Public Works and Government Services Canada

Requisition No. EZ899-173322/A

SPECIFICATIONS
for
Glacier National Park – Rogers Pass Maintenance Compound
Infrastructure Improvements – Phase 2
Rogers Pass, BC

Project No. R.076550.001
March 2017

APPROVED BY:

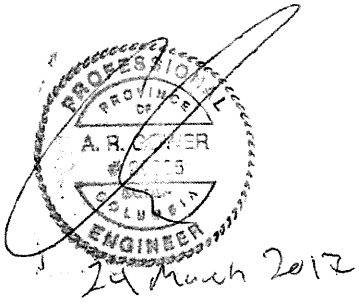
Regional Manager, AES — Date 2017-04-03

Construction Safety Coordinator — Date 2017-04-04

TENDER:

Project Manager — Date 17/04/04

Real Property Services Branch, Professional and Technical Services, Pacific Region
#219 - 800 Burrard Street, Vancouver, B.C. V6Z 0B9

DISCIPLINE	SEAL
PRIME CONSULTANT CIVIL ENGINEER	 14 March 2012

END OF SECTION

SPECIFICATIONS

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Part 1 General

1.1 LOCATION OF SITE

.1 The work is located at the Rogers Pass maintenance compound along the Trans-Canada Highway, 70.3km Northeast of Revelstoke, B.C.

.2 The compounds elevation ranges from 1304m to 1313m.

.3 The work is in Glacier National Park, located on federal land.

1.2 GENERAL DESCRIPTION OF THE WORK

.1 Principle Work under this Contract comprises of upgrades to the existing civil infrastructure within the Rogers Pass Maintenance Compound on both the east and west sides of the Trans-Canada Highway.

.2 The compound was built in the 1960's and has had numerous fill and paving projects completed since. The pavement surface has now degraded and requires resurfacing.

.3 Work to be performed under this contract includes, however is not limited to, the following items covered in the contract documents:

- .1 Stormwater diversion and detention upgrades:
  - .1 Installation of multiple underground stormwater detention facilities.
  - .2 Construction of various drainage swales, berms, culverts, and storm sewers to convey storm run-off to detention facilities.
  - .3 Installation of sediment chambers and oil/silt separators.
- .2 Sanitary system upgrades
  - .1 Removal and replacement of the sanitary network west of the Trans-Canada Highway.
- .3 Protective barrier fence
  - .1 Installation of a reinforced concrete retaining wall along the banks of Rogers Creek.
- .4 Asphalt Re-Surfacing
  - .1 Removal and offsite disposal of approximately 16,800 m^2 of asphalt driving surface from east of the Trans-Canada Highway (variable thickness). Material to be transported up to 20 km to a Parks' site and crushed by Contractor. Crushed material is **not** for reuse on this project.
  - .2 Paving of approximately 22,000 m^2 of asphalt driving surface, including re-grading of base course as required.

1.3 CODES AND STANDARDS

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

1.4 PROJECT MEETINGS

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

1.5 DRAWINGS

.1 Contract Drawings:

.1 Contract drawings will be available for download from the PWGSC Buyandsell.gc.ca website.

.2 No additional contract drawings will be provided.

.2 Record Drawings:

.1 Record Drawings to be completed and submitted per Section 01 78 00 – Closeout Submittals.

.2 Production of CAD Record Drawings not included within Contract.

1.6 EXISTING SITE CONDITION

.1 Make inquiries or investigations necessary to become thoroughly acquainted with site, soil, surface, stream and road access conditions, and the nature and extent of the work.

.2 Refer to additional information on ground conditions is included in the appendices of these specifications.

.3 Submission of a tender will be deemed confirmation that the Contractor is acquainted with the site and is conversant with all relevant conditions.

1.7 ENVIRONMENTAL BASIC IMPACT ASSESSMENT

.1 Review and become familiar with the BIA included in Appendix G of the Contract Specification package.

.2 Specifically reference Phase 2 Details.

1.8 LAYOUT OF WORK

.1 Construction layout is the responsibility of Contractor.

.2 Point Files and survey data will be made available by the Departmental Representative.

.3 Notify Departmental Representative immediately if the work cannot be completed as shown in the plans and specifications.

1.9 WORK SEQUENCE

.1 Within 15 days of Contract award, Contractor to submit to the Departmental Representative for approval a plan clearly indicating proposed sequencing of Work.

.1 Include documents submittals warning Departmental Representative of forthcoming activities.

.2 Sequencing to ensure that full sanitary service is maintained to all areas affected by the Work throughout the duration of the project.

.3 Whenever a variation from the schedule in excess of 5 working days occurs or is expected to occur, request approval from Departmental Representative for the change in writing.

.4 Work from September 11-24, 2017.

.1 Access between the entrance road, the sand shed and the fuel tanks needs to be unobstructed to accommodate the hauling of sand.

.1 No active work in this area will be permitted.

.5 Work extending beyond October 15, 2017.

.1 Work north of the Office/Garage or Helipad restricted to between the hours of 07:00 – 09:00.

.2 Work to be coordinated with the Highway Operations Unit, as snow plowing in that area also needs to happen during that same 2 hour period.

1.10 TIME OF COMPLETION

.1 Complete all work, including all required submittals, under the contract within twenty (20) weeks of award.

1.11 USE OF SITE

.1 Use of site is limited to work areas required for the work, including the storage of materials and equipment and to the access routes assigned by the Departmental Representative required for the completion of work as specified. Access keys will be provided to the contractor as required.

.2 Hours of work to comply with local bylaws.

.1 Perform work during normal hours, Monday to Friday, except holidays.

.2 Work may be performed after working hours, on weekends and holidays as approved by Departmental Representative.

1.12 ASSISTANCE BY THE CONTRACTOR

.1 Provide access to the work areas as required for the Departmental Representative to perform their duties.

1.13 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.14 EXISTING SERVICES

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

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 72 hours' notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.

.3 Provide alternative routes for pedestrian and vehicular traffic.

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

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

.6 Provide temporary services as directed by Departmental Representative to maintain critical building and tenant systems.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

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

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

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

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

1.15 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of existing equipment and fixtures indicated or specified is to be considered as approximate.

1.16 INSPECTION SERVICES

.1 Inspections will be carried out by Departmental Representative.

.2 Where inspections reveal that work is not in accordance with the contract requirements, additional inspections to confirm acceptability of the corrected work will be conducted at the expense of the Contractor.

1.17 INTERPRETATION

.1 In interpreting the Contract, in the event of discrepancies or conflicts between anything in the Plans and Specifications and the General Conditions, the General Conditions govern.

.2 In interpreting the Plans and Specifications, in the event of discrepancies or conflicts between:

.1 The Plans and Specifications, the Specifications govern.

.2 The Plans, the Plans drawn with the largest scale govern; and

.3 Figured dimensions and scaled dimensions, the figured dimensions govern.

1.18 SAFE COMPANIES CERTIFICATION

.1 The Contractor must ensure that all works are performed by contractors who:

.1 Have current WCB registration and clearance.

.2 Have required WHIMIS training.

1.19 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

.2 Contract Drawings and Waste Reduction Workplan.

.3 Specifications.

.4 Addenda.

.5 Reviewed Shop Drawings.

.6 List of Outstanding Shop Drawings.

.7 Change Orders.

.8 Other Modifications to Contract.

.9 Field Test Reports.

.10 Copy of Approved Work Schedule.

.11 Health and Safety Plan and Other Safety Related Documents.

.12 Other documents as specified.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

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

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

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

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

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

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

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

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

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in British Columbia, Canada.

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

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

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

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

.7 Accompany submissions with transmittal letter containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:

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

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

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

.11 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.13 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

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

.15 Delete information not applicable to project.

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

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

.18 The review of shop drawings by the Departmental Representative is for the sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 PRODUCT DATA

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

.2 Delete information not applicable to project.

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

.4 Cross-reference product data information to applicable portions of Contract documents.

.5 Submit electronic PDF copies of product data.

1.4 SAMPLES

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

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

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

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

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

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

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

1.5 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg standard resolution as directed by Departmental Representative.

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

.3 Frequency of photographic documentation: as directed by Departmental Representative.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 35 43 – Environmental Procedures.

.2 Section 02 41 99 – Demolition for Minor Works.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-51M-81, Polyethylene Sheet for Use in Building Construction.

.2 Canada Labour Code: Part 11-Occupational Health and Safety.

.3 Canada Occupational Health and Safety Regulations.

.4 Canadian Environmental Protection Act, S.C.

.5 Species-at-Risk Act.

.6 Controlled Products Regulations.

.7 Inter-provincial Movement of Hazardous Waste Regulations.

.8 National Fire Code of Canada.

.9 Transportation and Dangerous Goods Act.

.10 Canadian Council of Ministers of the Environment (CCME) Documentation.

.11 CCME Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil.

.12 British Columbia Environmental Management Act.

.1 British Columbia Contaminated Sites Regulation.

.2 British Columbia Hazardous Waste Regulation.

.13 British Columbia Water Sustainability Act.

.1 British Columbia Groundwater Protection Regulation.

.14 British Columbia Workers Compensation Act.

.15 British Columbia Occupational Health and Safety Regulation.

.16 Land Development Guidelines for the Protection of Aquatic Habitat (Department of Fisheries and Oceans).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Copies of transport manifests, trip tickets, and disposal receipts for waste materials removed from work area.

.2 Other information required by Departmental Representative or relevant to agenda for upcoming progress meeting.

.2 Site Layout: within 7 days after date of Notice to Proceed and prior to mobilization to site, submit site layout drawings showing existing conditions and facilities, construction facilities and temporary controls provided by Contractor including following:

.1 Drum sampling and staging areas.

.2 Equipment and personnel decontamination areas.

.3 Means of ingress, egress and temporary traffic control facilities. Refer to Section 01 56 00 - Temporary Barriers and Enclosures for traffic control.

.4 Equipment and material staging areas.

.5 Soil stockpile areas.

.3 Equipment Decontamination Pad: submit equipment decontamination pad design to Departmental Representative for review prior to commencing construction.

.4 Submit documentation verifying that hazardous materials employees have been trained, tested, and certified to safely and effectively carry out their assigned duties in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.5 Contaminated Waste Management Plan: within 10 Working Days after Contract award and prior to mobilization to Site, Submit plan detailing management of Contaminated Waste. Include:

.1 Sequence, methods and means to ensure different categories of waste are segregated.

.2 Sequence, methods and means to handle, transport, and store Contaminated Waste onsite.

.3 Sequence, methods and means to transport Contaminated Waste offsite. Include name, vehicle type, and licenses of transporters.

.4 Sequence, methods and means to dispose Contaminated Waste offsite. Include name of facility, location of facility, copies of provincial or territorial authorizations, and evidence of compliance with municipal zoning and bylaws of each Disposal Facility that will be used to dispose each of the Contaminated Waste categories identified. Supply evidence they are authorized and/or licensed to accept and dispose of the specific category of material. Disposal Facility requirements:

.1 Be an existing offsite facility located in Canada.

.2 Be designed, constructed and operated to prevent any pollution from being caused by the facility outside the area of the facility from waste placed in or on land within the facility.

.3 Hold a valid and subsisting permit, certificate, approval, or any other form of authorization issued by a province or territory for the disposal of soil, construction/demolition waste or other material requiring disposal.

.4 Comply with applicable municipal zoning, bylaws, and requirements.

.5 If proposed Disposal Facility is not acceptable to Departmental Representative, identify an alternate Disposal Facility that is acceptable.

.6 Contaminated Wastewater Management Plan: within 10 Working Days after Contract award and prior to mobilization to Site, Submit plan detailing management of Contaminated Wastewater. Include:

.1 Sequence, methods and means to handle, transport, and store Contaminated Wastewater onsite.

.2 Sequence, methods and means to transport Contaminated Wastewater offsite. Include name, vehicle type, and licenses of transporters.

.3 Sequence, methods and means to dispose Contaminated Wastewater offsite. Include name of facility, location of facility, copies of provincial or territorial authorizations, and evidence of compliance with municipal zoning and bylaws of Discharge Approval. If proposed Disposal Facility is not acceptable to Departmental Representative, identify an alternate Disposal Facility that is acceptable

.7 Transport Manifests: within 3 Working Days of offsite transport, Submit documentation verifying that material has been transported appropriately. Include:

.1 Method of transport.

.2 Name of transport company.

.3 Weigh scale receipt including location, date, and weight of loading.

.4 Weigh scale receipt including location, date, and weight of unloading.

.8 Certificate of Disposal: within 30 Working Days of disposal at Disposal Facility, Submit documentation verifying that materials have been disposed by Contractor. Include:

.1 Issued by the Disposal Facility.

.2 On company letterhead.

.3 Name and location of facility where the material is being disposed.

.4 Date and weight for each shipment received and total weight received at the Disposal Facility.

.5 Identification of final ownership of material.

.6 Signed by identified authorized disposal company representative.

1.4 REGULATORY REQUIREMENTS

.1 Provide erosion and sediment control in accordance with Section 01 35 43 – Environmental Procedures.

.2 Comply with federal, provincial, and local anti-pollution laws, ordinances, codes, and regulations when disposing of waste materials, debris, and rubbish.

.3 Work to meet or exceed minimum requirements established by federal, provincial, and local laws and regulations which are applicable.

.1 Contractor: responsible for complying with amendments as they become effective.

.4 In event that compliance exceeds scope of work or conflicts with specific requirements of contract notify Departmental Representative immediately.

1.5 SEQUENCING AND SCHEDULING

.1 Do not commence Work involving contact with potentially contaminated materials until decontamination facilities are operational and approved by Departmental Representative.

1.6 EQUIPMENT DECONTAMINATION FACILITY

.1 Prior to commencing work involving equipment contact with potentially contaminated materials, construct equipment decontamination pad to accommodate largest piece of on-site potentially contaminated equipment.

.2 Construct equipment decontamination pad consisting of bermed area overlain by impermeable liner (capable of withstanding equipment traffic) sloping toward sump where equipment decontamination wastewater can be collected.

.3 Provide, operate, and maintain necessary equipment, pumps, and piping required to collect and contain equipment decontamination wastewater and sediment and transfer materials to approved storage tanks/areas.

.4 Provide an area to enable workers and other personnel leaving areas such as exclusion area to remove deleterious and contaminated materials from boots, clothing and skin surfaces.

.5 Be responsible for ensuring that all materials, chemicals, protective clothing, wash water and deleterious materials are collected, treated and disposed of in accordance with applicable environmental standards and regulations.

.6 Personnel Decontamination area to be available for use by persons other than the Contractor's workers and Subcontractors, including federal employees, other contractor(s), and environmental agencies. Provide use of facilities to other persons.

1.7 DRUM STAGING PAD

.1 Provide, maintain, and operate drum staging pad as required.

.2 Construct drum staging pad with sump capable of collecting leachate and rain runoff. Place polyethylene sheeting such that sheeting contours over top of berm, and leachate and runoff from staging pad is directed solely to sump on staging pad.

1.8 CONTAMINATED SOIL STOCKPILING FACILITIES

.1 Provide, maintain, and operate storage/stockpiling facilities as indicated.

.2 Install rugged, impermeable liner (e.g. thick, pre-fabricated liner such as a 60 mil LLPDE liner) capable of withstanding equipment traffic below proposed Contaminated Waste stockpile locations to prevent contact between stockpile material and ground and

constructed in a manner to contain any water generated from the stockpiled waste materials. Location of facility must be and approved by the Departmental Representative. Location of facility must minimize disturbance to on-site vehicle and pedestrian traffic and adjacent workplaces.

.3 Material in the Contaminated Soil a Stockpiling Facilities is to be covered with an impermeable cover (i.e. 6 mil polyethylene cover) nightly, during periods of work stoppage, during periods of high intensity or sustained rainfall, during periods when the stockpiled material is not being actively handled and as directed by the Departmental Representative. It is the Contractor's responsibility to ensure that the covers are not left off and are adequately weighted down to ensure the covers are not blown off the stockpiles (e.g. with tires).

1.9 WASTEWATER STORAGE TANK

.1 Provide, operate, and maintain wastewater storage tanks to store wastewaters.

.2 Wastewater includes wastewaters from Personnel Hygiene/Decontamination Facility; water collected from dewatering operations in contaminated areas; water collected from Equipment Decontamination Facility; and water collected from contaminated soil stockpiling facilities.

.3 Store wastewaters from dewatering operations and Equipment Decontamination Facility in separate tank from wastewater from Personnel Hygiene/Decontamination Facility.

.4 If toilet facilities are provided in Personnel Hygiene/Decontamination Facility, store wastewater from these toilets with wastewater from handbasins, showers, and laundry for ultimate disposal off site.

.5 Discharges: comply with applicable discharge limitations and requirements; do not discharge wastewaters to site sewer systems that do not conform to or are in violation of such limitations or requirements; and obtain Departmental Representative's approval prior to discharge of wastewater.

.6 Install wastewater storage tanks in locations as directed by Departmental Representative.

.7 Connect pumps, piping, valves, miscellaneous items, and necessary utilities as required for operation of facilities; and protect tanks, valves, pumps, piping, and miscellaneous items from freezing.

.8 Do not operate wastewater storage tanks until inspected and approved by Departmental Representative.

1.10 DRUMS

.1 Storage of Liquid Waste: 200 L steel drums meeting Transportation and Dangerous Goods Act, closable lids, complete with labels for marking contents and date filled.

.2 Storage of Solid Waste: 200 L steel drums meeting Transportation and Dangerous Goods Act, closable lids, complete with labels for marking contents and date filled.

1.11 VEHICULAR ACCESS AND PARKING

.1 Maintenance and Use:

.1 Prevent contamination of access roads. Immediately scrape up debris or material on access roads which is suspected to be contaminated as determined by Departmental Representative; transport and place into designated area approved by Departmental Representative. Clean access roads at least once per shift or as directed by Departmental Representative.

.2 Departmental Representative may collect soil samples for chemical analyses from traveling surfaces of constructed and existing access routes prior to, during, and upon completion of Work. Excavate and dispose of clean soil contaminated by Contractor's activities at no additional cost to Departmental Representative.

1.12 EQUIPMENT DECONTAMINATION

.1 Commence Work involving equipment contact with potentially contaminated material only after Equipment Decontamination Facility is operational.

.2 All equipment brought onto the site must be clean and free from contaminants including but not limited to soil, grease, vegetation, weeds, and debris.

.3 Decontaminate equipment after working in potentially contaminated work areas and prior to subsequent work or travel on clean areas.

.4 Decontaminate trucks in between loads of contaminated soil and clean fill.

.5 Perform equipment decontamination on Contractor-constructed equipment decontamination pad.

.6 At minimum, perform following steps during equipment decontamination: mechanically remove packed dirt, grit, and debris by scraping and brushing without using steam or high-pressure water to reduce amount of water needed and to reduce amount of contaminated rinsate generated. Pay particular attention to tire treads, equipment tracks, springs, joints, sprockets, and undercarriages. Scrub surfaces with long handle scrub brushes and cleaning agent. Rinse off and collect cleaning agent. Decontaminated equipment will be subject to inspection by Departmental Representative prior to leaving site to determine effectiveness of decontamination.

.7 Maintain inspection record on site which includes: equipment descriptions with identification numbers; time and date entering decontamination facility; and name of inspector with comment stating that decontamination was performed and completed.

.8 Each piece of equipment will be inspected by Departmental Representative after decontamination and prior to removal from site and/or travel on clean areas. Departmental Representative will have right to require additional decontamination to be completed if deemed necessary.

.9 Take appropriate measures necessary to minimize drift of mist and spray during decontamination including provision of wind screens.

.10 Collect decontamination wastewaters and sediments which accumulate on equipment decontamination pad. Transfer wastewaters to designated wastewater storage tank.

.11 Transfer sediments to contaminated soil staging area.

.12 Furnish and equip personnel engaged in equipment decontamination with protective equipment including suitable disposable clothing, respiratory protection, and face shields.

1.13 PROGRESS CLEANING

.1 Maintain cleanliness of Work and surrounding site to comply with federal, provincial, and local fire and safety laws, ordinances, codes, and regulations.

.2 Co-ordinate cleaning operations with disposal operations to prevent accumulation of dust, dirt, debris, rubbish, and waste materials.

1.14 FINAL DECONTAMINATION

.1 Perform final decontamination of construction facilities, equipment, and materials which may have come in contact with potentially contaminated materials prior to removal from site.

