Appendix.

3.1 Hand Auger Holes

Generally the hand auger holes encountered a thin (approximately 50 mm thick) topsoil layer overlying native sandy clay to silty sand. Some of the hand auger holes encountered a moist to wet sand and gravel to sand layer overlying the native sandy clay to silty sand.

HA16-1 encountered a thin layer of topsoil overlying a 0.65 m thick layer of wet sand and gravel to gravelly sand, possible fill material. Native sandy clay was encountered at a depth of 0.7 m below the existing ground surface. Refusal with the hand augering equipment was reached at 0.8 m depth.

Underlying the thin topsoil layer in HA16-2 is a sand and gravel that transitions into a wet silty sand at 0.4 m depth. Hand equipment refusal was encountered at 1.1 m depth.



HA16-3 encountered a thin topsoil layer overlying a gravelly sand to a depth of 0.25 m. The gravelly sand is underlain by native sandy clay to clayey sand. Refusal with the hand equipment was encountered at 0.6 m depth due to encountering a possible cobble. A one inch (25 mm) diameter pry bar was driven with a three pound sledge hammer adjacent to HA16-3, and refusal was not encountered within the limit of the pry bar (i.e. bedrock/dense soils at >0.9 m depth).

HA16-4 encountered a thin layer of topsoil overlying sand. Refusal with the hand equipment was reached at 0.3 m depth.

HA16-5 encountered a thin layer of topsoil overlying sand and gravel to a depth of 0.25 m. Native silty clay was encountered at 0.25 m depth. Refusal with the hand equipment was encountered at 1.1 m depth.

No free water was observed during the field investigation; however, minor seepage was encountered in HA16-1, -3, -4 and -5 at depths between 0.15 m to 0.3 m below the existing ground surface. HA16-2 encountered wet soil conditions at a depth of 0.4 m. Due to the shallow bedrock and sloping ground surface, the area is expected to become saturated during the winter months and dry out during the summer months.

3.2 Hand Probe Holes

The nine hand probe holes were completed to refusal of the probe or to a maximum depth of 0.9 m (limit of the probe). Refusal is anticipated to have occurred on dense till or bedrock, but could also be on larger gravel pieces or cobbles in the granular soils. The maximum advancement ranged from 0.32 m to 0.9 m depth below existing ground surface. A table summarizing the maximum advancement depth below the existing ground surface can be found in the Appendix, and the data is also shown on the drawing in the Appendix.

4. GEOTECHNICAL ASSESSMENT & RECOMMENDATIONS

At this time, we understand that the layout and design has not been determined. The recommendations provided below are therefore general in nature, and Thurber should review the preliminary layout drawings when they have been prepared.

Survey drawings were provided by LEES+Associates on March 9, 2016. Based on the conditions encountered in the hand auger and probe holes and the survey, the proposed site generally slopes to the northeast. The maximum grade change across the site is about 5.6 m. A large bedrock bluff is located west of the proposed site and three bedrock outcrops were also identified across the site. The depth to bedrock between the observed rock outcrops could be quite variable as the bedrock surface in the Victoria area is known to be very irregular.

4.1 Site Development

All topsoil/organic materials (roots, etc.) and wet sand should be stripped beneath all structures (columbaria, etc.) to expose native clay, till, or bedrock. In non-structural areas, it is recommended



that a minimum stripping depth of 300 mm be assumed since it is difficult for machines to excavate less than this depth in a cost effective manner.

Depending on the time of year when the construction takes place, softening of the clayey sandy to silty clay subgrade could occur; this should be minimized by placing a thin layer of compacted crushed gravel on the surface of the subgrade immediately after excavation and approval of the subgrade by a geotechnical engineer. If softening of the subgrade occurs, the softened material should be removed prior to placement of backfill or foundations.

Imported backfill used to bring the areas for structures up to the final design grade should consist of 75 mm minus, sandy gravel fill or 19 mm minus crushed gravel, with less than 5% passing the 0.075 mm sieve. The fill should be placed in maximum lifts of 300 mm and compacted to at least 98% of Standard Proctor Maximum Dry Density (SPMDD).

A qualified geotechnical engineer should inspect all foundation excavations and bearing surfaces to confirm the suitability of the subgrade material. Any unsuitable native soils identified at foundation locations during the subgrade inspection and/or during construction, should be excavated to approved subgrade and then backfilled in accordance with the recommendations given above.

4.2 Foundation Design Recommendations

Based on the results of the geotechnical investigation, it is considered feasible to support the columbaria(s) on conventional slab-on-grade or footings as discussed below.

4.2.1 Foundations on Soils

Foundations supported on undisturbed stiff native clays, till or compacted granular soils placed above the approved native soils can be designed for a serviceability limit state (SLS) bearing resistance of 125 kPa and an ultimate limit state (ULS) bearing resistance of 190 kPa.

The foundations/slab-on-grade should be founded at a minimum depth of 0.45 m below the final ground surface for frost protection.

At least 150 mm of free-draining, 25 mm minus sandy gravel (with less than 5% passing the 0.075 mm sieve) should be placed directly beneath the slab-on-grade areas to provide uniform support and adequate drainage.

4.2.2 Foundations on Bedrock

The bearing capacity of bedrock is a function of rock strength, weathering, and fracturing. Foundations should be founded entirely on bedrock to prevent cracking that can occur if the foundation is supported on both soil and bedrock. A conservative ULS bearing resistance of 500 kPa can be used for foundations supported on bedrock. The SLS is not a design issue for foundations on bedrock.



If bedrock is exposed at or above design elevation under a portion of the foundation, it should be removed to a depth of at least 500 mm below the underside of foundation and backfilled with compacted gravel as described above to minimize differential settlement and cracking.. Alternatively, the entire foundation area could be excavated to bedrock and mass concrete used to level the area to the underside of the foundation.

If the bedrock is sloping at greater than 6H:1V and is not naturally keyed, the bedrock should chipped or carefully blasted to prepare level bearing areas. Such area will need to be inspected by a geotechnical engineer to confirm that the preparation of sloping rock areas is acceptable. The bedrock surface should be hosed and broomed clean prior to pouring any foundations so that the concrete will bond to the rock.

4.3 Drainage

Standard perimeter drains should be provided around the columbaria to control shallow groundwater in this area. The final ground surface should be shaped to direct surface water away from the foundation/slab-on-grade areas.

4.4 Footpath Recommendations

The footpath layout and design within the proposed site has not been determined at this time. General recommendations are provided below, and should be reviewed when preliminary layout drawings have been prepared.

If non-hard surfacing footpath materials (e.g. wood-chips or gravel) are chosen, then the topsoil and organics should be stripped from these areas prior to constructing the footpath.

If hard surfacing footpath materials (e.g. asphalt, concrete, paving stones) are chosen for the design, then in addition to the topsoil layer being removed, the area should be backfilled and compacted in maximum 300 mm thick lifts with clean granular fill as described above prior to placing the surfacing materials.

If the footpath areas extend across sloping exposed bedrock, the rock may have to be benched, or a structure (such as stairs) dowelled into the rock.

The final grade of the footpath should also be a minimum of 150 mm above the surrounding ground surface to help mitigate ponding within the footpath.

More detailed recommendations can be provided for the footpath once the preliminary layout has been determined.

4.5 Site Grading Fill Recommendations

We understand that a minimum soil cover of 0.6 m is required for interment purposes. Depending on the location of the burial areas and the proposed final site grades, localized filling may be



required to achieve this minimum cover. It is anticipated that these areas will general have no structure placed on them except for small head stones.

Fill placed to raise the grade in these areas can consist of clays or granular soil. It is recommended that the fill be placed in maximum 300 mm thick lifts and compacted to about 95% SPMD. If the fill is not adequately compacted, these areas could become spongy and difficult to access. Settlement could also occur in these areas if not properly compacted. If clay fill is used for site grading, it should have a suitable moisture content to achieve the specified level of compaction.

Prior to placing any fill, topsoil and organics should be removed from the area.

More detailed recommendations can be provided once the site grading plan for the burial areas has been determined.

5. FURTHER WORK

Thurber should review the preliminary design drawings and provide additional recommendations, if required, for the actual layout of the structures, internment areas, and footpaths.

During construction, Thurber should inspect prepared subgrade areas prior to filling or placing foundations. Compaction testing should also be conducted to confirm that the specified level of compaction has been achieved.



6. CLOSURE

We trust the above provides the information you require at this time. If you have any questions regarding this letter, please do contact either of the undersigned.