.2 Perform decontamination as specified to satisfaction of Departmental Representative. Departmental Representative will direct Contractor to perform additional decontamination if required.

1.15 CONTAMINATED WASTEWATER

.1 Collect Contaminated Wastewater that has, or potentially has, come into contact with Contaminated Waste. Contain Contaminated Wastewaters and transfer collected Contaminated Wastewaters to Contractor –supplied wastewater storage tanks.

.2 Notify Departmental Representative 4 business day (Monday to Friday excluding holidays) minimum in advance of when Contaminated Wastewater storage tank is anticipated to be full and/or wastewater will be removed for disposal.

.1 Do not discharge additional liquids to filled tank following sampling by Departmental Representative.

.2 Departmental Representative will determine appropriate disposition of wastewaters based on sample analysis.

.3 Contaminated Wastewater sample and analysis: Departmental Representative will perform sampling and analysis of stored Contaminated Wastewater for disposal purposes prior to removal from site. Results of analyses will determine appropriate methods of disposal. Upon receipt of analytical results, transfer tank contents without spills or release, as directed by Departmental Representative to off-site disposal facility. Following completion of tank emptying, decontaminate tank interior. Dispose of tank decontamination water with tank contents.

.4 Assume ownership of, and be responsible for Contaminated Wastewater once it is loaded on a vehicle for transport offsite.

.5 Transport and dispose collected Contaminated Wastewater at off-site Contaminated Wastewater Disposal Facility as identified by Contractor and approved by Departmental Representative.

1.16 CONTAMINATED WASTE MANAGEMENT

.1 Remove all Contaminated Waste within Work areas in accordance with the Contract and as instructed by the Departmental Representative.

.2 Minimize generation of Contaminated Waste to greatest extent practicable. Take necessary precautions to avoid mixing during excavation, handling, loading, stockpiling, and transport of Contaminated Waste of differing classifications.

.3 Segregate, excavate, handle, stockpile, load, transport, and dispose Contaminated Waste separately into the following classifications in accordance with the Contract or as instructed by the Departmental Representative based on insitu results, field observations, field measurements, and/or ex-situ characterization:

.1 Hazardous Waste (maximum stockpile size 50 m^3) defined as exceeding the BC Hazardous Waste Regulation standards.

.2 Waste Quality (maximum stockpile size 150 m^3) defined as exceeding the CCME Commercial soil quality guidelines but below the BC Hazardous Waste Regulation standards.

.3 Commercial Quality Not Geotechnically Suitable for Re-Use (maximum stockpile size 250 m^3) defined as being below the CCME Commercial soil quality guidelines but not considered geotechnically suitable for re-use.

.4 Handle, stockpile, load, and transport Contaminated Waste from the Site separately from material from other sites.

.5 Dispose Contaminated Waste from the Site separately from material from other sites to the extent practicable as acceptable to the Departmental Representative.

.6 Material characterization additional to information provided in Contract required by transport or Disposal Facility is responsibility of Contractor.

1.17 CONTAMINATED WASTE TRANSPORT

.1 Assume ownership of, and be responsible for, Contaminated Waste once it is loaded on a vehicle for transport offsite.

.2 Transport material offsite as soon as practical. Do not unreasonably stockpile material onsite.

.3 Cover material while being transported to prevent release of airborne dust, vapours, or odours, and to prevent saturation and leachate generation from material.

.4 Do not allow excess water in soil or sediment to flow out of vehicle during transport.

.5 Stabilize soil, sediment or other material as necessary.

.6 Transport Hazardous Waste soil or other material by appropriately licensed and equipped vehicles and operators.

.7 Manifest and correlate weights of all material transported from Site documenting weight at removal from Site, movement, and weight of material at final Disposal Facility. Submit all manifests, as instructed by the Departmental Representative.

.8 Resolve discrepancies in manifests for material transported as required by regulations and as acceptable to the Departmental Representative. Discrepancies include:

.1 No manifest or an incomplete manifest.

.2 The material transported does not match the description in the manifest.

.3 The amount transported differs by more than 5% in the manifest.

.4 The material transported is in a hazardous condition.

1.18 CONTAMINATED WASTE DISPOSAL

.1 Dispose Contaminated Waste at Disposal Facility identified by Contractor and accepted by the Departmental Representative.

.2 Dispose material as soon as practical and within 3 Working Days of leaving Site unless otherwise accepted by Departmental Representative.

.3 Permanently store material sent to a Disposal Facility at that facility.

.4 Submit Certificates of Disposal for all material disposed offsite.

1.19 RECORD KEEPING

.1 Maintain adequate records to support information provided to Departmental Representative regarding exception reports, annual reports, and biennial reports.

.2 Maintain bills of ladings for minimum of 375 days from date of shipment or longer period required by applicable law or regulation.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 99 – Demolition for Minor Works

.2 Section 31 00 99 – Earthworks for Minor Works

.3 Section 31 23 33.01 – Excavation, Trenching, and Backfilling.

1.2 REFERENCE STANDARDS

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

.2 Province of British Columbia

.1 Workers Compensation Act, RSBC 1996 - Updated 2012.

.3 National Building Code of Canada (NBC):

.1 Part 8, Safety Measures at Construction and Demolition Sites.

.4 Canadian Standards Association (CSA) as amended:

.1 CSA Z797-2009 Code of Practice for Access Scaffold

.2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes

.3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Submit the following:

.1 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation.

.2 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.3 Submit copies of incident and accident reports.

.4 Submit WHMIS MSDS - Material Safety Data Sheets, and all other documentation required by Workplace Hazardous Materials Information System requirements.

.5 Emergency Procedures.

.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.

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

1.4 EMERGENCY PROCEDURES

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:

.1 Designated personnel from own company.

.2 Regulatory agencies applicable to work and as per legislated regulations.

.3 Local emergency resources.

.4 Departmental Representative and site staff.

.2 Include the following provisions in the emergency procedures:

.1 Notify workers and the first-aid attendant, of the nature and location of the emergency.

.2 Evacuate all workers safely.

.3 Check and confirm the safe evacuation of all workers.

.4 Notify the fire department or other emergency responders.

.5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.

.6 Notify Departmental Representative.

.3 Provide written rescue/evacuation procedures as required for, but not limited to:

.1 Work at high angles.

.2 Work in confined spaces or where there is a risk of entrapment.

.3 Work with hazardous substances.

.4 Underground work.

.5 Work on, over, under and adjacent to water.

.6 Workplaces where there are persons who require physical assistance to be moved.

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

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

1.5 FILING OF NOTICE

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

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

.2 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.6 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project based on contract documents.

1.7 MEETINGS

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

.1 Attend all subsequent meetings called by the Departmental Representative.

1.8 REGULATORY REQUIREMENTS

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

.2 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.

.3 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.

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

1.9 GENERAL REQUIREMENTS

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

.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.

.2 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.

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

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.

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

1.10 WORKERS COMPENSATION BOARD COVERAGE

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

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

1.11 RESPONSIBILITY

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

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

.3 The Contractor is to assume the role of the "prime contractor" for the duration of the job.

1.12 COMPLIANCE REQUIREMENTS

.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.

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

1.13 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.

1.14 POSTING OF DOCUMENTS

.1 Post legible versions of the following documents on site:

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

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

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

1.15 CORRECTION OF NON-COMPLIANCE

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

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

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

1.16 WORK STOPPAGE

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

1.17 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 01 33 00 – Submittal Procedures.

.2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.

.3 Provide adequate means of ventilation in accordance with Section 01 51 00 – Temporary Utilities.

1.18 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.

1.19 BLASTING

.1 Blasting or other use of explosives is not permitted

1.20 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

.2 Section 35 42 19 – Preservation of Water Courses and Wetlands.

.3 Appendix G – Parks Canada Basic Impact Assessment (BIA) - Golder

1.2 DEFINITIONS

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

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

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

.4 Include in Environmental Protection Plan:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.

.3 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.4 Conceptual Intercepted Water Management Plan to mitigate impacts to Rogers Creek during instream works. The Conceptual Intercepted Water Management plan must describe how the works areas will be isolated and water intercepted and re-routed, including identifying the methods and procedures for management, re-routing and discharge of intercepted upstream surface waters. The Contractor will identify the equipment and systems that will be used for interception and transfer of the volume of upstream water present in Rogers

Creek as well as for treatment and discharge of non-contaminated waters generated during instream works.

.5 Contaminated Wastewater Management Plan that identifies methods and procedures for management and/or discharge of waters which are derived from work activities in contaminated areas (e.g. dewatering of groundwater in contaminated work areas). The Contractor will identify the equipment and systems that will be used for transfer, storage and treatment of dewatered contaminated wastewater. The Contractor must provide contingency for five business days minimum water storage capacity to allow for testing, laboratory analysis and communication of results.

.6 Process Water Management Plan identifying methods and procedures for management and discharge of water generated by construction processes, such as concrete curing water, clean-up water, etc. and from sanitary facilities.

.7 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.9 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

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

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

1.4 FIRES

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

1.5 WATER CONTROL

.1 Provide temporary drainage and pumping required to keep excavations and site free from water. Provide, operate, and maintain necessary equipment appropriately sized to keep work areas free from water.

.2 Have on hand sufficient pumping equipment, machinery, and tankage in good working condition for ordinary emergencies, including power outage, and competent workers for operation of pumping equipment.

.3 Prevent precipitation from infiltrating or from directly running off contaminated materials and cover stockpiled contaminated materials as outlined in Section 01 35 13.43 - Special Project Procedures for Contaminated Sites.

.4 Collect, contain and dispose of contaminated wastewater as outlined in Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

.5 Provide water control during instream works as outlined in Section 35 42 19 – Preservation of Water Courses and Wetlands.

.6 Dispose of water in manner not injurious to public health or safety, to property, or to any part of work completed or under construction.

.7 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

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

.9 Treatment of non-contaminated discharge waters is intended to control sediment concentrations in water pumped from a work area and discharged. Treatment options include:

.1 Discharge onto well vegetated areas to allow water laden with sediments to infiltrate into the ground. Discharges onto well vegetated areas shall not be undertaken when ground is snow covered or frozen as ground will have limited infiltration capacity

.2 Sediment retention and waste water storage ponds;

.3 Dedicated wastewater and filtration equipment; or

.4 Sediment retention 'bags'

.10 The Contractor is responsible for obtaining all necessary disposal and/or discharge permits as required.

1.6 SITE CLEARING AND PLANT PROTECTION

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

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes.

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

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

.4 Minimize stripping of topsoil and vegetation.

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

1.7 FISH AND WILDLIFE PROTECTION

.1 All wildlife and habitat related mitigation measures identified in the BIA provided in Appendix G must be implemented, with special emphasis on:

.1 The construction timing windows in relation to sensitive timing windows for specific wildlife/fish.

.2 Conducting instream works during timing window of least risk to fish, specifically June 1 to August 31, to protect Bull Trout and Mountain Whitefish and

.3 The implementation of any protection measures aimed at excluding wildlife species from the work area and any "no go" areas aimed at excluding project works activities from species habitats.

.2 All on site staff are to undertake all project works and activities with care, caution, and awareness to avoid killing, harming, or harassing any fish and wildlife species, and damaging or destroying habitat or disrupting species during its sensitive life stage (i.e. hibernation, reproduction, and rearing).

.3 Feeding of wildlife is prohibited.

.4 Hunting, fishing or trapping by project personnel is prohibited.

.5 Do not harass or disturb any wildlife present on site or adjacent lands.

.6 Allow Parks Canada or a qualified person designated by the Departmental Representative to inspect and survey the work site prior to vegetation clearing and instream works, to identify potential wildlife issues (e.g., hibernating animals or nursing mothers and their young, etc.) and to inform or adjust mitigation planning as needed. The timing and scope of this inspection will vary depending on the type and extent of habitat to be affected and the anticipated timing for site clearing.

.7 Inspect or "sweep" the work area daily prior to commencement of project works and activities to ensure wildlife are not present in the work area. Notify the Departmental Representative immediately if sensitive species are identified in the work area.

.8 Allow Parks Canada or qualified professionals designated by the Departmental Representative to conduct vegetation, fish and/or wildlife protection activities prior to and during construction activities and instream works as required. Notify the Departmental Representative two calendar weeks in advance of construction activities so that the Departmental Representative can coordinate vegetation, fish and/or wildlife protection activities.

.9 Parks Canada or qualified professionals designated by the Departmental Representative will notify the Departmental Representative immediately and without delay at any time that adverse impacts to sensitive species are observed or anticipated. The Departmental Representative will in turn direct the Contractor to stop work.

.10 Record incidental encounters with the following species:

.1 Amphibians: Western Toad

.2 Small mammal: American Pine Marten

.3 Large Mammal, Grizzly bear, Black bear

.4 Ungulates: deer, moose, elk

.5 Birds: Olive-sided Flycatcher (SARA Schedule 1 Threatened).

.6 Bats: Little Brown Myotis (SARA Schedule 1 Endangered), Northern Myotis (SARA Schedule 1 Endangered)

.7 Fish: Bull trout; Mountain whitefish

1.8 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

.2 Perform Work in accordance with Section 35 42 19 – Preservation of Water Courses and Wetlands.

1.9 DUST AND PARTICULATE CONTROL

.1 Execute Work by methods to minimize raising dust from construction operations.

.2 Implement and maintain dust and particulate control measures as directed by Departmental Representative.

.3 Cover or wet down dry materials to prevent blowing dust and debris. Use potable water for dust and particulate control. Use of chemical means for dust and particulate control only with Departmental Representative's prior written approval.

.4 At minimum, use appropriate covers on trucks hauling fine or dusty material. Use watertight vehicles to haul wet materials.

.5 Prevent dust from spreading to adjacent property sites.

.6 Departmental Representative will stop work at any time when Contractor's control of dusts and particulates is inadequate for wind conditions present at site, or when air quality monitoring indicates that release of fugitive dusts and particulates into atmosphere equals or exceeds specified levels.

.7 If Contractor's dust and particulate control is not sufficient for controlling dusts and particulates into atmosphere, stop work. Contractor must discuss procedures that Contractor proposes to resolve problem. Make necessary changes to operations prior to resuming excavation, handling, processing, or other work that may cause release of dusts or particulates.

1.10 POLLUTION CONTROL

.1 Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious toxic substances and pollutants produced by construction operations.

.2 Be prepared to intercept, clean up, and dispose of spills or releases that may occur whether on land or water. Maintain materials and equipment required for cleanup of spills or releases readily accessible on site.

.3 Promptly report spills and releases potentially causing damage to environment to:

.1 Authority having jurisdiction or interest in spill or release including conservation authority, water supply authorities, drainage authority, road authority, and fire department.

.2 Owner of pollutant, if known.

.3 Person having control over pollutant, if known.

.4 Departmental Representative.

.4 Contact manufacturer of pollutant if known and ascertain hazards involved, precautions required, and measures used in cleanup or mitigating action.

.5 Take immediate action using available resources to contain and mitigate effects on environment and persons from spill or release.

.6 Provide spill response materials including, containers, adsorbent, shovels, and personal protective equipment. Make spill response materials available at all times in which hazardous materials or wastes are being handled or transported. Spill response materials: compatible with type of material being handled.

.7 Volatile Organic Compounds (VOC) Control:

.1 In addition to requirements of Section 01 35 29.06 - Health and Safety Requirements, monitor air quality for volatile organics as directed by Departmental Representative during tank removal activities and during excavation of any contaminated materials, and maintain log of air quality readings.

.2 If air quality monitoring indicates that release of volatile organics in air at site boundary exceeds Level C of Personnel Protective Equipment threshold for air quality, implement corrective actions to control volatile organics.

.3 If actions are not sufficient to control release of volatile organics within 1/2 hour of identification of air quality problem, suspend work resulting in excessive volatile organic emissions. Departmental Representative and Contractor to discuss additional methods that Contractor proposes to control release of volatile organics.

.4 Make necessary changes at no additional cost to Departmental Representative prior to resuming Work.

.5 In addition, if Departmental Representative's monitoring of ambient air at site perimeter indicates unacceptable concentrations of contaminants in air, modify operations to minimize such off-site impacts

1.11 EROSION AND SEDIMENT CONTROL

.1 Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas. Prevent erosion and sedimentation.

.2 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical. Strip vegetation, regrade, or otherwise develop to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and water courses, and repair damage caused by soil erosion and sedimentation as directed by Departmental Representative.

.3 Provide and maintain temporary measures which may include, silt fences, hay or straw bales, ditches, geotextiles, drains, berms, terracing, riprap, temporary drainage piping,

sedimentation basins, vegetative cover, dikes, and other construction required to prevent erosion and migration of silt, mud, sediment, and other debris off site or to other areas of site where damage might result, or that might otherwise be required by Laws and Regulations. Make sediment control measures available during construction.

.4 Hay or Straw Bale: wire bound or string tied; securely anchored by at least 2 stakes or rebar driven through bale 300 mm to 450 mm into ground; chinked (filled by wedging) with hay or straw to prevent water from escaping between bales; and entrenched minimum of 100 mm into ground.

.5 Silt Fence: assembled, ready to install unit consisting of geotextile attached to driveable posts. Geotextile: uniform in texture and appearance, having no defects, flaws, or tears that would affect its physical properties; and contain sufficient ultraviolet ray inhibitor and stabilizers to provide minimum 2-year service life from outdoor exposure.

.6 Net Backing: industrial polypropylene mesh joined to geotextile at both top and bottom with double stitching of heavy-duty cord, with minimum width of 750 mm.

.7 Posts: sharpened wood, approximately 50 mm square, protruding below bottom of geotextile to allow minimum 450 mm embedment; post spacing 2.4 m maximum. Securely fasten each post to geotextile and net backing using suitable staples.

.8 Plan construction procedures to avoid damage to work or equipment encroachment onto water bodies or drainage ditch banks. In event of damage, promptly take action to mitigate effects. Restore affected bank or water body to existing condition.

.9 Installation:

.1 Construct temporary erosion control items as indicated. Actual alignment and/or location of various items as directed by Departmental Representative.

.2 Do not construct bale barriers and silt fence in flowing streams or in swales.

.3 Check erosion and sediment control measures weekly after each rainfall; during prolonged rainfall check daily.

.4 Bales and/or silt fence may be removed at beginning of work day, replace at end of work day.

.5 Whenever sedimentation is caused by stripping vegetation, regrading, or other development, remove it from adjoining surfaces, drainage systems, and watercourses, and repair damage as quickly as possible.

.6 Prior to or during construction, Departmental Representative may require installation or construction of improvements to prevent or correct temporary conditions on site. Improvements may include berms, mulching, sediment traps, detention and retention basins, grading, planting, retaining walls, culverts, pipes, guardrails, temporary roads, and other measures appropriate to specific condition. Temporary improvements must remain in place and in operation as necessary or until otherwise directed by Departmental Representative.

.7 Repair damaged bales, end runs, and undercutting beneath bales.

.8 Unless directed by Departmental Representative, remove temporary erosion and sediment control devices upon completion of Work. Spread accumulated

sediments in on-site location approved by Departmental Representative or dispose of sediments off-site. Materials once removed become property of Contractor.

.10 Construct fill areas by selective placement to avoid erosive surface silts or clays.

.11 Do not disturb existing embankments or embankment protection.

.12 Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

.13 If soil and debris from site accumulate in low areas, storm sewers, roadways, gutters, ditches, or other areas where in Departmental Representative's determination it is undesirable, remove accumulation and restore area to original condition.

1.12 REMOVAL AND DISPOSAL

.1 Remove surplus materials and temporary facilities from site.

.2 Dispose of contaminated waste material as outlined in Section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

.3 Dispose of non-contaminated waste materials, litter, debris, and rubbish off site.

.4 Do not burn or bury rubbish and waste materials on site.

.5 Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

.6 Do not discharge wastes into streams or waterways.

.7 Dispose of following materials at appropriate off-site facility identified by Contractor and approved by Departmental Representative:

- .1 Debris including excess construction material.
- .2 Non-contaminated litter and rubbish.
- .3 Disposable PPE worn during final cleaning.
- .4 Wastewater generated from final decontamination operations including wastewater storage tank cleaning.
- .5 Lumber from decontamination pads.

.8 Dispose of materials as directed by Departmental Representative.

.9 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

.10 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:

- .1 Hazardous wastes recycled in manner constituting disposal;
- .2 Hazardous waste burned for energy recovery;
- .3 Lead-acid battery recycling;
- .4 Hazardous wastes with economically recoverable precious metals.