Yours truly,
Thurber Engineering Ltd.
Kevin Sterne, M.Sc., P.Eng.
Review Engineer



Caroline Silins, B.Sc., EIT.
Project Engineer

Attachments

Statement of Limitations and Conditions
Drawing No. 11799-1
Unified Classification System for Soils (ASTM D2487)
Hand Auger Hole Logs
Hand Probe Hole Summary Table



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

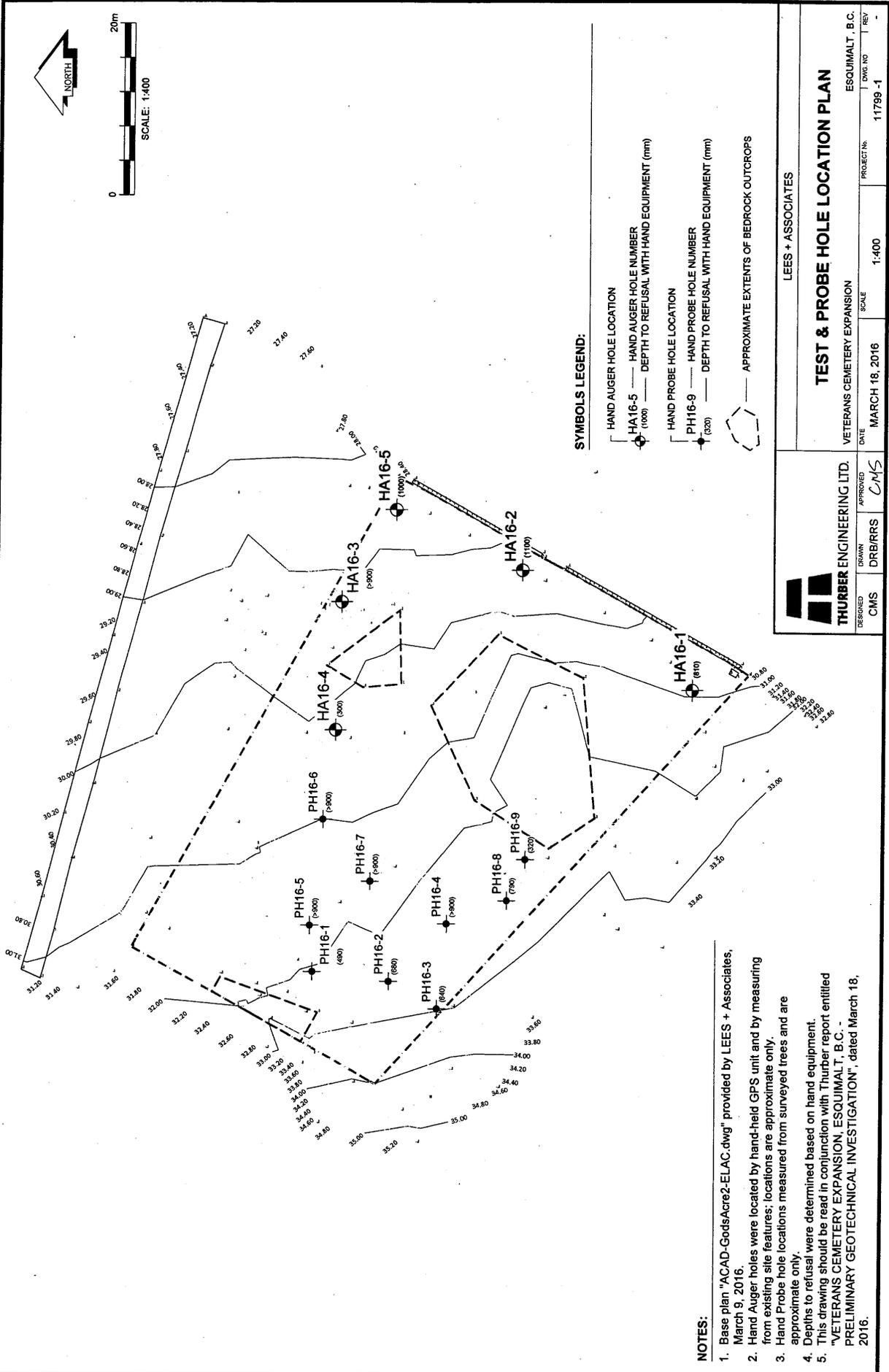
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.