1.13 HISTORICAL/ ARCHAEOLOGICAL CONTROL

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

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

1.14 NOTIFICATION

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

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

.1 Take action only after receipt of written approval by Departmental Representative.

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

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 CLEANING

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

.1 Leave Work area clean at end of each day.

.2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.4 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 77 00 – Closeout Procedures.

1.2 INSPECTION

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

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

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

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

1.3 INDEPENDENT INSPECTION AGENCIES

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

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

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

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

1.4 ACCESS TO WORK

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

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

1.5 PROCEDURES

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

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

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

1.6 REJECTED WORK

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

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

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

1.7 REPORTS

.1 Submit 4 copies of inspection and test reports to Departmental Representative in accordance with Section 01 33 00 – Submittal Procedures.

1.8 EQUIPMENT AND SYSTEMS

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 43 – Environmental Procedures.

1.2 REFERENCE STANDARDS

.1 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).

.2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

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

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.5 DEWATERING

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

1.6 WATER SUPPLY

.1 Departmental Representative will not provide continuous supply of potable water for construction use.

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

1.7 TEMPORARY HEATING AND VENTILATION

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

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

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.3 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.4 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

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

1.8 TEMPORARY COMMUNICATION FACILITIES

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

1.9 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 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 Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas. Prevent erosion and sedimentation.

.3 Provide and maintain temporary measures which may include, silt fences, hay or straw bales, ditches, geotextiles, drains, berms, terracing, riprap, temporary drainage piping, sedimentation basins, vegetative cover, dikes, and other construction required to prevent erosion and migration of silt, mud, sediment, and other debris off site or to other areas of site where damage might result, or that might otherwise be required by Laws and Regulations. Make sediment control measures available during construction..

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 – Cleaning.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

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

1.3 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.4 HOARDING

.1 Erect temporary site enclosures using one of the following:

.1 Construction grade lumber framing, exterior grade fir plywood to CSA O121.

.2 Temporary construction fencing made galvanized steel that is 2.235 m height and 2.965 m center on center.

.3 Erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Maintain fence in good repair.

.2 Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.

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

1.5 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations in excess of 0.6m.

.2 Provide additional barricades as required by Departmental Representative on site and governing authorities.

1.6 WEATHER ENCLOSURES

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

1.7 DUST TIGHT SCREENS

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

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

1.8 ACCESS TO SITE

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

1.9 PUBLIC TRAFFIC FLOW

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

1.10 FIRE ROUTES

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

1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.12 PROTECTION OF BUILDING FINISHES

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

.2 Provide necessary screens, covers, and hoardings.

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

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

1.13 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.14 SIGNAGE

.1 Provide signage on fencing identifying:

.1 DANGER – EXCAVATION

.2 NO SMOKING AND NO IGNITION SOURCES

.3 Personal Protective Equipment required to enter the fenced area.

.4 Contractor point-of-contact information in event of emergency.

.2 Signage to be constructed of plywood or aluminum backing.

.3 Place signage in 1.14.1 at all entry points into area of work.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCE STANDARDS

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

1.3 QUALIFICATIONS OF SURVEYOR

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

1.4 SURVEY REFERENCE POINTS

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

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

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

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

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

1.5 SURVEY REQUIREMENTS

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

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

.3 Stake for grading, fill placement.

.4 Establish pipe invert elevations.

1.6 EXISTING SERVICES

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

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

1.7 LOCATION OF EQUIPMENT AND FIXTURES

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

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

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

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

1.8 RECORDS

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

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

1.9 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit all required documentation in accordance with Section 01 33 00 – Submittal Procedures

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

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

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

1.10 SUBSURFACE CONDITIONS

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

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 56 00 – Temporary Barriers and Enclosures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

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

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

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

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

.6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.7 Dispose of waste materials and debris off site.

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

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

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

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

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

1.3 FINAL CLEANING

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

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

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

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

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

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

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

.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 Clean and sweep roofs, gutters, areaways, and sunken wells.

.11 Sweep and wash clean paved areas.

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

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

.14 Remove snow and ice from access to building.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - 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

Part 1 General

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work, submit for approval a written Waste Management plan to the Department Representative. Approval must be obtained prior to beginning onsite work.

.2 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.

.3 Protect environment and prevent environmental pollution damage.

1.2 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast in place Concrete.

.2 Section 03 39 50 – Geosynthetic Concrete Composite Mat.

.3 Section 31 32 19.01 – Geotextiles.

.4 Section 33 31 13 – Public Sanitary Utility Sewerage Piping

1.3 DEFINITIONS

.1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.

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

.3 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.

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

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

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

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

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

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

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

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

.10 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

.11 Waste Audit (WA): detailed inventory of estimated quantities of waste materials that will be generated during construction, demolition, deconstruction and/or renovation. Involves quantifying by volume/weight amounts of materials and wastes that will be reused, recycled or landfilled. Refer to Schedule A.

.12 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Workplan (Schedule B) information acquired from Waste Audit.

1.4 DOCUMENTS

.1 Post and maintain in visible and accessible area at job site, one copy of following documents:

- .1 Waste Audit (Schedule A).
- .2 Waste Reduction Workplan (Schedule B).
- .3 Waste Source Separation Program.
- .4 Schedules A & B completed for project.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prepare and submit following prior to project start-up:

- .1 Electronic copies of completed Waste Audit (WA): Schedule A.
- .2 Electronic copies of completed Waste Reduction Workplan (WRW): Schedule B.
- .3 Electronic copies of Waste Source Separation Program (WSSP).

1.6 WASTE AUDIT (WA)

.1 Prepare WA prior to project start-up.

.2 WA provides detailed inventory, estimated quantities and types of waste materials that will be generated as well as their potential to be reused and/or recycled and project's waste diversion goals and objectives.

.3 After award of contract, contractor to review WA and confirm that anticipated quantities of waste generated are accurate and goals achievable.

1.7 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare and submit WRW (Schedule B) prior to project start-up.

.2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations, based on information acquired from WA.

.3 WRW should include but not limited to:

- .1 Destination of materials identified.
- .2 Deconstruction/disassembly techniques and schedules.
- .3 Methods to collect, separate, and reduce generated wastes.
- .4 Location of waste bins on-site.
- .5 Security of on-site stock piles and waste bins.
- .6 Protection of personnel, sub-contractors.
- .7 Clear labelling of storage areas.
- .8 Training plan for contractor and sub-contractors.
- .9 Methods to track and report results reliably (Schedule D).
- .10 Details on materials handling and removal procedures.
- .11 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.

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

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

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

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

.8 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project (Schedule D).

1.8 WASTE SOURCE SEPARATION PROGRAM (WSSP)

.1 As part of Waste Reduction Workplan, prepare WSSP prior to project start-up.

.2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.

.3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.

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

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

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

.7 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.

1.9 USE OF SITE AND FACILITIES

.1 Execute Work with minimal interference and disturbance to normal use of premises.

.2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

1.10 STORAGE, HANDLING AND PROTECTION

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

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

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed and salvaged materials from movement or damage.

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

.7 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.

.8 Separate and store materials produced during project in designated areas.

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

.1 On-site source separation is recommended.

.2 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

1.11 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

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

1.12 SCHEDULING

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 APPLICATION

.1 Do Work in compliance with WRW and WSSP.

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

3.2 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 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

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

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

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

.3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Metals	100	
Rubble	100	
Wood (uncontaminated)	100	
Other		

.4 Construction Waste:

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

3.4 WASTE DIVERSION REPORT

.1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:

.1 Identify final diversion results and measure success against goals from Waste Reduction Workplan.

.2 Compare final quantities/percentages diverted with initial projections in Waste Audit and Waste Reduction Workplan and explain variances.

.1 Supporting documentation.

.2 Waybills and tracking forms.

.3 Description of issues, resolutions and lessons learned.

3.5 WASTE AUDIT (WA)

.1 Schedule A – Waste Audit (WA)

Material Category	Material Quantity Unit	Estimated Waste %	Total Quantity of Waste (unit)	Generation Point	% Recycled	% Reused

3.6 WASTE REDUCTION WORKPLAN (WRW)

.1 Schedule B

(1) Material Category	(2) Person(s) Responsible	(3) Total Quantity of Waste (unit)	(4) Reused Amount (units) Projected Actual	(5) Recycled Amount (unit) Project Actual	(6) Material Destination
Wood and Plastics Material Description					
Chutes					
Warped Pallet Forms					
Plastic Packaging					
Cardboard Packaging					
Wood					
Metal					
Other					

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 78 00 – Closeout Submittals.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Departmental Representative Inspection:

.1 Notify the Departmental Representative in writing of satisfactory completion claim and request the Departmental Representative's inspection. A minimum of 7 days' notice is required.

.2 Department Representative will complete an inspection and prepare a list of deficiencies and/or outstanding work.

.3 Contractor to correct Work as directed by Departmental Representative.

.2 Completion Tasks: submit written certificates in English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Operation of systems: demonstrated to required personnel.

.4 Work: complete and ready for final inspection.

.3 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative.

.2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.

.4 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

1.3 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – 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

Part 1 General

1.1 RELATED REQUIREMENTS

.1 33 05 16 – Maintenance Holes and Catch Basin Structures

.2 33 31 13 – Public Sanitary Utility Sewerage Piping.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative to:

.1 Verify Project requirements.

.2 Review manufacturer's installation instructions and warranty requirements.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

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

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

1.4 FORMAT

.1 Organize data as instructional manual.

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

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

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

.5 Arrange content by systems (i.e. utilities, controls) under Section numbers and sequence of Table of Contents.

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

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

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide Record Drawings and Final Survey data.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

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

.1 Date of submission; names.

.2 Addresses and telephone numbers of Departmental Representative and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

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

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

.5 Typewritten Text: as required to supplement product data.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

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

1.6 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, onsite for Departmental Representative one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

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

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of Contract Drawings.

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

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 Referenced Standards to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

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

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

1.8 FINAL SURVEY

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

1.9 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics and limiting conditions.

.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

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

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 Include summer, winter, and any special operating instructions.

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

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

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

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

1.10 MAINTENANCE MATERIALS

.1 Spare Parts:

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

.2 Extra Stock Materials:

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

.3 Special Tools:

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

1.11 DELIVERY, STORAGE AND HANDLING

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

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

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

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

.5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.12 WARRANTIES AND BONDS

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

.2 Submit warranty management plan, 15 days before planned pre-warranty conference, to Departmental Representative approval.

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

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

.5 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

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

.7 Conduct joint 12 month warranty inspection, measured from time of acceptance, by Departmental Representative.

.8 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Provide list for each warranted equipment, items, and features of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

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

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

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

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

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

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

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

.3 Contractor's plans for attendance at 12 month post-construction warranty inspection.

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

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

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

.10 Written verification to follow oral instructions.

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

1.13 WARRANTY TAGS

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

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

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

.4 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 33 05 13 – Maintenance Holes and Catch Basin Structures

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate operation and maintenance of equipment and systems to Departmental Representative prior to date of final inspection.

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

.3 Preparation:

- .1 Verify conditions for demonstration and instructions comply with requirements.
- .2 Verify designated personnel are present.
- .3 Ensure equipment has been inspected and put into operation in accordance with manufacturer's recommendations, Contract Specifications, and to the satisfaction of the Departmental Representative.
- .4 Ensure testing, adjusting, and balancing has been performed as required and equipment and systems are fully operational.

.4 Demonstration and Instructions:

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

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

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

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

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.4 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct personnel designated by Departmental Representative on use.

.2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

Part 2 Products

2.1 EQUIPMENT

.1 Where applicable, use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

Part 3 Execution

3.1 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.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 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.

.3 Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

3.2 REMOVAL

.1 Remove existing asphalt pavement to lines and grades as indicated by Departmental Representative.

.2 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

.3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.4 Suppress dust generated by removal process.

.1 Use non-petroleum based dust control methods only

.5 Asphalt removed to be transported to Beaver Pit and crushed into base aggregate – not for reuse on this project.

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 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

.4 Waste Management: separate waste materials for reuse and 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.

.2 Removed asphalt pavement which is to be recycled in hot mix asphalt concrete under this contract may be stockpiled at designated asphalt plant site.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian Federal Legislation.

- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .2 Canadian Environmental Assessment Act (CEAA), 2012.
- .3 Transportation of Dangerous Goods (TDGA), 1992, c. 34.
- .4 Motor Vehicle Safety Act (MVSA), 1995.
- .5 CSA S350 M1980 (R1998), Code of Practice for Safety in Demolition of Structures.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures and 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Sections 01 74 21 - Construction/Demolition Waste Management and Disposal and 01 11 05 - General Instructions and indicate:

- .1 Descriptions of and anticipated quantities of materials to be salvaged reused, recycled and landfilled.
- .2 Schedule of selective demolition.
- .3 Number and location of dumpsters.
- .4 Anticipated frequency of tippage.
- .5 Name and address of waste facilities.

1.3 SITE CONDITIONS

.1 Review "Waste Reduction Workplan" and take precautions to protect environment.

.2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.

- .1 Proceed only after receipt of written instructions have been received from Departmental Representative.

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 EXAMINATION

.1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

.4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.

.1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.

.2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PREPARATION

.1 Protection of In-Place Conditions:

.1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

.5 In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.

.6 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 Demolition/Removal:

.1 Remove items as indicated on drawings and as directed by Departmental Representative.

.2 Asphalt in the work area will be cut to provide a clean finishing surface. The cuts shall be straight and at right angles.

.3 Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Departmental Representative. When utility lines are encountered that are not indicated on the drawings, the Departmental Representative shall be notified prior to further work in that area.

.4 Protect underlying and adjacent granular materials.

.5 Excavate at least 300mm below pipe invert when removing pipes.

.6 Structure Removal, Pipes:

.1 This item shall consist of removing the existing waste transfer pipes on the construction drawings. This includes the complete removal of the pipes.

.2 Approximate locations of piped to be removed are shown on the construction drawings. Actual locations shall be determined during the construction process.

.3 Salvage of the materials will be acceptable upon approval of the Departmental Representative.

.4 Materials not suitable to be buried or salvaged should be disposed of at on offsite disposal area of the Contractors own choosing and at the Contractor's own expense in accordance with provincial and local regulations.

.5 Plastic and steel pipes must be removed from the site and properly disposed of.

.7 Obtain written approval of Departmental Representative prior to removing trees not designated for removal.

.8 Stockpile topsoil for final grading and landscaping, ensuring proper erosion control if not immediately used.

.9 Backfill:

.1 Backfill in areas as indicated.

.2 Backfill material and compaction to Section 31 00 99 – Earthworks for Minor Works.

3.3 SALVAGE

.1 Remove items to be reused, store as directed by Departmental Representative and re-install where specified.

3.4 RESTORATION

.1 Restore areas and existing works outside areas of demolition to match conditions of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

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

.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCE STANDARDS

.1 American Concrete Institute (ACI)

- .1 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.
- .2 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 ASTM International

- .1 ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- .2 ASTM A 143/A 143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- .3 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .4 ASTM A497/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
- .5 ASTM A 775/A 775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

.3 CSA International

- .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
- .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .4 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .5 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .6 CSA W186-M1990 (R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

- .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 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, ANSI/ACI 315, and ACI 315R.

.3 Shop Drawings:

.1 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacing, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacing and locations of chairs, spacers and hangers.

.2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

1.4 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control and as described in Part 2.3 of this Section - SOURCE QUALITY CONTROL.

.1 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials off ground on platform, skids, or racks, and protect from prolonged exposure to weather.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: billet steel, grade 400R, deformed bars to CSA-G30.18, bearing identifying marks indicating size and grade. .

.3 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.

.4 Deformed steel wire for concrete reinforcement: to ASTM A 82/A 82M.

.5 Welded steel wire fabric: to ASTM A 185/A 185M.

.1 Provide in flat sheets only.

.6 Epoxy Coating of non-prestressed reinforcement: to ASTM A 775/A 775M.

.7 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/mý.

.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.

.8 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.9 Mechanical splices: subject to approval of Departmental Representative.

.10 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, 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 A 775A/A 775M.

2.3 SOURCE QUALITY CONTROL

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

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

Part 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 A 143/A 143M.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.3 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Ensure materials, before being placed, are free of loose scaly rust, dirt, oil, paint or other bond-breaking coating.

.3 Use plain round bars as slip dowels in concrete.

.4 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.1 The Departmental Representative's approval indicates review for general conformance with the contract documents only and does not relieve the Contractor of his responsibility for the accuracy and correctness of the Work

.5 Unless indicated otherwise on the Drawings, provide minimum concrete cover for reinforcement in cast-in-place concrete as follows.

.1 Cast-on-grade: 75 mm

.2 All other: 50 mm

.6 Tolerances for placing reinforcing steel shall be in accordance with CAN/CSA-A23.1 as applicable, except that concrete cover to reinforcing steel shall not be reduced by more than 6 mm

.7 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 reuse 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 03 20 00 – Concrete Reinforcing.

.2 Section 31 00 99 – Earthworks for Minor Works.

.3 Section 33 05 15 – Maintenance Holes and Catch Basin Structures

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 CAN/CSA-A23.1 Concrete Materials and Methods of Concrete Construction (Including Notes and Appendices in the Standard).

.2 ASTM C 260/C 260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.3 ASTM C 309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C 494/C 494M-10a, Standard Specification for Chemical Admixtures for Concrete.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 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: convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure Departmental Representative attends.

.1 Verify project requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit concrete mix designs of any mix designed by the Contractor to the Departmental Representative for review 14 days prior to placement. Concrete mix design submittals shall include the mass in kilograms of fine aggregate, coarse aggregate, cement, fly ash, silica fume and water in each cubic metre of concrete. Concrete mix design submittals shall specify the properties of the concrete.

.1 At least four weeks prior to commencing work of this section, inform the Departmental Representative of proposed source of aggregates and provide access for sampling.

.3 Provide testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.1 Submission of test results will not relieve the Contractor from his obligation to interpret the test results and make necessary corrections or adjustments to his construction procedures or mix designs.

.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.

.1 Submit a letter of assurance that the proposed aggregate source will not produce concrete that will be compromised by deleterious effects from alkali-aggregate reaction

.5 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 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.

.3 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.

.4 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 delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.2 Packaging Waste Management: remove for reuse and return of pallets and crates in accordance with Section 01 74 21 – Construction Demolition Waste Management and Disposal.

Part 2 Products

2.1 PERFORMANCE CRITERIA

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

2.2 MATERIALS

.1 Portland Cement and Supplementary Cementing Material : Type GU Portland cement to CAN/ CSA-A3000.

.2 Water: to CAN/ CSA-A23.1.

.3 Aggregates: to CAN/ CSA-A23.1, normal density.

.4 Air Entraining Admixtures: to ASTM C260.

.5 Chemical Admixtures: to ASTM C494. Departmental Representative to approve type and use of accelerating or set-retarding admixtures during cold and hot weather placing.

.6 Curing Compound: to CSA A23.1 and ASTM C309.

2.3 FORMWORK MATERIALS

.1 Formwork materials shall meet the requirements of CAN/ CSA-S269.3 and this section.

.2 Contact surfaces or lining of formwork shall be suitably smooth to provide finished concrete surfaces meeting the requirements of this section.

.3 Form Ties: threaded internal disconnecting type, leaving no holes larger than 1 in. diameter in concrete surface.

.4 Form Release Agent: non-staining chemically active release agent, compatible with form material which will prevent adherence of concrete to forms.

2.4 MIXES

.1 Select concrete mix proportions in accordance with CAN/ CSA-A23.1 to give the following properties for all cast-in-place concrete unless specified otherwise on design Drawings:

.1 Minimum Compressive Strength at 28 Days: 30 MPa.

.2 Maximum Water/Cementing Materials Ratio: 0.40.

.3 Exposure Class: C-1.

.4 Nominal Maximum Size of Coarse Aggregate: 20 mm.

.5 Slump at Time and Point of Discharge: 130 mm ± 25 mm.

.6 Air Content: 5% to 8%.

.2 Do not change concrete mix without prior approval of the Departmental Representative. Should change in material source be proposed, new mix design to be approved by the Departmental Representative.

2.5 CONCRETE PRODUCTION

.1 Measure, batch and mix concrete in accordance with CAN/ CSA-A23.1.