SYMBOLS LEGEND:

- HAND AUGER HOLE LOCATION
- HA16-5 (1000) — HAND AUGER HOLE NUMBER
- (1000) — DEPTH TO REFUSAL WITH HAND EQUIPMENT (mm)
- HAND PROBE HOLE LOCATION
- PH16-9 (320) — HAND PROBE HOLE NUMBER
- (320) — DEPTH TO REFUSAL WITH HAND EQUIPMENT (mm)
- — APPROXIMATE EXTENTS OF BEDROCK OUTCROPS

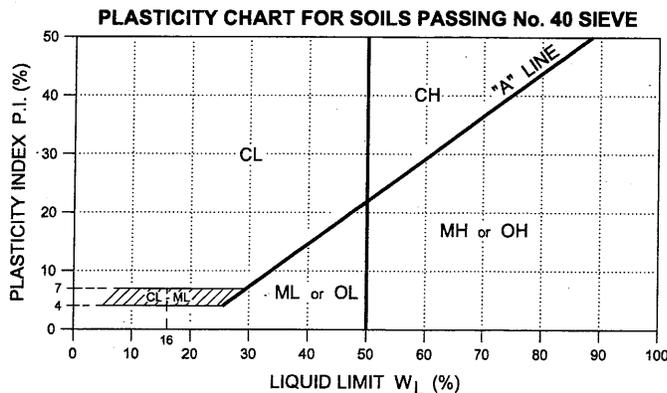
- NOTES:**
1. Base plan "ACAD-GodsAcre2-ELAC.dwg" provided by LEES + Associates, March 9, 2016.
 2. Hand Auger holes were located by hand-held GPS unit and by measuring from existing site features; locations are approximate only.
 3. Hand Probe hole locations measured from surveyed trees and are approximate only.
 4. Depths to refusal were determined based on hand equipment.
 5. This drawing should be read in conjunction with Thurber report entitled "VETERANS CEMETERY EXPANSION, ESQUIMALT, B.C. - PRELIMINARY GEOTECHNICAL INVESTIGATION", dated March 18, 2016.

THURBER ENGINEERING LTD. DESIGNED: CMS DRAWN: DR/RRS APPROVED: CMS		DATE: MARCH 18, 2016 SCALE: 1:400	
		PROJECT NO: 11799-1 REV: -	
LEES + ASSOCIATES TEST & PROBE HOLE LOCATION PLAN VETERANS CEMETERY EXPANSION ESQUIMALT, B.C.			



UNIFIED CLASSIFICATION SYSTEM FOR SOILS (ASTM D2487)