.2 Before unloading concrete at the Site, furnish the Departmental Representative with a delivery ticket for each batch of concrete in accordance with CAN/ CSA-A23.1

Part 3 Execution

3.1 GENERAL

.1 Prior to placing concrete, ensure that all reinforcing and other items to be embedded in concrete are in place, properly oriented, located, and secured. Verify that concrete may be placed to the lines and elevations shown on the Drawings with all required

clearances and cover for reinforcement. Ensure that forms are clean and absolutely all debris has been removed.

.2 Obtain the Departmental Representative's approval before placing concrete. Provide 48 hours notice prior to placing of concrete.

.3 Prior to placing concrete, obtain the Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.4 Maintain accurate records of poured concrete items to indicate date, location of pour, quantity, air temperature and any Contractor's test samples taken.

3.2 FORMWORK

.1 Construct and erect formwork in accordance with CAN/ CSA-S269.3

.2 Assemble forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/ CSA-A23.1.

.3 Align form joints and make watertight. Use minimum number of form joints.

.4 Clean formwork in accordance with CAN/ CSA-A23.1 before placing concrete.

3.3 PREPARATION

.1 Set sleeves, anchor bolts and other inserts as indicated or specified elsewhere. Sleeves and openings greater than 100 mm and not indicated on structural Drawings must be approved by the Departmental Representative.

.2 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from the Departmental Representative before placing of concrete.

3.4 PLACING OF CONCRETE – GENERAL

.1 Handle, deposit and consolidate concrete in accordance with CAN/ CSA-A23.1 and ACI A309R. Take care not to disturb forms or reinforcing steel when depositing and consolidating concrete.

.2 Ensure that spare internal vibrators or external form vibrators are on hand during placing of concrete.

.3 Unless specified otherwise, where fresh concrete will be placed against hardened concrete, bond the fresh concrete to the hardened concrete in accordance with CAN/ CSA-A23.1.

3.5 CONSTRUCTION JOINTS

.1 Make construction joints in accordance with CAN/ CSA-A23.1.

.2 Locate construction joints as indicated on the Drawings or as approved by the Departmental Representative. Construction joints not indicated on the Drawings will not be permitted without the prior authorization of the Departmental Representative.

3.6 FINISHING UNFORMED SURFACES

.1 Top surfaces of concrete which will ultimately receive additional concrete:

.1 Screed the surface across the grade strips or forms so that the resulting surface will have no irregularities greater than the maximum size aggregate.

.2 Roughen the surface with 6 mm amplitude.

.3 Prior to placing additional concrete, clean the surface of: laitance, dirt, excess water, and other deleterious material. Do not use hydro-milling until sufficient time has elapsed to prevent loosening of the top aggregate.

.2 Top Surface of Exposed Concrete:

.1 Initial Finishing: immediately after placing concrete, screed the surface to the indicated grade and Work the surface with a bull float, or with a darby and highway straight edge, in accordance with CAN/ CSA-A23.1. Complete initial finishing before any bleeding or free water is present on the concrete surface.

.2 Begin final finishing operations after the bleed water has disappeared and the concrete has stiffened sufficiently to prevent the working of excess mortar to the surface. Do not add water to facilitate finishing. Carry out final finishing operations in accordance with CAN/ CSA-A23.1.

.3 Unless noted otherwise, exterior surfaces shall receive a light broom finish, with broom striations approximately 2 mm deep.

.3 Finished surfaces shall conform to the slopes specified on the Drawings.

3.7 FINISHED FORMED SURFACES

.1 Finish formed surfaces in accordance with CAN/CSA-A23.1 and as specified below.

.2 Formed surfaces which may ultimately serve as forms for additional concrete pour or which will remain unexposed:

.1 The surface may contain shear keys, reinforcing steel, anchor bolts, or other embedment's as indicated on the Drawings.

.2 Repair honeycomb concrete and fill form-tie holes. Remove fins and ridges from concrete surfaces.

.3 Clean the surface of laitance, dirt, excess water, and other deleterious material prior to applying waterproofing treatment or placing additional concrete.

3.8 CURING AND PROTECTION

.1 Cure and protect concrete in accordance with CAN/ CSA-A23.1 and as specified below.

.2 Cure topping concrete by the application of wetted burlap immediately after completion of finishing operations. Maintain burlap in a saturated condition using soaker hoses wrapped in burlap and installed on top of the deck surface. When the daily mean ambient temperature is above 5 deg. C, curing shall be continuous for a minimum of seven days or for the time necessary to attain 70% of the specified 28 day compressive strength.

.3 When the air temperature is at or above 27 deg. C, or when there is a probability of it rising to 27 deg. C during the placing period (as forecast by the nearest official meteorological office), conform also to the requirements of ACI 305R - Hot Weather Concreting.

.4 When the air temperature is at or below 5 deg. C, or when there is a probability of it falling below 5 deg. C within 24 hours of placing (as forecast by the nearest official meteorological office), conform also to the requirements of ACI 306R - Cold Weather Concreting.

3.9 TOLERANCES

.1 Tolerances for concrete Work as built shall conform to CAN/ CSA-A23.1 unless indicated otherwise.

.2 Finish tolerances for concrete topping shall meet the requirements for the conventional (non-slip) Class B surface of CAN/ CSA-A23.1 Table 16.

.3 The flatness of the topping surface will be determined by the straightedge method as outlined in CAN/ CSA-A23.1.

3.10 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at 7 and 28 days.

.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting for Departmental Representative.

.4 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

.5 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.11 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition 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 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,

.7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for constructing new Geosynthetic Concrete Composite Mat (GCCM) that consists of a flexible, three-dimensional fiber matrix impregnated with cement that hardens when hydrated to form a durable concrete layer.

1.2 RELATED SECTIONS

.1 Section 01 11 05 – General Instructions.

.2 Section 03 20 00 - Concrete Reinforcement.

.3 Section 03 30 00 – Cast in place Concrete.

.4 Section 31 00 99 – Earthworks for Minor Works.

1.3 REFERENCES

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

- .1 ASTM C473 – Standard Test Methods for Physical Testing of Gypsum Panel Products
- .2 ASTM C773 – Standard Test Method for Compressive (Crushing) Strength of Fired Whiteware Materials
- .3 ASTM C1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards
- .4 ASTM D5035 – Breaking Strength and Elongation of Textile Fabrics – Strip Method
- .5 ASTM D5199 – Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
- .6 ASTM D5261 – Standard Test Method for Measuring Mass Per Unit Area of Geosynthetics
- .7 ASTM D5993 – Standard Test Method for Measuring Mass Per Unit of Geosynthetic Lay Liner

1.4 SUBMITTALS

.1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.

.2 Certifications: Manufacturer shall submit a letter of certification that the product meets or exceeds all technical and packaging requirements.

1.5 SCHEDULING OF WORK

.1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

Part 2 Products

2.1 MATERIALS

.1 Pre-packaged by the Manufacturer.

.2 GCCM shall be a polyester fiber matrix, which is cement impregnated and PVC backed, manufactured in rolls that conforms to the shape of its substrate and hardens when watered.

.1 Components

.1 Fabric – polyester

.2 Cement – specially formulated

.3 PVC Backing

.2 Aggregate: to CSA A82.56.

.3 Cement: to CAN/CSA-A8.

.3 Accessories

.1 Anchoring Devices

.1 GCCM shall be secured in place using heavy-duty metal staples or spikes. The metal staples shall be U-shaped, a minimum of 6 inch long (each leg), one and one half (1-1/2) inches wide, and shall be fabricated from 9 gauge diameter metal wire.

.2 Stakes shall be 12inches minimum, with 2 inch washers

.3 Fastening Screws: Stainless Steel #10 or #12 Hex head self-tapping course thread, ½ to 1 inch in length (depending on subsurface conditions) used for securing all overlaps together. See drawings for placement and frequency.

.4 Adhesive Caulk (if required, see drawings): Loctite PL Premium Polyurethane, Sikaflex 1A or other adhesive that has been demonstrated in laboratory tests to adhere to both sides of the Concrete Cloth. Strictly comply with manufacturer's installation instructions and recommendations. See drawing for placement.

.5 Earth Percussion Anchors (if required, see drawings): Gripple Inc, Platipus or equal. Strictly comply with manufacturer's installation instruction and recommendations to determine load capacity. See Drawing for placement

.4 8mm GCCM

.1 The GCCM shall conform to the following properties under laboratory conditions.

Property	Test Method	Indicative Properties (English)
Physical		
Thickness (uncured)	ASTM D5199	0.31 inches
Thickness (cured)	ASTM D5199	0.35 inches
Mass/unit area (uncured)	ASTM D5261 and D5993	2.5 psf
Mass/unit area (cured)	ASTM D5261 and D5993	3.4 psf
Performance		
Compressive Strength	ASTM C473 and C773	5800 psi
Ultimate Strip Tensile Strength (MD) (cured)	ASTM D5035	49 lb/in
Ultimate Strip Tensile Strength (MD) (uncured	ASTM D5035	108 lb/in
3 Point Bending Strength	ASTM C1185	490 psi

.2 Packaging

.1 Roll size

.1 Batch Roll: 3.6 ft. by 15 feet (54 sq.ft./roll)

.2 Bulk Roll: 3.6 ft. by 373 feet (1,346.0 sq.ft./roll)

.2 Weight

.1 Batch Roll: 135 lbs. per roll

.2 Bulk Roll: 3,354 lbs

.5 13mm GCCM

.1 The GCCM shall conform to the following properties under laboratory conditions.

Property	Test Method	Indicative Properties (English)
Physical		
Thickness (uncured)	ASTM D5199	0.51 inches
Thickness (cured)	ASTM D5199	0.54 inches
Mass/unit area (uncured)	ASTM D5261 and D5993	3.9 psf
Mass/unit area (cured)	ASTM D5261 and D5993	5.3 psf
Performance		
Compressive Strength	ASTM C473 and C773	5800 psi
Ultimate Strip Tensile Strength (MD) (cured)	ASTM D5035	111 lb/in
Ultimate Strip Tensile Strength (MD) (uncured	ASTM D5035	114 lb/in
3 Point Bending Strength	ASTM C1185	490 psi

.2 Packaging

.1 Roll size

.1 Bulk Roll: 3.6 ft. by 239 feet (862.0 sq.ft./roll)

.2 Weight

.1 Bulk Roll: 3,354 lbs

Part 3 Execution

3.1 SUBSTRATE PREPARATION

.1 Examine substrates and conditions where materials will be applied. Ensure surface is relatively flat to achieve optimum contact of the GCCM with soil surface unless it is the desire of the designer to create an energy dissipation structure with considerable roughness.

.2 Erosion features such as rills, gullies, etc. must be graded out of the surface before GCCM deployment.

.3 Apply the GCCM to geotechnically stable slope(s) or channel(s), otherwise, compact the surface (as required by the Engineering plans/specifications) before deploying GCCM.

.4 Make sure the GCCM makes direct contact with the surface to minimize soil bridging or potential soil migration under the GCCM.

.5 Do not proceed with installation until satisfactory conditions are established.

.6 Rocks or foreign objectives larger than 1 inch in diameter and any other material which could damage the GCCM or not allow the GCCM to be directly in contact with the surface shall be removed from the surface.

.7 Each day during placement of GCCM, the Departmental Representative shall inspect the surface on which GCCM is to be placed and certify in writing that the surface is acceptable.

.8 Repairs to the subgrade shall be performed at no additional cost.

.9 During placing when adhesive seaming of the overlaps are required, the subgrade shall be kept free of all standing water to allow the adhesive to cure per manufacturer's requirements unless the adhesive manufacturer lists application of the adhesive underwater as a recommended use.

.10 Depending upon project sequencing and intended application, prepare subgrade in compliance with other specifications.

.11 Cut trenches for initial anchor trenches, termination trenches and longitudinal anchor trenches (min 6 inches deep) as shown on the drawings.

.12 Where appropriate or required, cut intermediate check slots at 30-40 ft. apart, perpendicular to channel flow direction (min. 3 inches wide and min. 6 inches in depth) depending on channel alignment. This is an acceptable alternative if approved by Departmental Representative prior to installation

3.2 INSTALLATION

.1 Installation to be completed by Sub-Contractor specialized in GCCM applications.

.2 Strictly comply with manufacturer's installation instructions/recommendations and drawings.

.3 Each panel of the GCCM shall be rolled out and installed in accordance with the approved shop drawings prepared by the Contractor or as depicted on the drawings. The layout shall be designed to keep field seams of the concrete cloth to a minimum and consistent with proper methods of manufacturer's installation requirements. The GCCM shall be free of tensile stresses, folds, and wrinkles.

.4 GCCM rolls shall be placed using proper spreader and rolling bars so that the GCCM would not be stretched during deployment.

.5 The Contractor shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired.

.6 Personnel working on the GCCM shall not wear damaging shoes or involve themselves in any activity that may damage the GCCM.

.7 Vehicular traffic across the GCCM shall not be allowed, except as specified herein. When the subgrade has been prepared and is stiff enough to carry vehicle traffic or a designed base is constructed to carry the vehicle traffic, vehicle traffic will be allowed. Otherwise vehicle traffic over the GCCM may very well deform into ruts that form in the subgrade.

.8 All damaged areas and destructive sample locations shall be recorded and located on the as-built drawings.

.9 The GCCM shall be kept free of debris, unnecessary tools and materials. In general, the GCCM area shall remain neat in appearance.

.10 Should it be necessary to place equipment required to perform the installation on top of the GCCM, a scrap piece of the GCCM shall be placed under the equipment and between the equipment and the GCCM being installed in order to protect from possible damage.

.11 No equipment shall be allowed to remain on top of the installed GCCM overnight. All equipment must be removed and stored away from the installed GCCM.

.12 Care shall be taken during installation to avoid damage occurring to the GCCM as a result of the installation process. Should the GCCM be damaged during installation, a GCCM patch shall be placed over the damaged area extending a minimum of 6 inches in all directions beyond the damaged area and attach the GCCM in place according to the manufacturer's instructions.

.13 Remove the protective plastic cover of each GCCM roll only when ready to deploy and install to prevent undue exposure to humidity, precipitation or other construction activities that would cause the GCCM to start to hydrate prior to completing the installation of the roll.

.14 Install the approved anchoring devices if required (will depend on application, soils and terrain) at a minimum frequency of 0.25 pins/staples per square yard. Additional anchoring devices may be required depending on site conditions or alignment of the slope or channel. See drawings for required anchor systems and spacing.

.15 When overlapping successive GCCM rolls or edge rolls, the rolls shall be overlapped upstream over downstream and/or upslope over downslope to allow for shingling and prevent water from striking exposed edges in the direction of water flow.

.16 Channel applications

.1 Begin at the downstream end of the channel. Inspect trenches for position accuracy and depth and re-dig to required dimensions. If trenches have not yet been constructed, dig termination anchor trench, check slot trenches and longitudinal anchor trenches as illustrated in installation guidelines or as directed on the plans. Unroll and cut the GCCM to the desired length. Position and deploy the GCCM over the termination trench, see drawings for overlap directions – PVC side should always be facing down). Secure the GCCM within the termination trench and longitudinal trench with the appropriate anchor device when required. See drawing for placement and frequency.

.2 Position the next panel with a 4 inch overlap from the previous panel installation. Continue deploying the GCCM upstream to the next check slot. Overlap a minimum of 4 inches the ends of rolls with the next roll(s) being deployed, or position in bottom of check slot and anchor. If significant water has accumulated within the anchor trench, remove excess water as directed by engineer or owner. Install anchoring devices and fasten screws as shown on drawings. Apply Mechanical Channel, Adhesive Caulk, fasten screws or Adhesive Tape (if required) concurrently during the overlap process of deploying the next GCCM over the previous GCCM installation panel. Always backfill intermediate check slots prior to deploying the next GCCM panel over the backfill check slot. Only install what can be fully installed hydrated (including anchor devices) before the end of construction day to minimize any adverse effect on the installation and/or performance capabilities of the product.

.17 Slope applications

.1 Construct top anchor trench 1-3 ft beyond crest of slope, or as illustrated in drawings or shown in manufacturers recommended installation guidelines. Position GCCM roll at crest of slope with sufficient material to line the anchor trench as illustrated in the drawings. Position adjacent rolls to facilitate 4 inch overlaps. Anchor GCCM in trench with appropriate pins/staples at the required intervals as shown on the drawings. The preferred method of deployment is to roll the GCCM down slope and stand on the uphill side of the roll and install the anchoring devices as it rolls out down the slope, minimizing foot traffic until GCCM is secured with anchor devices and fastening screws at the overlaps. Always allow the mat to drape over the soil, never pulling it taut, to ensure contact with the surface. Place additional pins into any apparent depressions to maintain contact with the soil. During the anchor trench backfill compact the soil alongside the GCCM and spray the GCCM within the anchor trenches with water to start the hydration process. Do not backfill soils into trench if significant water has accumulated within the anchor trench. Remove excess water as directed by engineer or owner. Apply Mechanical Channel/Adhesive Caulk or Adhesive Tape (if required) concurrently during the overlap process of

deploying the next GCCM over the previous GCCM installation panel. Only install what can be fully installed and hydrated (including anchor devices) before the end of construction day.

.18 Hydration

.1 Hydration shall be completed in accordance with the manufacturer's requirements.

.2 Spray the fiber surface multiple times until the GCCM is fully saturated.

.3 Do not spray high pressure water directly onto the GCCM.

3.3 DEFECTS AND REPAIRS

.1 Repair or replace torn or damaged GCCM.

.2 Perform repairs in accordance with manufacturer's requirements.

.3 Remove and replace GCCM rolls which cannot be repaired.

.4 Repairs shall be performed at no additional cost.

3.4 VISUAL INSPECTION AND EVALUATION

.1 The GCCM, seams, and non-seam areas shall be visually inspected by the Contractor and Departmental Representative for defects, holes, or damage due to weather conditions or construction activities. A daily inspection report will note the area of inspection, time, date and who inspected the area, when the GCCM was installed and when it was fully hydrated (weather: temperature and precipitation events).

.2 At the Departmental Representative's discretion, the surface of the GCCM shall be brushed, blown, or cleared by other methods by the Contractor if the amount of dust, mud, or foreign material inhibits inspection or functioning of the GCCM. Refer to the MSDS for personal protective equipment recommendations when blowing dust off the surface of the GCCM. Inspection shall be completed prior to and after hydration.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section includes product design, manufacture, transportation, erection and other related items such as anchorage, inserts and similar accessories required for work under this contract.

1.2 RELATED REQUIREMENTS

.1 Section 03 20 00 – Concrete Reinforcing

.2 Section 03 30 00 – Cast-in-Place Concrete

1.3 REFERENCES

.1 Canadian Standards Association (CSA).

- .1 CSA A23.1-00 – Concrete Materials and Methods of Concrete Construction
- .2 CSA A23.2-00 – Methods of Test for Concrete
- .3 CSA A23.3-94 – Design of Concrete Structures
- .4 CSA A23.4-00 – Precast Concrete-Materials and Construction
- .5 CSA A251-00 – Qualification Code for Architectural and Structural Precast Concrete Products
- .6 CSA A266.4-M78 – Guidelines for the Use of Admixtures in Concrete
- .7 CSA A266.5-M1981 – Guidelines for the Use of Superplasticizing Admixtures in Concrete
- .8 CSA A283-1980 – Qualification Code for Concrete Testing Laboratories
- .9 CSA G30.5-M – Weld Steel Wire Fabric for Concrete Reinforcement
- .10 CSA G30.15-M – Welded Deformed Steel Wire Fabric for Concrete Reinforcement
- .11 CAN/CSA G30.18 – Billet Steel Bars for Concrete Reinforcement
- .12 CAN/CSA-G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles
- .13 CSA W186-M1997 – Welding of Reinforcing Bars in Reinforced Concrete Construction

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

- .1 ASTM A775/A 775M [94d] – Specification for Epoxy-Coated Reinforcing Steel Bars

.3 Conform to applicable requirements of British Columbia Building Code, National Building Code and local authorities having jurisdiction.

.4 Design and provide reinforcement, anchors and supports as required by codes and to Consultant's approval. Submit relevant design data prepared by a professional engineer registered in the province of British Columbia for approval if so requested by the Consultant.

1.4 QUALIFICATIONS OF MANUFACTURER

.1 Fabricate precast concrete elements certified by the Canadian Standards Association in the appropriate categories according to CSA Standard A23.4-00 "Precast Concrete - Materials and Construction". The precast concrete manufacturer shall be certified in accordance with the CSA Certification program for Structural Precast Concrete prior to submitting a tender and must specifically verify as part of his tender that he is currently certified in the appropriate categories:

.1 (A) Precast Concrete Products – Structural – Non-Prestressed

.2 (C) Precast Concrete Products – Specialty – Non-Prestressed

.2 Minimum Acceptable Standard: precast concrete Alfabloc® elements.

.1 Certification must be maintained for the duration of the fabrication and erection for the project. Precast concrete elements shall be fabricated in accordance with British Columbia Building Code requirements.

.3 The precast concrete manufacturer shall be a member in good standing with the Canadian Standards Association (CSA) and have a proven record and satisfactory experience in the design, manufacture and erection of precast concrete facing units of the type specified. The company shall have adequate financing, equipment, plant and skilled personnel to detail, fabricate and erect the work of this Section as required by the Specification and Drawings. The size of the plant shall be adequate to maintain the required delivery schedule.

.4 Alternate wall systems other than Alfabloc® may be considered, provided that both drawings and calculations are signed and sealed by a professional engineer registered within the Province of British Columbia and submitted to the Departmental Representative 4 weeks prior to the bid date for review and approval. The proposed alternate wall system shall be in strict compliance with **Section 3.5 – Permissible Variations**, and provide legal opinion regarding potential patent infringement upon the Aplfaboc® wall system. If an approved system other than Alfabloc® is provided, the approved wall system manufacturer shall provide past project performance record utilizing an A-Frame type wall systems. The approved alternate manufacturer must provide a qualified representative on site during the entire time all precast wall components are being installed with written certification to the Departmental Representative, that all precast wall components are installed in accordance to plans and specifications.

1.5 ALLOWABLE TOLERANCES

.1 Conform to the requirements of CSA A23.4-Section 10.

.2 Refer to related Sections of this Specification and fabricate work to accommodate the specified tolerances.

1.6 SOURCE QUALITY CONTROL

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

.2 Submit copies of quality control tests related to this project as specified in CSA 1-A23.4.

.3 Submit records from in-house quality control program based upon plant certification requirements for inspection and review.

.4 Submit certified copy of mill test reports of steel reinforcement supplied, showing physical and chemical analysis.

.5 In addition to quality control, an independent inspection and testing company may be appointed by the Departmental Representative to verify compliance with this Specification.

.6 Cooperate with Inspector to facilitate his work.

.7 Cost of an independent inspection is to be paid for by the Departmental Representative.

1.7 SHOP DRAWINGS

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

.2 Prepare and submit shop drawings of precast structural concrete elements in accordance with the General Conditions of the contract, CSA-A23.4 and CSA-A23.3, and as specified below.

.3 Submit fully detailed and dimensioned drawings showing and including but not limited to the following:

.1 Design calculations for items designed by manufacturer.

.2 Typical details of non-prestressed members, reinforcement and connections.

.3 Finishing Schedules.

.4 Methods of handling and erection.

.5 Openings, sleeves, inserts and related reinforcement.

.6 Show the exact location of inserts and anchors required to be cast into precast units for interface elements.

.7 Show the system of identifying units for erection purposes on shop drawings and apply a similar mark on all units at the time of manufacture.

.8 Provide the Shop Drawings to obtain approvals from the Authorities having jurisdiction prior to fabrication of structural precast units.

.9 Upon request, provide drawings of all precast members.

1.8 FINISHES OF FORMED SURFACES

.1 Finishes shall be (a) Commercial Grade, (b) Standard Grade, (c) Finish Grade B, or (d) Finish Grade A in accordance with clause 24 of CSA A23.4 as shown on the contract drawings.

.2 Finishes shall be (a) Commercial Grade, or (b) Standard Grade unless otherwise noted.

1.9 WARRANTY

.1 Provide standard CSA warranty with a duration of one (1) year in accordance with the General Conditions. Warranty shall be in writing and shall warrant work under this Section to be free from defects for the period stipulated.

1.10 DELIVERY, STORAGE AND PROTECTION

.1 Accept full responsibility for delivery, handling and storage of units.

.2 Deliver, handle and store precast units using methods approved by the manufacturer.

.3 Do not permit units to contact staining influences or to rest on corners.

1.11 DESIGN

.1 Design and fabricate precast structural concrete elements, brackets and anchorage devices so that when installed they will:

.1 Compensate for allowable construction tolerances in the structure to which they are secured.

.2 Design loads shall be as specified by the British Columbia Building Code.

1.12 SPECIAL SURFACE TREATMENTS

.1 All anchors, plates, etc. exposed to the elements (less than 11/2" concrete cover) to be hot dipped galvanized.

Part 2 Products

2.1 MATERIALS

.1 Reinforcing steel: to CSA-A23.1.

.2 Forms: to CSA3-A23.4.

.3 Hardware and miscellaneous materials: to CSA-A23.1.

.4 Anchors and Connection Straps: to CSA-G40.21, Type 400 galvanized.

.5 Welding materials: to CSA W47.1-97 and CSA W186-M1997.

.6 Steel primer: to CGSB 1-GP-40M.

.7 Air entrainment admixture: to CSA-A266.4.

.8 Bearing pads: neoprene, [60] durometer hardness to ASTM D2240, and 17 MPa minimum tensile strength to ASTM D412, molded to size or cut from molded sheet. (Random oriented fiber-reinforced neoprene.)

.9 Shims: steel.

.10 Zinc-rich primer: to CGSB 1-GP-181M.

.11 Surface retardant: to CSA-A266.2.

2.2 CONCRETE MIXES

.1 Unless otherwise noted or specified, use concrete mix designed to produce a minimum of 35 MPa compressive cylinder strength at 28 days, with a maximum water/cement ratio to CSA A23.4.

.2 Use cement and supplementary cementing materials which conform to CSA A23.1.

.3 Air Entrainment of Concrete Mix: Refer to CSA-A23.1.

.4 Use of calcium chloride not permitted.

2.3 REINFORCEMENT AND ANCHORS

.1 Attach anchors securely in accordance with CSA W.186.70

.2 Galvanize anchors after fabrication and touch up anchors with zinc rich primer after welding.

.3 Reinforcing Steel: To CSA G30.16, CSA G30.12, CSA G30.18.

2.4 FABRICATION

.1 Fabricate precast concrete units to CSA - A23.4.

.2 Mark each precast unit to correspond to identification mark on shop drawings for location.

.3 Mark each precast unit with date cast.

.4 Cast members in accurate rigid moulds designed to withstand high frequency vibration. Set reinforcing anchors and auxiliary items to detail. Cast in anchors, blocking and inserts supplied by other Sections as required to accommodate their work. Vibrate concrete during casting until full thickness is reached. Provide necessary holes and sinkages for flashings, anchors, cramps, etc. as indicated. Separately and accurately batch cement and aggregates uniformly by weight to ensure maintenance of even and uniform appearance.

.5 Anchors, lifting hooks, shear bars, spacers and other inserts or fittings required shall be as recommended and/or designed by manufacturer for a complete and rigid installation. Each shall conform to requirements of local building by-laws. Lift hooks shall be adequately sized to safely handle panels according to member dimension and weight. Anchors/inserts shall be concealed where practical.

2.5 FINISHES

.1 Finish units to commercial grade to CSA A23.4.

Part 3 Execution

3.1 GENERAL

.1 Erect precast work in accordance with CSA-A23.4.

3.2 INSTALLATION

.1 Set precast concrete units, straight, level and square.

.2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA W186, for welding of reinforcement.

.3 Erect precast elements within allowable tolerances.

.4 Set elevations and alignment between units to within allowable tolerances before connecting units.

.5 Secure with bolts using lockwashers.

.6 Do not weld or secure bearing plates at sliding joints.

.7 Use grout to align elevations at surface of joints in situations where allowable tolerances have been exceeded or as noted on consultant's drawings in critical locations.

.8 Fasten units in place as per approved connection detail shop drawings.

.1 8' Alfabloc: kit contains: 2 each 1" x 20" threaded bar, 2 each square plate washers, 4 each hex nuts and 2 each epoxy resin capsules.

.1 With element placed in the correct position, installer to climb into the hollow of the block and drills 2 each 1-3/16" holes to a depth of 5-1/2" into the existing slab through the precast holes in the base of the block.

.2 Clear dust out of the holes using compressed air.

.3 Place epoxy capsules in the 2 holes, 1" x 20" threaded bars are tapped into holes, breaking epoxy capsules, then twisted fully down into the wet resin.

.4 After the resin has cured, tighten four (4) nuts down onto square plate washers.

.2 10' and 12' Alfabloc: kit contains: 4 each 1" x 20" threaded bar, 4 each square plate washers, 8 each hex nuts and 4 each epoxy resin capsules.

.1 With element placed in the correct position, installer to climb into the hollow of the block and drills 4 each 13/16" holes to a depth of 5-1/2" into the existing slab through the precast holes in the base of the block.

.2 Clear dust out of the holes using compressed air.

.3 After the resin has cured, tighten eight (8) nuts down onto square plate washers.

3.3 HANDLING AND ERECTION

.1 Precast components shall be handled and erected in accordance with CSA Standard A23.4 and as per the manufacturer's instructions.

.2 Precast components shall be delivered and handled in such a manner as to avoid warpage.

.3 Holes and reglets shall be protected from forming of ice during freezing weather.

.4 Lifting devices shall be protected from rusting at all times.

.5 All precast components shall be erected by experienced workmen under the supervision of a qualified superintendent with a minimum of five (5) years' experience.

.6 Units shall be set plumb and true with joints parallel and uniform.

.7 Patch damaged, or chipped components as required.

3.4 CLEANING

.1 Clean in accordance with Section 01 74 11 – Cleaning.

.2 If required, clean exposed face work by washing and brushing only, as precast is erected. Use approved masonry cleaner if washing and brushing fails to achieve required finish. Remove immediately materials that may set up or harden. This section is not responsible for soiling or damage by others.

3.5 PERMISSIBLE VARIATIONS

.1 Wall Units

.1 Wall Unit Shape – Each wall unit shall be one monolithic piece in shape of the capital letter "A" only. Alternate shapes and variations will not be acceptable.

.2 Wall Thickness - The wall unit thickness shall not differentiate by that shown in the design by more than +/- 5mm.

.3 Wall Sections – Each wall section shall be comprised of two pieces including the standard 3.0m high Alfabloc® base unit and 0.6m high Alfabloc® extension unit.

.4 Deviation of Ends - Variations along end of wall units shall not be more than 10mm except where beveled ends for laying of curves are specified by the Departmental Representative.

.5 Angle of Wall Surface - Angle variations along the front and rear wall faces shall not be more than 1%.

.6 Length of Section - The underrun length of each wall shall be 1220mm, and not deviate more than 10mm in any wall unit. Alternate underrun lengths will not be accepted.

.7 Connecting Straps – The adjoining wall unit connections shall use a full height connection strap constructed from hot rolled steel with a minimum thickness of 5mm. Alternate connections are not permissible.

.8 Inserts & Embedded Hardware – The maximum variation in position of inserts and embedded items shall not vary by more than 10mm.

.9 Position of Reinforcement - The maximum variation in position of the reinforcement shall be +/- 5mm. In no case shall the cover over the reinforcement be less than 50mm. These tolerances or cover requirements do not apply to mating surfaces of the joints.

.10 Area of Reinforcement - The areas of steel reinforcement shall be the design steel areas as shown in the Manufacture's shop drawings. Steel areas greater

than those required may be cause for rejection. The permissible variation in diameter of any reinforcement shall conform to the tolerances prescribed in the CSA Specification for that type of reinforcement.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 99 – Demolition for Minor Works.

.2 Section 31 23 33.01 – Excavating Trenching and Backfilling.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C88-13, Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

.2 ASTM C136-14, Method for Sieve Analysis of Fine and Coarse Aggregate.

.3 ASTM C117-13, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.

.4 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

.2 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 REGULATIONS

.1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

.2 Not later than one week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill or fill materials proposed for use.

.3 Do not begin backfilling or filling operations until material has been approved for use by the Departmental Representative.

.4 Not later than 48 hours before backfilling or filling with approved material, notify the Departmental Representative so that compaction tests can be carried out by designated testing agency.

.5 Before commencing work, conduct, with the Departmental Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

1.5 TESTS AND INSPECTIONS

.1 Testing of materials and compaction of backfill and fill will be carried out by a certified testing firm, retained by the Contractor and approved by the Departmental Representative.

1.6 BURIED SERVICES

.1 Before commencing work, verify the location of all buried services on and adjacent to the site using ground penetrating radar.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations. Cap cut offs.

1.7 PROTECTION

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Departmental Representative's approval.

.4 Protect natural and manmade 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.

Part 2 Products

2.1 MATERIALS

.1 Gravel to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM test procedure C-88 or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.

.2 All crushed gravel when tested according to ASTM C-136 and ASTM C-117, or latest revised issue, to have a generally uniform gradation and conform to following sieve must have one or more fractured faces. Determination of the Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "A", which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.

.3 Native material to be any workable soil free of organic or foreign matter; any material obtained within limits of Contract may be deemed native material for purposes of

payment if it is approved by the Departmental Representative. Native material is not acceptable if it is impracticable to control its water content or compact to specified density.

.4 Granular Pipe Bedding and Surround Material

.1 Crushed or graded gravels: to conform to following gradation:

Sieve	Percent Passing Type 1*	Type*2
25.0mm	100	100
19.0mm	90 - 100	90 - 100
12.5mm	65 - 85	70 - 100
09.5mm	50 - 75	--- ---
4.75mm	25 - 50	40 - 70
2.36mm	10 - 35	25 - 52
1.18mm	6 - 26	15 - 38
0.600mm	3 - 17	6 - 27
0.300mm	--- ---	3 - 20
0.075mm	0 - 5	0 - 8

*Type 1: standard gradation

*Type 2: to be used only in dry trench conditions and with Departmental Representative's prior approval.

.5 Top Soil for seeded areas: mixture of articulates, micro-organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture: The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Finished surface free from:

.1 Debris and stones over 50 mm diameter.

.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.4 Consistencies: friable when moist

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions:

.1 Before commencing work verify locations of buried services on and adjacent to site.

.2 Evaluation and Assessment:

.1 Arrange with appropriate authority for relocation of buried services that interfere with execution of work.

.2 Before commencing work, conduct, with Departmental Representative, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

3.2 PREPARATION

.1 Protection of in-place conditions:

.1 Keep excavations clean, free of standing water, and loose soil.

.2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.

.3 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.

.4 Protect buried services that are to remain undisturbed.

.2 Removal:

.1 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.

.2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.3 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

.4 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.

.5 Remove stumps and tree roots below footings, slabs, and paving, and to 200 mm below finished grade elsewhere.

3.3 EXCAVATION

.1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.

.2 Topsoil stripping:

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Strip topsoil to depths as directed by Departmental Representative. Avoid mixing topsoil with subsoil.

.3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.

.4 Stockpile in locations as directed by Departmental Representative.

.5 Dispose of topsoil to location as directed by Departmental Representative.

.3 Excavate as required to carry out work, in all materials met.

.1 Do not disturb soil or rock below bearing surfaces. Notify Departmental Representative when excavations are complete.

.2 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

.3 Fill excavation taken below depths shown without Departmental Representative's written authorization with concrete of same strength as for footings at no extra cost to Departmental Representative.

.4 Excavate trenches to provide uniform continuous bearing and support for 100 mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 300 mm above pipe not to exceed diameter of pipe plus 600 mm.

.5 Excavate for slabs and paving to subgrade levels.

.1 Remove topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 SITE QUALITY CONTROL

.1 Fill material and spaces to be filled to be inspected and approved by Departmental Representative.

3.5 BACKFILLING

.1 Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from Departmental Representative.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with selected subgrade material compacted as specified for fill.

.5 Placing:

.1 Place backfill, fill and base course material in 150 mm lifts. Add water as required to achieve specified density.

.2 Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.

.6 Compaction: compact each layer of material to following densities for material to ASTM D1557:

.1 Boulevards and easements: minimum 90%.

.2 Roads, driveways, shoulders, re-shaped ditches and sidewalks: minimum 95%

.3 Basecourses: 100%.

.4 Elsewhere: 90%.

.7 Under slabs and paving:

.1 In accordance with Contract Drawings.

.8 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.

.9 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

.10 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.

.11 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.

.12 Underground tanks: use sand to bottom of granular base courses or to bottom of topsoil, as applicable.

3.6 CONTAMINATED MATERIALS

.1 If contaminated materials are detected during excavation operations, immediately notify the Departmental Representative. Any contaminated materials to be disposed of using methods approved by the Departmental Representative.

3.7 GRADING

.1 Grade to ensure that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative. Grade to be gradual between finished spot elevations as indicated.

3.8 CLEANING

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

.1 Dispose of cleared and grubbed material off site daily.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and 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 32 11 16.01 – Granular Sub-Base.

.2 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

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

.2 Allow continual sampling by Departmental Representative during production.

.3 Provide Departmental Representative with access to source and processed material for sampling.

.4 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.

.5 Supply new or clean sample bags or containers according appropriate to aggregate materials.

.6 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

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

Part 2 Products

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.

.2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.

.1 Greatest dimension to exceed 5 times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.2 Reclaimed asphalt pavement.

.3 Reclaimed concrete material.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock.

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

.3 Light weight aggregate, including slag and expanded shale.

.4 Reclaimed asphalt pavement.

.5 Reclaimed concrete material.

2.2 SOURCE QUALITY CONTROL

.1 Inform 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 4 weeks 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 Departmental Representative.

3.2 PREPARATION

.1 Aggregate source preparation:

- .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction.
- .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
- .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
- .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
- .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
- .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.

.2 Processing:

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
  - .1 Use methods and equipment approved in writing by Departmental Representative.

.3 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.

.4 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.

.1 Use only equipment approved in writing by Departmental Representative.

.5 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 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:

.1 Maximum 1.5 m for coarse aggregate and base course materials.

.2 Maximum 1.5 m for fine aggregate and sub-base materials.

.3 Maximum 1.5 m for other materials.

.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.9 Do not cone piles or spill material over edges of piles.

.10 Do not use conveying stackers.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.3 CLEANING

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

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

.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.

.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 01 35 29.06 - Health and Safety Requirements

.2 Section 01 35 43 - Environmental Procedures

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.4 Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

1.2 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

.6 EAB refers to Emerald Ash Borer a non-native, invasive beetle that is highly destructive to ash trees where it occurs.

.7 Woodchips in the context of EAB consist of untreated, raw bark and wood fragments broken or shredded from logs or branches. Woodchips are to be less than 2.5 cm in at least any two dimensions.

.8 Firewood in the context of EAB consists of non-manufactured, solid wood material, with or without bark, cut into sizes less than 1.2 metres long and less than 25 cm in diameter which may be handled manually.

.9 Logs in the context of EAB consist of untreated, raw wood greater than 1.2 metres in length and greater than 25 cm diameter.

.10 Enclosed vehicle in the context of EAB consist of any vehicle transporting regulated wood material that is equipped to prelude the loss of materials or the escape of EAB while in transit.

1.3 STORAGE AND PROTECTION

.1 Prevent damage to trees, shrubs, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, and root systems of trees which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

.2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

.1 Trim limbs and tops, and saw into saleable lengths.

.2 Stockpile adjacent to site.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing and grubbing.

.4 Keep roads and walks free of dirt and debris.

3.2 APPLICATION

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

3.3 CLEARING

.1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.

.2 Clear as indicated on Contract Drawings and/or by Departmental Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.3 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.4 CLOSE CUT CLEARING

.1 Close cut clearing to ground level.

.2 Perform close cut clearing by hand so that existing muskeg is not damaged.

.3 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 ISOLATED TREES

.1 Cut off isolated trees as directed by Departmental Representative at height of not more than 300mm above ground surface.

.2 Grub out isolated tree stumps.

.3 Prune individual trees as indicated.

.4 Cut limbs and branches to be trimmed close to bole of tree or main branches.

3.6 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated at ground level.

3.7 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^3.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform to existing adjacent surface of ground.

3.8 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials and transport to storage area as directed by Departmental Representative.

.2 Chip and stockpile cleared and grubbed vegetative material on site as directed by Departmental Representative.

.1 Authorization from Departmental Representative required prior to chipping activities commencing.

.3 Cut timber greater than 125 mm diameter to 3000 mm lengths and stockpile as directed by Departmental Representative. Unless otherwise notified, stockpiled timber becomes property of Departmental Representative.