MAJOR DIVISION			SYMBOLS		TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
			GROUP	GRAPH		
COARSE-GRAINED SOILS (MORE THAN 50% BY WEIGHT RETAINED ON No. 200 SIEVE)	GRAVELS MORE THAN 50% COARSE FRACTION RETAINED ON No. 4 SIEVE	CLEAN GRAVELS (< 5% FINES)	GW		WELL GRADED GRAVEL and WELL GRADED GRAVEL with SAND.	$C_U = \frac{D_{60}}{D_{10}} \geq 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			GP		POORLY GRADED GRAVEL and POORLY GRADED GRAVEL with SAND.	NOT MEETING ABOVE REQUIREMENTS
		GRAVELS WITH FINES (> 12% FINES)	GM		SILTY GRAVEL, GRAVEL - SAND - SILT MIXTURES.	FINES CLASSIFY AS ML or MH ⁽³⁾
			GC		CLAYEY GRAVEL, GRAVEL - SAND - CLAY MIXTURES.	FINES CLASSIFY AS CL or CH ⁽³⁾
	SANDS MORE THAN 50% COARSE FRACTION PASSES No. 4 SIEVE	CLEAN SANDS (< 5% FINES)	SW		WELL GRADED SAND and WELL GRADED SAND with GRAVEL	$C_U = \frac{D_{60}}{D_{10}} \geq 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP		POORLY GRADED SAND and POORLY GRADED SAND with GRAVEL.	NOT MEETING ABOVE REQUIREMENTS
		SANDS WITH FINES (> 12% FINES)	SM		SILTY SAND, SAND - SILT MIXTURES.	FINES CLASSIFY AS ML or MH ⁽³⁾
			SC		CLAYEY SAND, SAND - CLAY MIXTURES.	FINES CLASSIFY AS CL or CH ⁽³⁾
FINE-GRAINED SOILS (MORE THAN 50% BY WEIGHT PASSES No. 200 SIEVE)	SILTS BELOW "A" LINE NEGLECTIBLE ORGANIC CONTENT	$W_L < 50\%$	ML		INORGANIC SILTS, SILTS with SAND and SILTS with GRAVEL and SANDY or GRAVELLY SILTS.	P.I. < 4 or PLOTS BELOW THE "A" LINE
		$W_L > 50\%$	MH		INORGANIC SILTS, SILTS with SAND & SILTS with GRAVEL & SANDY or GRAVELLY SILTS, FINE SANDY or SILTY SOILS.	P.I. PLOTS BELOW THE "A" LINE
	CLAYS ABOVE "A" LINE ON PLASTICITY CHART NEGLECTIBLE ORGANIC CONTENT	$W_L < 50\%$	CL		INORGANIC CLAYS of LOW PLASTICITY, GRAVELLY, SANDY, or SILTY CLAYS, LEAN CLAYS.	P.I. > 7 and PLOTS ON OR ABOVE THE "A" LINE
		W_L near 50%	CL-CH		BORDERLINE INORGANIC CLAYS and SILTY CLAYS with LIQUID LIMITS NEAR 50%.	(only used for visual identification)
		$W_L > 50\%$	CH		INORGANIC CLAYS of HIGH PLASTICITY, FAT CLAYS.	P.I. PLOTS ON OR ABOVE THE "A" LINE
	ORGANIC SILTS and CLAYS	$W_L < 50\%$	OL		ORGANIC SILTS and ORGANIC SILTY CLAYS of LOW PLASTICITY.	$\frac{W_L \text{ (oven dried)}}{W_L \text{ (not dried)}} < 0.75$
		$W_L > 50\%$	OH		ORGANIC CLAYS OF HIGH PLASTICITY.	$\frac{W_L \text{ (oven dried)}}{W_L \text{ (not dried)}} < 0.75$
	HIGHLY ORGANIC SOILS			PT		PEAT and other HIGHLY ORGANIC SOILS.



NOTES:

- ALL SIEVE SIZES ARE U.S. STANDARD, A.S.T.M. E11-04.
- COARSE GRAINED SOILS WITH 5 TO 12% FINES REQUIRE DUAL SYMBOLS (GW-GM, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC).
- IF FINES CLASSIFY CL-ML USE DUAL SYMBOL (GC-GM or SC-SM).
- WHERE TESTING IS NOT CARRIED OUT, THE IDENTIFICATIONS ARE DETERMINED BY VISUAL-MANUAL PROCEDURES DESCRIBED IN ASTM D2488-06.



SYMBOLS AND TERMS USED ON TEST LOGS

1. PARTICLE SIZE CLASSIFICATION OF MINERAL SOILS

DESCRIPTION	APPARENT PARTICLE SIZE
BOULDERS	> 200 mm
COBBLES	75 mm to 200 mm
GRAVEL coarse	19 mm to 75 mm
GRAVEL fine	4.75 mm to 19 mm
SAND coarse	2 mm to 4.75 mm
SAND medium	0.475 mm to 2 mm
SAND fine	0.075 mm to 0.475 mm
SILT	Non-plastic particles, not visible to the naked eye
CLAY	Plastic particles, not visible to the naked eye

NOTE: Metric Conversion is approximate only

2. TERMS DESCRIBING CONSISTENCY (Cohesive Soils Only)

DESCRIPTION	APPROXIMATE UNDRAINED SHEAR STRENGTH
Very Soft	Less than 10 kPa (250 psf)
Soft	10 to 25 kPa (250 - 500 psf)
Firm	25 to 50 kPa (500 - 1000 psf)
Stiff	50 to 100 kPa (1000 - 2000 psf)
Very Stiff	100 to 200 kPa (2000 - 4000 psf)
Hard	Greater than 200 kPa (4000 psf)

NOTE: Metric Conversion is approximate only

3. TERMS DESCRIBING DENSITY (Cohesionless Soils Only)

DESCRIPTION	STANDARD PENETRATION TEST Number of blows per foot (300 mm) *
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	over 50