.4 Dispose of cleared and grubbed materials by unable to be chipped offsite as directed by Departmental Representative.

.5 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

3.9 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate maintenance vehicle access to approval of Departmental Representative.

3.10 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, flagging tape, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 99 – Demolition for Minor Works.

.2 Section 33 05 13.01 – Oil Silt Separator - Storm Treatment Device.

.3 Section 33 05 16 – Maintenance Holes and Catch Basin Structures.

.4 Section 33 11 16 – Site Water Utility Distribution Piping.

.5 Section 33 31 13 – Public Sanitary Utility Sewerage Piping.

.6 Section 33 41 00 – Storm Utility Drainage Piping.

1.2 REFERENCE STANDARDS

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

.1 ASTM C 117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 422-63 2002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D 698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ^{3}) (600 kN-m/m ^{3}).

.5 ASTM D 1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ^{3}) (2,700 kN-m/m ^{3}).

.6 ASTM D 4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 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.

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 1.0 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 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 D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.2.

.2 Table:

Sieve Designation	% Passing
2.00mm	100
0.10mm	45-100
0.02mm	10-80
0.005mm	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. (Section 31 23 33.01 –Excavating, Trenching, and Backfilling)

.2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section. (Section 31 23 33.01 –Excavating, Trenching, and Backfilling)

.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 testing and inspection results and reports as described in PART 3 of this Section. (Section 31 23 33.01 – Excavating, Trenching, and Backfilling)

.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 and location plan of relocated and abandoned services, as required.

.4 Samples:

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

.2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

.3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.

.4 Ship samples to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.

.5 At least 4 weeks prior to beginning Work, inform Departmental Representative source of fly ash and submit samples to Departmental Representative.

.1 Do not change source of Fly Ash without written approval of Departmental Representative.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Where Departmental Representative is employee of Contractor, submit proof that Work by Departmental Representative is included in Contractor's insurance coverage.

.3 Submit design and supporting data at least 2 weeks prior to beginning Work.

.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in British Columbia, Canada.

.5 Keep design and supporting data on site.

.6 Engage services of qualified professional Engineer who is registered or licensed in British Columbia, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

.7 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.

.8 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Divert excess aggregate materials from landfill to local facility for reuse as directed by Departmental Representative.

1.7 EXISTING CONDITIONS

.1 Examine soil reports.

.2 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Confirm locations of buried utilities by careful test excavations or soil hydro vac methods.

.6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing, re-routing.

.8 Record location of maintained, re-routed and abandoned underground lines.

.9 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 buildings 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 Departmental Representative.

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 C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.3 Table:

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

3.2 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.

3.3 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as indicated by Contract Drawings and/or Departmental Representative after area has been cleared of brush, weeds, and grasses and 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 as directed by Departmental Representative.

3.4 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.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements

.1 Where conditions are unstable, Departmental Representative to verify and advise methods.

.2 Obtain permit from authority having jurisdiction for temporary diversion of water course.

.3 Construct temporary Works to depths, heights and locations as approved by Departmental Representative.

.4 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.

.5 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore watercourses in accordance with Section 35 42 19 – Preservation of Water Courses and Wetlands.

3.6 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for Departmental Representative review and approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

.1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved collection areas and 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.

.6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.7 EXCAVATION

.1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as indicated by Contract Drawings.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material in approved location on site.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Obtain Departmental Representative approval of completed excavation.

.12 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.13 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with concrete specified for footings 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.

.14 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 Departmental Representative.

3.8 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 1557.

.1 Under concrete slabs: in accordance with Contract Drawings. Compact base course to 100%.

.2 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95%. For remaining portion, use Type 3 fill compacted to 95%.

.3 Place unshrinkable fill in areas as indicated.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as specified in Section 31 00 99 – Earthwork for Minor Works.

.2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

.1 Mechanical vibratory compaction equipment.

.2 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.

.3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.4 Do not use backfill material which is frozen or contains ice, snow or debris.

.5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.6 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed Work to equalize loading.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative or:

.2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

.7 Place recycled fill in areas as indicated.

.8 Consolidate and level unshrinkable fill with internal vibrators.

.9 Install drainage system in backfill as directed by Departmental Representative.

3.11 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 – Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil as directed by Departmental Representative.

.3 Reinstate lawns to elevation which existed before excavation.

.4 Reinstate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.

.5 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation of polymeric geotextiles used in revetments, breakwaters, retaining wall structures, filtration, drainage structures, roadbeds and railroad beds purpose of which is to:

.1 Separate and prevent mixing of granular materials of different grading.

.2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 31 00 99 – Earthworks for Minor Works.

.4 Section 31 37 00 – Rip-Rap.

1.3 REFERENCES

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

.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(2013), Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.4 ASTM D4751-12, 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-M89(April 1997), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).

.2 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 Canadian Standards Association (CSA International):

.1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 Ontario Provincial Standard Specifications (OPSS):

.1 OPSS 1860-[March 1998], Material Specification for Geotextiles.

.5 British Columbia Ministry of Health – British Columbia Onsite Sewage Association:

.1 Sewerage System Standard Practice Manual – Version 2, 21 September, 2007.

1.4 SUBMITTALS

.1 Submit to Departmental Representative 3 copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 MATERIAL

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls:

.1 Width: 2 m minimum.

.2 Length: 200 m minimum.

.3 Composed of: minimum 85% by mass of polypropylene 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, minimum 1.2 mm.

.2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 155 g/m2.

.3 Grab tensile strength and elongation: to ASTM D4632.
  .1 Breaking force: minimum 35 lb, wet condition.
  .2 Elongation at future: minimum 50%.
.4 Puncture; to ASTM D4833: 10 lbs minimum.
.5 Trapezoidal tear; to ASTM D4533: 11 lbs minimum.

.3 Hydraulic properties:
  .1 Apparent opening size (AOS): to ASTM D4751, US Sive # 20 minimum and 70 maximum.
  .2 Permitivity: to ASTM D4491, 100 gal/min/sq ft minimum.

.4 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m2to CAN/CSA G164.

Part 3 Execution

3.1 INSTALLATION

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.
.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 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
.6 After installation, cover with overlying layer within 4 h of placement.
.7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
.8 Place and compact soil layers in accordance with Section 31 00 99 – Earthworks for Minor Works.

3.2 CLEANING

.1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

3.3 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 - Earthworks for Minor Works.

.2 Section 31 32 19.01 – Geotextiles.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C 144-99, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM C 618-00, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

.2 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-00, Concrete Materials and Methods of Concrete Construction.

.2 CAN/CSA-A3000-98, Cementations Materials Compendium.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Fold up metal banding, flatten and place in designated area for recycling.

.4 Divert left over aggregate materials from landfill to local facility for reuse as approved by Departmental Representative.

.5 Divert left over hardened cement materials from landfill to local facility for reuse as approved by Departmental Representative.

.6 Divert left over geotextiles to local plastic recycling facility as approved by Departmental Representative.

Part 2 Products

2.1 RIP-RAP

.1 Rip rap shall consist of clean, free draining, sound dense, durable crushed rock; free of organics, roots, silt, sand, clay, snow, ice, or other deleterious material.

.2 Dense, sound, hard and durable fieldstone or quarried rock fragments. Quarried rock fragments shall have a specific gravity of at least 2.6 and a limit of 2% absorption.

.3 Rock shall be hard white durable limestone or dolomite with the following properties:

.1 Minimum bulk specific gravity of 2.6 (ASTM C 127).

.2 Maximum Los Angeles abrasion loss of 35% (ASTM C 131).

.3 Maximum soundness loss of 18% (ASTM C88).

.4 Maximum absorption of 2.5% (ASTM C127).

Rip rap to meet following size distribution for use intended:

Canadian Metric Sieve Size	% of Total Dry Weight Passing Each Sieve
400mm	100
250mm	40-60
50mm	0-5

2.2 CEMENT MORTAR

.1 Cement: to CAN/CSA-A3000, type 10.

.2 Sand for mortar: to ASTM C 144.

.3 Mortar mix: 1 part by volume of cement to 3 parts sand, to consistency approved by Departmental Representative.

2.3 GEOTEXTILE FILTER

.1 Geotextile soil stabilization: in accordance with Section 31 32 19.16 - Geotextile soil stabilization.

Part 3 Execution

3.1 GENERAL

.1 Prior to commencing rip-rap Works, eliminate uneven areas and depressions on the area to be rip-rapped by fine grading to a uniform even surface. Fill depressions with suitable material and compact to provide firm bed.

.2 Obtain Departmental Representative approval of finish slope prior to proceeding with rip-rap placement.

3.2 STOCKPILING

.1 Temporarily stockpile all sand, gravel, and rock materials that have been processed by washing methods for a minimum of 48 hours to permit drainage of excess water. Do not place recently washed materials on top of or with drier stockpiled materials.

.2 Use equipment and methods that minimizes the amount of material handling, and that do not cause segregation or material breakdown.

.3 Do not stockpile materials where contamination with the underlying soils can occur.

3.3 PLACING

.1 Place rip-rap as indicated on Contract Drawings.

.2 Machine place. Do not dump at top of slope and spread.

.3 Intermix the rip rap material to uniformly distribute the larger size material and utilize small size material to fill in the void spaces resulting in a well -keyed, void free, stable surface with a consistent gradation. Ensure the segregation does not occur during placement.

.4 Do not dislodge or tear geotextile fabric during the placement of rip- rap. Repair as an incidental to the Works.

.5 Ensure the completed rip-rap placed is stable with no tendency to slide.

.6 Hand place as required to provide a neat and uniform surface.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C 117-04, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D 422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.

.5 ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ftü) (600kN-m/mü).

.6 ASTM D 1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ftü) (2,700kN-m/mü).

.7 ASTM D 1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Sustainable Design Submittals:

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005 and authorities having jurisdiction.

.2 Construction Waste Management:

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations and erosion and sedimentation control plan.

.2 Replace defective or damaged materials with new.

.3 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section.

Part 2 Products

2.1 MATERIALS

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

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.3 Table

Sieve Designation (mm)	% Passing
75	100
50	----
25	----
19	15-100
9.5	0-100
4.75	----
1.18	----
.600	0-100
.300	0-15
.075	0-5

.4 Other properties as follows:

.1 Liquid Limit: to ASTM D 4318, Maximum 25.

.2 Plasticity Index: to ASTM D 4318, Maximum 6.

.3 Los Angeles degradation: to ASTM C 131.

.1 Maximum loss by mass: 50 %.

.4 Particles smaller than 0.02 mm: to ASTM D 422, Maximum 3%.

.5 Soaked CBR: to ASTM D 1883, Minimum 40 when compacted to 100% of ASTM D 1557.

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of 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 Temporary Erosion and Sedimentation Control:

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

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

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

3.3 PLACEMENT AND INSTALLATION

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Placing:

.1 Construct granular sub-base to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow or ice.

.4 Begin spreading sub-base material on crown line or high side of one-way slope.

.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.9 Remove and replace portion of layer in which material has become segregated during spreading.

.3 Compacting:

.1 Compact to density not less than 100% corrected maximum dry density ASTM D 698.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.4 Proof rolling:

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.3 Proof roll at level in granular base as indicated.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with sub-base material and compact in accordance with this Section.

.3 Replace sub-base material and compact in accordance with Section.

.4 Replace base material and compact in accordance with this Section.

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with this Section at no extra cost.

3.4 CLEANING

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

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 SITE TOLERANCES

.1 Finished sub-base surface to be within 20 mm of elevation as indicated but not uniformly high or low.

3.6 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C 117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ftü) (600kN-m/mü).

.5 ASTM D 1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ftü) (2,700kN-m/mü).

.6 ASTM D 1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.7 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005 and authorities having jurisdiction.

.2 Construction Waste Management:

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

.2 Submit calculations on end-of-project recycling rates, salvage rates.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Stockpile minimum 50% of total aggregate required prior to beginning operation.

.2 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.3 Replace defective or damaged materials with new.

.4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

.3 Develop Construction Waste Management Plan related to Work of this Section.

Part 2 Products

2.1 MATERIALS

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

.1 Crushed stone or gravel.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.1 Gradation Method #1 to:

Sieve Designation (mm)	% Passing		
	(1)	(2)	(3)
25	-	100	-
19	-	80-100	-
12.5	-	-	-
9.5	-	50-85	100
4.75	-	35-70	75-100
2.36	-	25-50	50-72
1.18	-	15-35	5-30
.30	-	5-20	-
.075	-	0-5	0-10

.2 Material to level surface depressions to meet gradation (2) limits in accordance with Method #1.

.3 Material to for beddings to meet gradation (3) limits in accordance with Method #1.

.4 Liquid limit: to ASTM D 4318, maximum 25.

.5 Plasticity index: to ASTM D 4318, maximum 6.

.6 Los Angeles degradation: to ASTM C 131. Max. % loss by weight: 45

.7 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C 136.

Passing	Retained On	
25 mm	to	19.0 mm
19.0 mm	to	4.75 mm

Part 3 Execution

3.1 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

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

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

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

3.2 PLACEMENT AND INSTALLATION

.1 Place granular base after sub-base and/or subgrade surface is inspected and approved in writing by Departmental Representative.

.2 Placing:

.1 Construct granular base to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Begin spreading base material on crown line or on high side of one-way slope.

.5 Place material using methods which do not lead to segregation or degradation of aggregate.

.6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.9 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.4 Compacting:

.1 Compact to density not less than 100% corrected maximum dry density ASTM D 698.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.5 Proof rolling:

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.3 Proof roll at level in granular base as indicated.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.

.3 Replace sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-base.

.4 Replace base material and compact in accordance with this Section.

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this section at no extra cost.

3.3 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 CLEANING

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

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for 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.

.2 Divert unused granular material from landfill to local facility approved by Departmental Representative.

3.5 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCE STANDARDS

.1 American Association of State Highway and Transportation Officials (AASHTO)

.1 AASHTO M320-10, Standard Specification for Performance Graded Asphalt Binder.

.2 AASHTO R29-02, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.

.3 AASHTO T245-97(2004), Standard Method of Test for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

.2 Asphalt Institute (AI)

.1 AI MS-2-1994 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.3 ASTM International

.1 ASTM C 88-05, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

.2 ASTM C 117-04, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.

.3 ASTM C 123-04, Standard Test Method for Lightweight Particles in Aggregate.

.4 ASTM C 127-07, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.

.5 ASTM C 128-07a, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.

.6 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.7 ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.8 ASTM C 207-2006, Standard Specification for Hydrated Lime for Masonry Purposes.

.9 ASTM D 995--95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

.10 ASTM D 2419-[09], Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.11 ASTM D 3203-94(2005), Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

.12 ASTM D 4791-05e1, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-[88], Sieves Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-[M88], Sieves Testing, Woven Wire, Metric.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 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 asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175 degrees C 4 weeks prior to beginning Work.

.3 Samples:

.1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks prior to beginning Work.

.2 Submit samples of following materials proposed for use 4 weeks prior to beginning Work.

.1 One 5L container of asphalt cement.

.2 1 kg of hydrated lime.

.4 Test and Evaluation Reports:

.5 Certificates:

.1 Certification to be marked on pipe.

.6 Test and Evaluation Reports:

.1 Submit manufacturer's test data and certification that asphalt cement meets specification requirements.

.2 Submit manufacturer's test data and certification that hydrated lime meets specified requirements.

.3 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for approval at least 4 weeks prior to beginning Work.

.4 Submit printed record of mix temperatures at end of each day.

.7 Sustainable Design Submittals:

.1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005, and authorities having jurisdiction.

.2 Construction Waste Management:

.1 Submit project Waste Management Plan, and Waste Reduction Workplan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates.

.3 Recycled Content:

.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

.2 Submit evidence, when Supplementary Cementing Materials (SCMs) are used, to certify reduction in cement from Base Mix to Actual SCMs Mix, as percentage.

Part 2 Products

2.1 MATERIALS

.1 Performance graded asphalt cement: to AASHTO M320, grade PG 58 - 28 when tested to AASHTO R29.

.2 Aggregates: in accordance with Section 31 05 16 - Aggregate Materials: General and requirements as follows:

.1 Crushed stone or gravel.

.2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.3 Table:

Sieve Designation (mm)	% Passing		
	Lower Course	Surface Course	Sheet Asphalt
19.0	100	100	-
12.5	84-95	84-95	-
9.5	73-90	73-90	
4.75	50-75	50-75	-
2.36	35-57	35-57	-
1.18	26-45	26-45	

.60	18-34	18-34	-
.30	10-26	10-26	-
.15	6-17	6-17	
.075	3-7	3-7	-

2.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:

.1 Drum diameter: 1200 mm minimum.

.2 Amplitude of vibration (machine setting): 0.5 mm maximum for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms.

.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.

.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

.2 Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cmý for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Departmental Representative, may be used instead of tamping irons.

.3 Straight edges, 4.5 m in length, to test finished surface.

.6 Plant testing facility: provide laboratory space at plant site for exclusive use of Departmental Representative, for performing tests, keeping records and making reports.

2.3 MIX DESIGN

.1 Mix design to be prepared by Contractor and approved in writing by Departmental Representative.

.2 Mix to contain maximum 50% by mass of RAP. Departmental Representative may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.

.3 Design of mix: by Marshall method to requirements below.

.1 Compaction blows on each face of test specimens: 75.

.2 Mix physical requirements:

Property	Roads
Marshall Stability at 60°C (kN min)	5.5
Flow Value (mm)	2-4
Air Voids in Mixture (%)	3-5 surface course/2-6 lower course
Voids in Mineral Aggregate (% min)	15 surface course/ 13 lower course
Index of Retained Stability % minimum	75

.3 Measure physical requirements as follows:

.1 Marshall load and flow value: to AASHTO T245.

.2 Compute void properties on basis of bulk specific gravity of aggregate to ASTM C 127 and ASTM C 128. Make allowance for volume of asphalt absorbed into pores of aggregate.

.3 Air voids: to ASTM D 3203.

.4 Voids in mineral aggregates: to AI MS2.

.4 Do not change job-mix without prior approval of Departmental Representative. When change in material source proposed, new job-mix formula will be provided to be reviewed 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 asphalt paving 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 Temporary Erosion and Sedimentation Control:

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control drawings, and sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Finished sub-base surface to be within 20 mm of elevation as indicated but not uniformly high or low.

.3 Finished asphalt surface not to have irregularities exceeding 20 mm when checked with 4.5 m straight edge placed in any direction.

.4 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.

.5 Apply prime coat and tack coat prior to paving.

.6 Prior to laying mix, clean surfaces of loose and foreign material.

3.3 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product, at least daily or as required.

.1 Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.

.3 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light for night placing.

.4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.

.1 Do not dribble mix into trucks.

.5 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.6 Deliver loads continuously in covered vehicles and immediately spread and compact.

.1 Deliver and place mixes at temperature within range as directed by Departmental Representative, but not less than 135 degrees C.

3.4 TEST STRIP

.1 Construct and test strip to approval of Departmental Representative.

.2 During construction of test strip, Departmental Representative will establish optimum rolling pattern by taking nuclear densimeter readings and observations to:

.1 Determine sequence and number of passes.

.2 Determine correct operating characteristics of vibratory rollers.

.3 Determine maximum density of asphalt mix.

.4 Ensure smooth surface finish.

.5 Establish actual density achieved by coring in order to determine if additional or other rolling equipment is required to achieve density of not less than [98] % of density obtained with Marshall specimens prepared from samples of mix being used.

3.5 PLACING

.1 Obtain Departmental Representative's approval of base and existing surface and tack coat and prime coat prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as indicated on Contract Drawings and as directed by Departmental Representative.

.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is 5 degrees C minimum.

.2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as follows:

.1 Levelling courses to thicknesses required but not exceeding 50 mm.

.2 Lower course in 1 layer of 50 mm.

.3 Surface course in 1 layer of maximum 50 mm.

.5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.6 Place individual strips no longer than 500 m.

.7 On airport runways and taxiways, aprons and parking lots commence spreading at high side of pavement or at crown and span crowned centerlines with initial strip.

.8 Spread and strike off mixture with self-propelled mechanical finisher.

.1 Construct longitudinal joints and edges true to line markings.

.1 Departmental Representative to review lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.

.2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver.

.1 Work pavers as close together as possible and in no case permit them to be more than 30 m apart.

.3 Maintain constant head of mix in auger chamber of paver during placing.

.4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.5 Correct irregularities in alignment left by paver by trimming directly behind machine.