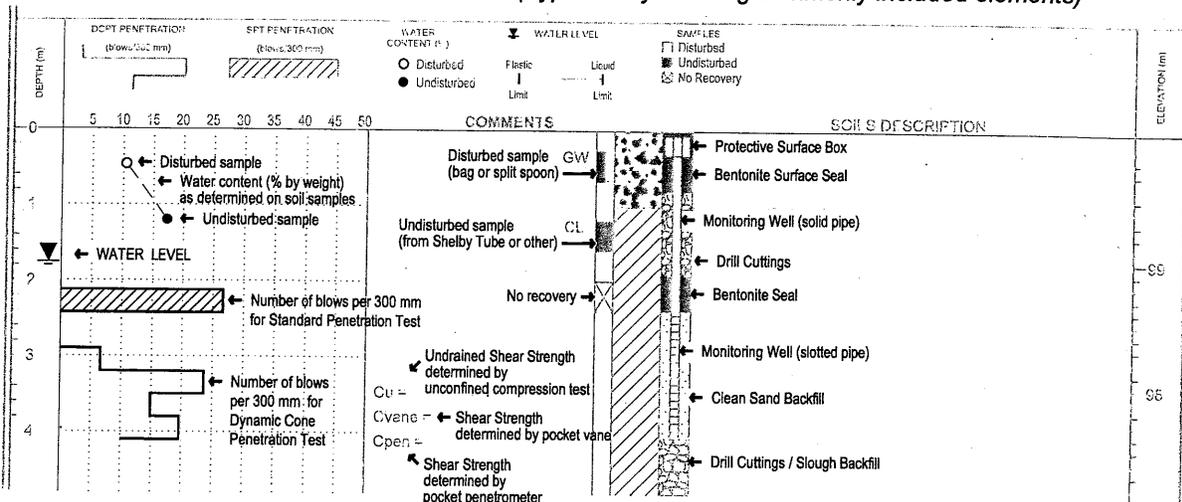
* Directly applicable to sands and, with interpretation, to gravels

4. PROPORTION OF MINOR COMPONENTS BY WEIGHT

DESCRIPTION	PERCENT BY WEIGHT
and	35 to 50 %
y / ey	20 to 35 %
some	10 to 20 %
trace	less than 10 %

EXAMPLE: Silty SAND, trace of gravel = Sand with 20 to 35% silt and up to 10% gravel, by dry weight. (Percentages of secondary materials are estimates based on visual and tactile assessment of samples).

5. LEGEND FOR TEST HOLE LOGS (Typical only showing commonly included elements)





VETERANS CEMETERY EXPANSION
ESQUIMALT, BC
PRELIMINARY GEOTECHNICAL INVESTIGATION –
HAND AUGER HOLE LOGS

HA16-1

Date Completed: March 8, 2016

DEPTH (m)	DESCRIPTION	SAMPLE DEPTH (m)	USCS	M.C. (%)
0 – 0.05	TOPSOIL	-	-	-
0.05 – 0.3	Moist, brown, SAND AND GRAVEL (possible FILL); gravel to 35 mm diameter; trace silt; contains organics and rootlets - Minor seepage encountered at 0.3 m depth	0.13 – 0.3	SM	19.5
0.3 – 0.7	Wet, brown, gravelly SAND (possible FILL); gravel to 25 mm diameter; trace silt; contains rootlets	0.3 – 0.4	SM-SP	16.4
0.7 – 0.8	Wet, brown mottled grey, sandy CLAY; low plasticity; trace gravel to 25 mm diameter; contains rootlets	0.4 – 0.8	CL	19.3
0.8	Refusal with hand equipment (dense/stiff soils or bedrock) -Backfilled with excavated materials -Advanced a 1 in. pry bar with a 3 lbs. sledge hammer at the bottom of HA16-1, encountered little/no advancement at 0.8 m depth.			