.6 Correct irregularities in surface of pavement course directly behind paver.

.1 Remove excess material forming high spots using shovel or lute.

.1 Fill and smooth indented areas with hot mix.

.2 Do not broadcast material over such areas.

.7 Do not throw surplus material on freshly screeded surfaces.

.9 When hand spreading is used:

.1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section.

.1 Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly without broad casting material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes.

.1 Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt.

.1 Control temperature to avoid burning material.

.2 Do not use tools at higher temperature than temperature of mix being placed.

3.6 COMPACTING

.1 Roll asphalt continuously using established rolling pattern for test strip and to density of not less than 100 % of maximum density determined for test strip.

.2 Do not change rolling pattern unless mix changes or lift thickness changes.

.1 Change rolling pattern only as directed by Departmental Representative.

.3 Roll asphalt continuously to density not less than 98 % of 75 blow Marshall density to AASHTO T245.

.4 General:

.1 Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.

.4 Use static compaction for levelling coarse less than 25 mm thick.

.5 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of [25] impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.6 Overlap successive passes of roller by minimum of [200] mm and vary pass lengths.

.7 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.8 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.9 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.10 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.1 Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.11 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.12 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.5 Breakdown rolling:

.1 Begin breakdown rolling with vibratory roller immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. When working on steep slopes or super-elevated sections use operation approved by Departmental Representative.

.4 Use only experienced roller operators.

.6 Intermediate rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

.7 Finish rolling:

.1 Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks.

.1 If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by Departmental Representative.

.2 Conduct rolling operations in close sequence.

.8 Dust entire area of sheet asphalt pavements with hydrated lime immediately after rolling to eliminate tendency to pick-up under traffic.

3.7 JOINTS

.1 General:

.1 Remove surplus material from surface of previously laid strip.

.1 Do not deposit on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 600 mm.

.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150 mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.

.1 If cold joint cannot be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.

.3 Overlap previously laid strip with spreader by 25 to 50 mm.

.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.

.5 Roll longitudinal joints directly behind paving operation.

.6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.

.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix.

.1 Place and compact joint to ensure joint is smooth and without visible breaks in grade.

.2 Locate feather joints as indicated.

.5 Construct butt joints as indicated.

3.8 FINISH TOLERANCES

.1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.

.3 Finished asphalt surface must be free draining such that no areas of standing water are created.

.4 If the variance for grade is rejected by the Departmental Representative, the Contractor shall remove the lot to a depth of at least the thickness of the course involved and replace it with hot-mix asphalt meeting the Contract requirements – all at the Contractor's cost. Skin patching for correcting low areas will not be permitted. The Contractor shall bear the cost of the evaluation by the Departmental Representative.

3.9 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.

.1 If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.

.2 Repair areas showing checking, rippling, or segregation.

.3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.10 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 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 31 00 99 - Earthworks for Minor Works

1.2 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide product data for:

- .1 Seed.
- .2 Hydraulic Erosion Control Product (HECP).
- .3 Tackifier.
- .4 Fertilizer.

.3 Submit in writing to Departmental Representative 5 days prior to commencing work:

- .1 Volume capacity of hydraulic seeder in litres.
- .2 Amount of material to be used per tank based on volume.

  Number of tank loads required per hectare to apply specified slurry mixture per hectare.

1.3 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

1.4 SCHEDULING

.1 Schedule hydraulic seeding to coincide with preparation of soil surface.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.

.4 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIALS

.1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.

.1 Grass mixture: "Certified", in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 13 % Alpine Bluegrass

.2 15 % Tufted Hairgrass

.3 22 % Rocky Mountain Fescue

.4 25 % Slender Wheatgrass

.5 25 % Blue Wild Rye

.2 Hydraulic Erosion Control Product (HECP): specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:

.1 Stabilized Fiber Matrix (SFM)

.1 Made from thermally processed wood fibres: 83% plus or minus 4%.

.2 Crosslinked Hydro-Colloid Based Tackifier: 5% plus or minus 1%

.3 Cure Time: 24-48 hrs

.4 Water Holding Capacity: 1350%

.5 Functional Longevity: 3-6 months

.6 Moisture Content: 12% plus or minus 3%

.3 Tackifier: water soluble vegetable carbohydrate powder.

.4 Water: free of impurities that would inhibit germination and growth.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and "Fertilizers Regulations".

.2 Complete synthetic, 225 kg/ha, slow release in water insoluble form – mix per manufacture's recommendations.

Part 3 Execution

3.1 WORKMANSHIP

.1 Do not spray onto structures, signs, guide rails, fences, plant material, utilities and other than surfaces intended.

.2 Do not spray within riparian areas. Refer to Section 35 42 19- Preservation of Water Courses and Wetlands for restoration of riparian areas.

.3 Clean up immediately, any material sprayed where not intended, to satisfaction of the Departmental Representative.

.4 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.

.5 Protect seeded areas from trespass until plants are established.

3.2 PREPARATION OF SURFACES

.1 Fine grade areas to be seeded free of humps and hollows.

.2 Hydraulic seeding is to be applied to slopes greater than 3(H):1(V).

3.3 FERTILIZING PROGRAM

.1 Fertilize prior to fine grading incorporating fertilizer equally distributed in accordance with manufacturer's recommendations.

.2 Fertilize twice during establishment and warranty periods.

.3 Fertilizers shall be commercial brands, having a guaranteed N-P-K analysis, meeting the requirements of the Canada Fertilizer Act.

3.4 PREPARATION OF SLURRY

.1 Measure quantities of materials by weight or weight calibrated volume measurement satisfactory to Departmental Representative. Supply equipment required for this work.

.2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.

.3 After all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.5 SLURRY APPLICATION

.1 Hydraulic seeding equipment:

.1 Slurry tank.

.2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/ or mechanical agitation method.

.3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.

.2 Slurry mixture applied per hectare to be per manufacturers recommendations.

.3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.

.1 Using correct nozzle for application.

.2 Using hoses for surfaces difficult to reach and to control application.

.4 Blend application 300 mm into adjacent grass areas or sodded areas and previous applications to form uniform surfaces.

.5 Re apply where application is not uniform.

.6 Remove slurry from items and areas not designated to be sprayed.

.7 Protect seeded areas from trespass satisfactory to the Departmental Representative.

.8 Remove protection devices as directed by the Departmental Representative.

3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of seed application for a minimum of two months or until acceptance by Departmental Representative.

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.

.3 Fertilize seeded areas after first in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles; water in well.

.4 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

.5 Water seeded areas to maintain optimum soil moisture level for germination and continued growth. Control watering to prevent washouts.

3.7 ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Plants are uniformly established. Seeded areas are free of rutted, eroded, bare or dead spots.

.2 Areas have been mown at least twice.

.3 Areas have been fertilized.

.4 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.8 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of the one year warranty period:

.1 Repair and reseed dead or bare spots to satisfaction of the Departmental Representative.

.2 Mow areas seeded, remove clippings, as directed by Departmental Representative, a minimum of four times during the warranty period.

.3 Fertilize seeded 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.

3.9 CLEANING

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 This section specifies requirements for constructing underground stormwater treatment chambers to construct the complete Oil Silt Separator (OSS) device. Work includes supply and installation of concrete bases, precast sections, and the appropriate precast section with all internal components completely and correctly installed within the OSS device, water tight seals prior to arrival to the project site.

1.2 RELATED SECTIONS

.1 Section 31 00 99 – Earthworks for Minor Works

.2 Section 33 05 16 – Maintenance Holes and Catch Basin Structures

1.3 REFERENCES

.1 AN/CSA-A257.3-M92: Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets

.2 CAN/CSA-A257.4-M92: Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings

.3 CAN/CSA-S6-00: Canadian Highway Bridge Design Code

.4 ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections

.5 ASTM C 443: Specification for Joints for Concrete Pipe and Maintenance Holes, Using Rubber Gaskets

.6 ASTM D2563: Standard Practice for Classification of Visual Defects in Reinforced Plastics

.7 ASTM D2584: Test Method for Ignition Loss of Cured Reinforced Plastics

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings shall detail the precast concrete components and the precast concrete component detailing all OSS internal components pre-installed and watertight sealed at the precast facility prior to shipment, including the sequence for installation.

1.5 HANDLING AND STORAGE

.1 Prevent damage to materials during storage and handling.

- .1 Internal OSS device materials supplied by the Manufacturer for connection to the precast concrete shall be pre-fabricated, bolted to the precast concrete, and watertight sealed to the precast surface prior to delivery.
- .2 Ensure manufacturer's quality control processes are fully adhered to.
- .3 Follow all instructions on precast concrete components during installation.

Part 2 Products

2.1 GENERAL

.1 The separator shall be circular and constructed from the pre-cast concrete circular riser and slab components.

.2 The concrete separator shall include a fiberglass insert bolted and sealed, watertight inside the concrete precast chamber, prior to delivery to the project site. The fiberglass insert must provide a lining for oil storage and retention as a secondary containment system within the OSS.

.3 The separator shall be allowed to be specified as a bend or junction structure in the stormwater drainage system.

.4 Minimum Acceptable Standard: be material and dimensional compliant with existing Stormsceptor STC products installed at project site. All parts and maintenance procedures to be identical to existing Stormsceptor STC products within the compound.

2.2 MATERIALS

.1 Concrete:

.1 Precast concrete sections: to Section 33 05 16 – Maintenance Holes and Catch Basin Structures

.2 Concrete: to Section 33 05 16 – Maintenance Holes and Catch Basin Structures.

.3 All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater.

.2 Gaskets:

.1 Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

.3 Frame and Cover:

.1 Frame and cover: to Section 33 05 16 – Maintenance Holes and Catch Basin Structures.

.4 Fiberglass:

.1 The fiberglass portion of the water treatment device shall be constructed in accordance with ASTM d-4907: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

.5 Ladders:

.1 Ladder rungs to be provided upon request.

.6 Safety Grate:

.1 A safety grate shall be installed within the chamber of the unit.

2.3 INSPECTION

.1 All precast concrete sections shall be inspected to ensure dimensions, appearance, integrity of internal components, and quality of the product meets contract specifications and associated standards.

2.4 PERFORMANCE AND DESIGN

.1 The OSS device shall remove oil and sediment from stormwater during frequent wet weather events, and retain these pollutants within the device for later removal.

.2 Total Suspended Solids (TSS):

.1 The OSS device shall be capable of removing 80 percent of the target total suspended sediment (TSS) load to achieve the MOE Enhanced water quality objectives, without scouring previously captured pollutants.

.2 Sizing methodologies shall only utilize acceptable stormwater management continuous simulation models that incorporate a detailed particle size gradation and associated particle densities, which analyze the performance of the OSS.

.3 The OSS performance and sizing methodology shall have Environmental Technology Verification (ETV) from the Canadian Environmental Technology Verification (ETV) Program.

.4 Target Sediment Gradation

Sieve Size	Percent Passing
12.5 mm	100
10 mm	80-92
5 mm	40-70
1.25 mm	20-45
315 um	9-22
160 um	5-15
80 um	0-10

.3 Free Oil/Spill Protection

.1 The OSS must be capable of removing a minimum of 90 percent floatable free oil, validated by 3rd party testing.

.2 The OSS device internal hydrocarbon storage area shall include a minimum of 405 mm of double wall containment for the full circumference of the device to provide safe oil and other hydrocarbon material storage and ground water protection.

.3 To avoid additional maintenance and disposal issues, no additional hydrocarbon absorbent materials which are removable (socks, blankets, pillows, sorbents, etc.) shall be accepted to achieve the performance in section 3.4.1 of this specification.

Part 3 Execution

3.1 CONCRETE INSTALLATION

.1 Concrete Work in accordance with Section 33 05 16 – Maintenance Holes and Catch Basin Structures.

3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 00 99 – Earthworks for Minor Works and as indicated.

.2 Obtain approval of Departmental Representative before installing OSS.

.3 The OSS device should not be installed on frozen ground. Excavation should extend a minimum of 300 mm from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

3.3 OSS CONSTRUCTION SEQUENCE

.1 The OSS in installed in sections in the following sequence:

- .1 Aggregate base.
- .2 Base slab.
- .3 Treatment chamber section(s); shall include the internals bolted/secured to the precast walls and water tight sealed prior to arrival to the project site to ensure quality control.
- .4 Transition Slab (if required).
- .5 Bypass section.
- .6 Connect inlet and outlet pipes.
- .7 Riser section and/or transition slab (if required).
- .8 Maintenance riser section(s) (if required).
- .9 Frame and access cover.

.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the OSS has been constructed, any lift holes must be plugged with mortar.

3.4 DROP PIPE, RISER PIPE, AND OIL PORT

.1 Once the upper chamber has been attached to the lower chamber, the inlet drop tee, and riser pipe must be attached. If an oil port is included, this must be attached as well. Pipe installation instructions and required materials shall be provided with the insert.

3.5 INLET AND OUTLET PIPES

.1 Inlet and outlet pipes should be securely set into the upper chamber using grout or approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight. Non-secure inlets and outlets will result in improper performance.

3.6 FRAME AND COVER OR FRAME AND GRATE INSTALLATION

.1 Precast concrete adjustment units should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

3.7 INSPECTION AND MAINTENANCE

.1 The OSS manufacturer shall provide an Operator's Manual upon request.

- .1 A Quality Assurance Plan that covers inspection and maintenance for up to 5 years shall be included with the OSS.
- .2 Inspection of the OSS, which includes sediment depth determination and oil/hydrocarbon presence, shall be easily conducted from finished grade.
- .3 Sediment removal from the OSS shall be conducted using a standard maintenance truck and vacuum apparatus.
- .4 No confined space for sediment removal or inspection of screens or other internal components shall be required for normal annual inspection or maintenance activity.
- .5 The OGS's Hydrocarbon treatment capability must, at all times, be adequate to capture, retain and store a minimum 55 gallons of hydrocarbons, or more as specified.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 20 00 - Concrete Reinforcement.

.2 Section 03 30 00 – Cast in place Concrete.

.3 Section 31 00 99 – Earthworks for Minor Works.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A 48/A 48M-03(2012), Standard Specification for Grey Iron Castings.

.2 ASTM A 123/A 123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM C 117-13, Standard Test Method for Materials Finer than 75-mm (No. 200) Sieve in Mineral Aggregates by Washing.

.4 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM C 139-11, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.

.6 ASTM C 478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

.7 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ftü (600 kN-m/mü)).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 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-A165 Series-04(R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).

.3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.4 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

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 maintenance holes and catch basin structures and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings to be approved by Departmental Representative.

1.4 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control.

.2 Certifications:

.1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.

.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect maintenance holes and catch basin structures from nicks, scratches, and blemishes.

1.6 SCHEDULING OF WORK

.1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

Part 2 Products

2.1 MATERIALS

.1 Cast-in-place concrete:

.1 In accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Concrete reinforcement: in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Precast maintenance hole units: to ASTM C 478M, circular or oval.

.1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

.2 Monolithic bases to be approved by Departmental Representative.

.4 Precast catch basin sections: to ASTM C 478M.

.5 Joints: made watertight using rubber rings.

.6 Mortar:

.1 Aggregate: to CSA A82.56.

.2 Masonry Cement: to CAN/CSA-A8.

.7 Ladder rungs: to CSA G30.18, No.25M billet steel deformed bars, hot dipped galvanized to ASTM A 123/A 123M.

.1 Rungs to be safety pattern (drop step type).

.8 Adjusting rings: to ASTM C 478M.

.9 Concrete Brick: to CAN/CSA-A165 Series.

.10 Drop maintenance hole pipe: same as sewer pipe.

.11 Steel gratings, I-beams and fasteners: as indicated.

.12 Frames, gratings, covers to dimensions as indicated and following requirements:

.1 Metal gratings and covers to bear evenly on frames.

.1 Frame with grating or cover to constitute one unit.

.2 Assemble and mark unit components before shipment.

.2 Gray iron castings: to ASTM A 48/A 48M, strength class 30B.

.3 Castings:

.1 Coated with two applications of asphalt varnish.

.2 Sand blasted or cleaned and ground to eliminate surface imperfections.

.4 Maintenance hole frames and covers: cover cast without perforations and complete with two 25 mm square lifting holes.

.13 Granular bedding and backfill: in accordance with Section 31 00 99 – Earthworks for Minor Works, and following requirements:

.1 Crushed screed stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136. Sieve sizes to CAN/CGSB-8.1.

.3 Table:

Sieve Designation (mm)	% Passing	
	Stone/Gravel	Gravel/Sand
25	100	-
12.5	65-90	100
4.75	35-55	50-100
2.00	-	30-90
.425	10-25	10-50
.075	0-8	0-10

.4 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.14 Unshrinkable fill: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.2 PRE-CAST VAULTS AND CHAMBERS

.1 Manufacturer to have AASHTO recognized third party certification.

.2 Detailed shop drawing in accordance with Section 01 33 00 – Submittal Procedures.

.3 Concrete vault inside dimensions:

.1 Sediment chambers: 3.0x1.5x2.0m

.2 Detention chambers: 5.0x2.1x2.0m

.4 Knock out cores to be provided as required.

.5 Unit to come with lifting insert.

.6 Chamber c/w 254mm thick lid w/ triple door as shown on Contract Drawings.

.7 Each core to have additional reinforcement placed around the core equal to or greater than the steel area removed for the core.

.8 All reinforcement has a minimum of 25mm concrete cover.

.9 Minimum concrete strength: 35 mpa

.10 Minimum rebar yield strength: 414 mpa

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 maintenance holes and catch basin structures 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 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 00 99 – Earthwork for Minor Works and as indicated.

.2 Obtain approval of Departmental Representative before installing maintenance holes or catch basins.

3.3 CONCRETE WORK

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Place concrete reinforcement in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 Position metal inserts in accordance with dimensions and details as indicated.

3.4 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.

.1 Maximum of 3 units behind point of pipe laying will be allowed.

.3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.

.4 Cast bottom slabs directly on undisturbed ground.

.5 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density.

.6 Precast units:

.1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.

.2 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination of these materials.

.3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.

.4 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.7 For sewers:

.1 Place stub outlets and bulkheads at elevations and in positions indicated.

.2 Bench to provide smooth U-shaped channel.

.8 Compact granular backfill to 95% corrected maximum dry density.

.9 Place unshrinkable backfill in accordance with Section 31 00 99 – Earthworks for Minor Works.

.10 Set frame and cover to required elevation on no more than 4 courses of brick.

.1 Make brick joints and join brick to frame with cement mortar.

.2 Purge and make smooth and watertight.

.11 Place frame and cover on top section to elevation as indicated.

.1 If adjustment required use concrete ring.

.12 Clean units of debris and foreign materials.

.1 Remove fins and sharp projections.

.2 Prevent debris from entering system.

.13 Install safety platforms in maintenance holes having depth of 5 m or greater, as indicated.

3.5 FIELD QUALITY CONTROL

.1 Leakage Test:

.1 Install watertight plugs or seals on inlets and outlets of each new maintenance hole and fill maintenance hole with water.

.2 Leakage not to exceed 0.3% per hour of volume of maintenance hole.

.3 If permissible leakage is exceeded, correct defects.

.4 Repeat until approved by Departmental Representative.

.5 Departmental Representative will issue Test Certificate for each maintenance hole passing test.

.6 Provide copy certification of leakage test acceptance to Departmental Representative. Include certification in Commissioning Manual.

3.6 CLEANING

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

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 03 30 00 – Cast-in-Place Concrete

.3 Section 31 00 99 – Earthwork for Minor Works

.4 Section 32 23 22.01 – Excavation, Trenching, and Backfilling

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA B300-10, Standard for Hypochlorites.

.2 ANSI/AWWA B303-10, Standard for Sodium Chlorite.

.3 ANSI/AWWA C111/A21.11-07, American National Standard for Rubber-Gasket Joints for Ductile-Iron and Fittings.

.4 ANSI/AWWA C110/A21.10-08, American National Standard for Ductile-Iron and Grey Iron Fittings for Water.

.5 ANSI/AWWA C150/A21.50-08, Standard for Thickness Design of Ductile-Iron Pipe.

.6 ANSI/AWWA C151/A21.51-09, Standard for Ductile-Iron Pipe, Centrifugally Cast.

.7 ANSI/AWWA C153/A21.53-11, Standard for Ductile-Iron Compact Fittings.

.8 ANSI/AWWA C500-09, Standard for Metal-Seated Gate Valves for Water Supply Service.