**VETERANS CEMETERY EXPANSION
ESQUIMALT, BC
PRELIMINARY GEOTECHNICAL INVESTIGATION –
HAND AUGER HOLE LOGS**

HA16-2

Date Completed: March 8, 2016

DEPTH (m)	DESCRIPTION	SAMPLE DEPTH (m)	USCS	M.C. (%)
0 – 0.05	TOPSOIL			
0.05 – 0.4	Moist, dark brown, SAND AND GRAVEL; gravel to 25 mm diameter; some organic silt; contains rootlets	0.2 – 0.4	SM-GM	20.0
0.4 – 1.1	Wet, brown, silty SAND; some low plasticity clay; trace gravel to 25 mm diameter; contains rootlets	0.4 – 1.1	SM-SC	23.2
1.1	Refusal with hand equipment (dense/stiff soils or bedrock) -Backfilled with excavated materials -Advanced a 1 in. pry bar with a 3 lbs. hammer at the bottom of HA16-2, encountered little/no advancement at 1.1 m depth.			



**VETERANS CEMETERY EXPANSION
ESQUIMALT, BC
PRELIMINARY GEOTECHNICAL INVESTIGATION –
HAND AUGER HOLE LOGS**

HA16-3

Date Completed: March 8, 2016

DEPTH (m)	DESCRIPTION	SAMPLE DEPTH (m)	USCS	M.C. (%)
0 – 0.05	TOPSOIL	-	-	-
0.05 – 0.25	Moist, brown, gravelly SAND; trace to some silt -Minor seepage encountered at 0.25 m depth	-	-	-
0.25 – 0.6	Wet, brown mottled grey, sandy CLAY to clayey SAND; low plasticity	-	-	-
0.6	Refusal with hand equipment (encountered possible cobble) -Backfilled with excavated materials -Advanced a 1 in. pry bar with a 3 lbs. hammer adjacent to HA16-3 from the existing ground surface. Bedrock/dense soils are at > 0.9 m depth.			

HA16-4

Date Completed: March 8, 2016

DEPTH (m)	DESCRIPTION	SAMPLE DEPTH (m)	USCS	M.C. (%)
0 – 0.05	TOPSOIL	-	-	-
0.05 – 0.3	Moist, brown, SAND; some gravel -Minor seepage encountered at 0.15 m depth	-	-	-
0.3	Refusal with hand equipment (dense/stiff soils or bedrock) -Backfilled with excavated materials -Advanced a 1 in. pry bar with a 3 lbs. sledge hammer at the bottom of HA16-4, encountered little/no advancement at 0.3 m depth.			



**VETERANS CEMETERY EXPANSION
ESQUIMALT, BC
PRELIMINARY GEOTECHNICAL INVESTIGATION –
HAND AUGER HOLE LOGS**

HA16-5

Date Completed: March 8, 2016

DEPTH (m)	DESCRIPTION	SAMPLE DEPTH (m)	USCS	M.C. (%)
0 – 0.25	TOPSOIL -Minor seepage encountered at 0.25 m depth	-	-	-
0.25 – 1.0	Moist, brown slightly mottled, silty CLAY; trace to some sand; trace gravel to 20 mm diameter gravel; contains rootlets	0.25 – 1.0	CL	20.8
1.0	Refusal with hand equipment (dense/stiff soils or bedrock) -Backfilled with excavated materials -Advanced a 1 in. pry bar with a 3 lbs. sledge hammer at the bottom of HA16-5, encountered little/no advancement at 1.0 m depth.			

*See Drawing 11799-1 attached in Thurber Engineering Ltd.'s report entitled Veterans Cemetery Expansion, Esquimalt, BC – Geotechnical Investigation dated March 18, 2016 for locations of HA16-1 to -5.



VETERANS CEMETERY EXPANSION
ESQUIMALT, BC
PRELIMINARY GEOTECHNICAL INVESTIGATION -
HAND PROBE HOLE SUMMARY TABLE

Date Completed: March 8, 2016

Hand Probe Hole ID.	Maximum Advancement Below Existing Ground Surface (m)
PH16-1	0.49
PH16-2	0.68
PH16-3	0.64
PH16-4	0.90*
PH16-5	0.90*
PH16-6	0.90*
PH16-7	0.90*
PH16-8	0.79
PH16-9	0.32

Notes:

1. Hand probe holes were completed by advancing a half inch diameter steel rod 0.9 m in length, using a three pound sledge hammer.
2. See Drawing 11799-1 attached in Thurber Engineering Ltd.'s report entitled Veterans Cemetery Expansion, Esquimalt, BC – Geotechnical Investigation dated March 18, 2016 for locations of PH16-1 to -9.

*Indicates refusal not achieved (limit of rod)