.9 ANSI/AWWA C600-10, Standard for Installation of Ductile-Iron Water Mains, and Their Appurtenances.

.10 ANSI/AWWA C651-05, Standard for Disinfecting Water Mains.

.11 ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Transmission and Distribution.

.2 ASTM International

.1 ASTM C 117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ftü (600 kN-m/mü)).

.3 American Water Works Association (AWWA)/Manual of Practice

.1 AWWA M11-2004, Steel Pipe - A Guide for Design and Installation.

.2 AWWA M17-2006, Installation, Field Testing, and Maintenance of Fire Hydrants.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.2 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids.

.5 CSA International

.6 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - current edition.

.7 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S520-07, Standard for Fire Hydrants.

.2 CAN/ULC-S543-09, Standard for Internal-Lug, Quick Connect Couplings for Fire Hose.

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 distribution piping materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Pipe certification to be on pipe.

.3 Samples:

.1 Inform Departmental Representative of proposed source of bedding materials and provide access for sampling at least 4 weeks prior to commencing work.

.2 Submit manufacturer's test data and certification that pipe materials meet requirements of this section 4 weeks minimum prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details.

.1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.

.3 Operation and Maintenance Data: submit operation and maintenance data for pipe, valves, valve boxes, valve chambers and hydrants for incorporation into manual.

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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect water distribution piping from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.

.3 Notify Departmental Representative minimum of 24 hours in advance of interruption in service.

.4 Do not interrupt water service for more than 3 hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized.

.5 Notify Departmental Representative of planned or accidental interruption of water supply to hydrants.

.6 Provide and post "Out of Service" sign on hydrant not in use.

.7 Advise local police department of anticipated interference with movement of traffic.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Tools: provide tools as follows:

.1 Service post wrenches for curb stops.

.2 Hydrant wrenches.

.3 Tee-handle operating keys for valves.

Part 2 PRODUCTS

2.1 PIPE, JOINTS AND FITTINGS

.1 Polyvinyl chloride pressure pipe: to ANSI/AWWA C900, pressure class 150, DR 18, 1 MPa gasket bell end.

.1 CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket and/or coupling.

.2 Cast iron fittings: to ANSI/AWWA C110/A21.10, and for pipe diameters larger than NPS4 cement mortar lined to ANSI/AWWA C104/A21.4.

2.2 PIPE PROTECTION

.1 Provide means of protection for iron pipe in corrosive soils in accordance with local practices and authorities having jurisdiction.

2.3 VALVES AND VALVE BOXES

.1 Valves to open counter clockwise.

.2 Gate valves: to AWWA C500, standard iron body, bronze mounted wedge or double disc valves with non-rising stems, suitable for 1 Pa with hub or flanged joints.

.3 Underground type indicator valve to be installed at locations shown on contract drawings. Indicator post to accurately indicate valve open or closed.

.4 Air and vacuum release valves: heavy duty combination air release valves employing direct acting kinetic principle.

.1 Fabricate valves of cast iron body and cover, with bronze trim, stainless steel floats with shock-proof synthetic seat suitable for 2070 kPa working pressure.

.2 Valves to expel air at high rate during filling, at low rate during operation, and to admit air while line is being drained.

.3 Valve complete with surge check unit.

.4 Ends to be flanged to ANSI/AWWA C110/A21.10.

.5 Cast iron valve boxes: bituminous coated screw type adjustable over minimum of 450 mm complete with valve operating extension rod, 30 mm minimum diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover.

.1 Base to be large round type with minimum diameter of 300 mm.

.2 Top of box to be marked "WATER"/"EAU".

2.4 HYDRANTS

.1 Hydrants: compression type hydrant, to CAN/ULC-S520, with two 65 mm threaded hose outlets, one 100 mm threaded pumper connection, 150 mm riser barrel, 125 mm bottom valve and 150 mm connection for main.

.1 Hydrants to open counter clockwise, threads to local standard. Provide metal caps and chains.

.2 Provide key operated gate valve located 1 m from hydrant.

.2 Hydrant paint: exterior enamel to MPI #96.

2.5 SELF-DRAINING STANDPIPE

.1 Diameter: 50mm

.2 Check Valve

- .1 Size: 50mm
- .2 Conical Lead Free silent check valve
- .3 PTFE seat
- .4 Minimum Pressure rating: 400psi WOG non-shock & 15psi WSP

.3 Reducer: 50mm x 38mm

.4 Threaded Fire-Hose Connection: 38mm

.5 Cast Iron to ASTM A-126-B

.6 Mild Steel to SAE 1020

.7 Bronze to ASTM B-62

.8 Urethane: Durometer 60

.9 Parts List

- .1 Handwheel: Aluminum
- .2 Handwheel Bolt: Brass
- .3 Washer: Brass
- .4 Handwheel Stem: Cast Bronze
- .5 Top End "O" Ring: Houghton – 221
- .6 Handwheel Stem Pin: Stainless Steel
- .7 Top End: Cast Iron
- .8 Pipe: Steel
- .9 Operating Rod: Steel
- .10 Gate Pin: Stainless Steel
- .11 Drain Shield: Plastic
- .12 Screwed Gate "O" Ring: Houghton – 227
- .13 Bottom End: Cast Bronze
- .14 Screwed Gate: Cast Bronze
- .15 Cotter Pin: Brass
- .16 Valve Discwasher: Steel
- .17 Valve Disc: Urethane

2.6 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material to: Section 31 00 99 –Earthwork for Minor Works and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.3 Table

Sieve Designation (mm)	% Passing	
	Stone/Gravel	Gravel/Sand
75	-	-
50	-	-
38.1	-	-
25	100	-
19	-	-
12.5	65-90	100
9.5	-	-
4.75	35-55	50-100
2.00	-	30-90
.425	10-25	10-50
.180	-	-
.075	0-8	0-10

.2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete.

2.7 BACKFILL MATERIAL

.1 In accordance with Section 31 00 99 – Earthwork for Minor Works.

2.8 PIPE DISINFECTION

.1 Sodium hypochlorite, ANSI/AWWA B300 to disinfect water mains.

.2 Disinfect water mains in accordance with ANSI/AWWA C651.

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 distribution piping 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 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.

.1 Inspect materials for defects to approval of Departmental Representative.

.2 Remove defective materials from site as directed by Departmental Representative.

3.3 TRENCHING

.1 Do trenching work in accordance with Section 33 00 99 – Earthwork for Minor Works.

.2 Ensure trench depth allows coverage over pipe as indicated.

.3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

3.4 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.1 Place concrete to details as directed by Departmental Representative.

.2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 hours after placing.

3.5 GRANULAR BEDDING

.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to 95% maximum density to ASTM D 698.

.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding with compacted bedding material.

3.6 PIPE INSTALLATION

.1 Lay pipes to ANSI/AWWA C600 and Manufacturer's standard instructions and specifications.

.1 Do not use blocks except as specified.

.2 Join pipes in accordance with ANSI/AWWA C600 and manufacturer's recommendations.

.3 Bevel or taper ends of PVC pipe to match fittings.

.4 Handle pipe by methods approved by Departmental Representative and recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.5 Lay pipes on prepared bed, true to line and grade.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.2 Take up and replace defective pipe.

.3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.

.6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes with equipment and methods approved by Departmental Representative.

.9 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.10 Align pipes before jointing.

.11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.12 Avoid displacing gasket or contaminating with dirt or other foreign material.

.1 Remove disturbed or contaminated gaskets.

.2 Clean, lubricate and replace before jointing is attempted again.

.13 Complete each joint before laying next length of pipe.

.14 Minimize deflection after joint has been made.

.15 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.16 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.

.17 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

.18 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.

.19 Do not lay pipe on frozen bedding.

.20 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.

.21 Backfill remainder of trench.

3.7 VALVE INSTALLATION

.1 Install valves to manufacturer's recommendations at locations as indicated.

.2 Support valves located in valve boxes or valve chambers by means of bedding same as adjacent pipe. Maximum length of pipe on each end of valve shall be 1 m. Valves not to be supported by pipe.

.3 Install underground post-type indicator valves as indicated.

3.8 HYDRANTS

.1 Install hydrants at locations as indicated.

.2 Install hydrants in accordance with AWWA M17.

.3 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated.

.4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50 mm above final grade.

.5 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.

.6 To provide proper draining for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5 m deep and backfill with coarse gravel or crushed stone to level 150 mm above drain holes.

.7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.9 THRUST BLOCKS AND RESTRAINED JOINTS

.1 For thrust blocks: do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Departmental Representative.

.3 Keep joints and couplings free of concrete.

.4 Do not backfill over concrete within 24 hours after placing.

.5 For restrained joints: only use restrained joints approved by Departmental Representative.

3.10 HYDROSTATIC AND LEAKAGE TESTING

.1 Do tests in accordance with ANSI/AWWA C600.

.2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.3 Notify Departmental Representative at least 24 hours in advance of proposed tests.

.1 Perform tests in presence of Departmental Representative.

.4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.

.5 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed as directed by Departmental Representative.

.6 Leave hydrants, valves, joints and fittings exposed.

.7 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.

.8 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.

.9 Open valves.

.10 Expel air from main by slowly filling main with potable water.

.1 Remove stops after satisfactory completion of test and seal holes with plugs.

.11 Thoroughly examine exposed parts and correct for leakage as necessary.

.12 Apply hydrostatic test pressure of 1380 kPa minimum based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.

.13 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.

.14 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.

.15 Repeat hydrostatic test until defects have been corrected.

.16 Apply leakage test pressure of 690 kPa minimum after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 hours.

.17 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 hours.

.18 Do not exceed allowable leakage of 1.079 L/day/km of pipe, including lateral connections.

.19 Locate and repair defects if leakage is greater than amount specified.

.20 Repeat test until leakage is within specified allowance for full length of water main.

3.11 PIPE SURROUND

.1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within 1 m of pipe.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Do not place material in frozen condition.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D 698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% maximum density to ASTM D 698.

3.12 BACKFILL

.1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.2 Do not place backfill in frozen condition.

.3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D 698.

.1 In other areas, compact to at least 90% maximum density to ASTM D 698.

3.13 HYDRANT FLOW TESTS

.1 Conduct flow tests on every hydrant to determine fire flows prior to painting hydrant caps and ports.

3.14 PAINTING OF HYDRANTS

.1 After installation, paint hydrants red.

.2 After hydrant flow tests, paint caps and ports to meet colour selections approved by authority having jurisdiction.

3.15 FLUSHING AND DISINFECTING

.1 Flushing and disinfecting operations: witnessed by Departmental Representative.

.1 Notify Departmental Representative at least 4 days in advance of proposed date when disinfecting operations will begin.

.2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.

.3 Flushing flows as follows:

Pipe Size NPS	Minimum Flow L/s
6 and below	38
8	75
10	115
12	150

.4 Provide connections and pumps for flushing as required.

.5 Open and close valves, hydrants and service connections to ensure thorough flushing.

.6 When flushing has been completed to Departmental Representative approval, introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.

.7 Rate of chlorine application to be proportional to rate of water entering pipe.

.8 Chlorine application to be close to point of filling water main and to occur at same time.

.9 Operate valves, hydrants and appurtenances while main contains chlorine solution.

.10 Flush line to remove chlorine solution after 24 hours.

.11 Measure chlorine residuals at extreme end of pipe-line being tested.

.12 Perform bacteriological tests on water main, after chlorine solution has been flushed out.

.1 Take samples daily for minimum of 2 days.

.2 Should contamination remain or recur during this period, repeat disinfecting procedure.

.13 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.

.14 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 hours.

.1 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

3.16 SURFACE RESTORATION

.1 After installing and backfilling over water mains, restore surface to original condition as directed by Departmental Representative.

3.17 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 21 - Construction/Demolition Waste Management and Disposal.

.4 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 01 33 00 – Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 03 30 00 – Cast in Place Concrete.

.4 Section 31 00 99 – Earthworks for Minor Works.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.2 ANSI/AWWA C900-2007, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inch-12 Inch (100 mm-300 mm), for Water Distribution.

.2 ASTM International

.1 ASTM C 12-09, Standard Practice for Installing Vitrified Clay Pipe Lines.

.2 ASTM C 14M-07, Standard Specification for Non-reinforced Concrete Sewer, Storm Drain and Culvert Pipe (Metric).

.3 ASTM C 76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).

.4 ASTM C 117-04, Standard Test Method for Material Finer Than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.5 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C 425-09, Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

.7 ASTM C 428-05(2006), Standard Specification for Asbestos-Cement Non pressure Sewer Pipe.

.8 ASTM C 443M-07, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.9 ASTM C 663-98(2008), Standard Specification for Asbestos Cement Storm Drain Pipe.

.10 ASTM C 700-09, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

.11 ASTM C 828-06, Standard Test Method for Low-pressure Air Test of Vitrified Clay Pipe Lines.

.12 ASTM D 698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft4-lbf/ftü (600 kN-m/mü)).

.13 ASTM D 1869-95(2005)e1, Standard Specification for Rubber Rings for Asbestos Cement Pipe.

.14 ASTM D 2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.15 ASTM D 3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.16 ASTM D 3350-10, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.17 ASTM F1417 (2015) - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 CAN/CGSB-34.9-M94, Pipe, Asbestos Cement, Sewer.

.4 CSA International

.1 CSA B1800-11, Thermoplastic Non-pressure Pipe Compendium.

.1 CSA B182.1-11, Plastic Drain and Sewer Pipe and Pipe Fittings.

.2 CSA B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.

.3 CSA B182.6-11, Profile Polyethylene (PE) Sewer Pipe and Fittings for Leak-Proof Sewer Applications.

.4 CSA B182.11-11, Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

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

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

.3 Notify Departmental Representative and building 24 hours minimum in advance of any interruption in service.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:

.1 Certification to be marked on pipe.

.4 Test and Evaluation Reports:

.1 Submit manufacturer's test data and certification 2 weeks minimum before beginning 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 accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 PLASTIC PIPE

.1 Type PSM Polyvinyl Chloride (PVC): to ASTM D 3034 or CSA B182.2.

.1 Standard Dimensional Ratio (SDR): 41.

.2 Locked-in gasket and integral bell system.

.3 Nominal lengths: 4 m.

.2 Acrylonitrile - Butadiene - Styrene (ABS): to ASTM D 2680 or CSA B182.2.

2.2 SERVICE CONNECTIONS

.1 Type PSM Poly (Vinyl) Chloride: to CSA B182.2.

.2 Plastic pipe: to CSA B182.1, with push-on joints.

.3 Cast iron service saddles: with oil resistant gaskets, stainless steel clamp and oil resistant "0" rings in branch end.

2.3 CEMENT MORTAR

.1 Portland cement: to CSA A3000, normal type 10.

.2 Mix mortar 1 part by volume of cement to two parts of clean, sharp sand mixed dry.

.1 Add only sufficient water after mixing to give optimum consistency for placement.

.2 Do not use additives.

2.4 PIPE BEDDING AND SURROUND MATERIALS

.1 Granular material to Section 31 05 16 - Aggregate Materials and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117.

.1 Sieve sizes to CAN/CGSB-8.2.

.2 Table:

Sieve Size (mm)	Stone/Gravel
31.5	100
25	60-100
19	15-100
2.36	10-100
.075	0-5

.3 Concrete mixes and materials for cradles, encasement, supports: to Section 03 30 00 - Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

.1 As indicated.

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 sewer pipe 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 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

.2 Clean and dry pipes and fittings before installation.

.3 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.3 TRENCHING

.1 Do trenching Work in accordance with Section 31 00 99 – Earthworks for Minor Works.

.2 Protect trench from contents of sewer or sewer connection.

.3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

3.4 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

- .1 Do not use blocks when bedding pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% corrected maximum dry density.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.5 INSTALLATION

.1 Lay and join pipes to: ASTM C 12.

.2 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.3 Handle pipe using methods approved by Departmental Representative.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.4 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Joint deflection permitted within limits recommended by pipe manufacturer.

.7 Water to flow through pipe during construction, only as permitted by Departmental Representative.

.8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.9 Install plastic pipe and fittings in accordance with CSA B182.11.

.10 Pipe jointing:

.1 Install gaskets in accordance with manufacturer's written recommendations.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes before joining.

.4 Maintain pipe joints free from mud, silt, gravel and foreign material.

.5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.

.9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 When stoppage of Work occurs, block pipes as directed by Departmental Representative to prevent creep during down time.

.12 Plug lifting holes with pre-fabricated plugs approved by Departmental Representative, set in shrinkage compensating grout.

.13 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.14 Make watertight connections to manholes.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

.15 Use prefabricated saddles or field connections approved by Departmental Representative, for connecting pipes to existing sewer pipes.

.1 Joints to be structurally sound and watertight.

3.6 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 200 mm compacted thickness as indicated.

.1 Do not dump material within 2 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to [mid height] of pipe to at least 95% corrected maximum dry density.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% corrected maximum dry density.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.7 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 200 mm compacted thickness up to grades as indicated.

3.8 SERVICE CONNECTIONS

.1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.

.2 Maintain grade for 100 and 150 mm diameter sewers at 2.0% minimum unless directed otherwise by Departmental Representative.

.3 Service connections to main sewer: Wye fittings or Departmental Representative approved saddles.

.1 Do not use break-in and mortar patch-type joints.

.4 Service connection pipe: not to extend into interior of main sewer.

.5 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of 4 pipe diameters.

.1 Use long sweep bends where applicable.

.6 Plug service laterals with water tight caps or plugs as approved by Departmental Representative.

.7 Place location marker at ends of plugged or capped unconnected sewer lines.

.1 Each marker: 38 x 89 mm stake extending from pipe end at pipe level to 0.6 m above grade.

.2 Paint exposed portion of stake red with designation SAN SWR LINE in black.

3.9 FIELD TESTING

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 When directed by Departmental Representative, draw tapered wooden plug with diameter 95% of nominal pipe diameter through sewer to ensure that pipe is free of obstruction.

.3 Remove foreign material from sewers and related appurtenances by flushing with water.

.4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.

.5 Do infiltration and exfiltration testing as specified herein and as directed by Departmental Representative.

.1 Perform tests in presence of Departmental Representative.

.2 Notify Departmental Representative 24 hours minimum in advance of proposed tests.

.6 Carry out tests on each section of sewer between successive manholes including service connections.

.7 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.

.8 Exfiltration Test:

.1 Fill test section with water to displace air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are begun.

.2 Immediately prior to test period add water to pipeline until there is head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.

.3 Duration of exfiltration test: 2 hours.

.4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.

.9 Infiltration Test:

- .1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
- .2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.
- .3 Install watertight plug at upstream end of pipeline test section.
- .4 Discontinue pumping operations for at least 3 days before test measurements are to begin and during this time, keep thoroughly wet at least one third of pipe invert perimeter.
- .5 Prevent damage to pipe and bedding material due to flotation and erosion.
- .6 Place 90 degrees V-notch weir, or other measuring device approved by Departmental Representative in invert of sewer at each manhole.
- .7 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.

.10 Leakage: not to exceed following limits in litres per hour per mm of diameter per 100m of sewer including service connections:

- .1 Exfiltration, based on 600 mm head: 0.175 L.
- .2 Infiltration: 0.150 L.

.11 Low Pressure Air Test:

- .1 Perform in accordance with ASTM F1417 and UNI B-6-90.
- .2 Equipment:
  - .1 Provided by Contractor.
  - .2 Properly calibrated and oil-free.
- .3 Provide separate lines for:
  - .1 Introduction of low pressure air.
  - .2 Constant monitoring of air pressure build-up in line.
  - .3 Inflation of pneumatic plugs from the control panel.
- .4 Mechanical or pneumatic plugs may be used to isolate pipe sections.
- .5 Procedure:
  - .1 Ensure lines have been flushed and video inspected prior to beginning low pressure air test.
  - .2 Isolate sewer line to be tested with plugs.
    - .1 Inspect manhole inverts for damage prior to installing plug.
  - .3 Conduct for time duration: T (seconds) =0.085DK/Q

    K = 0.000419DL, but not less than 1.0

    Q = 0.0015 ft^3/min/square foot internal pipe surface area

    D = nominal pipe diameter in inches

    L = length of pipe being tested in feet

.1 Minimum time (min:sec):

.1 100mm dia – 3:46

.2 150mm dia – 5:40

.3 200mm dia – 7:34

.4 250mm dia – 11:20

.4 Connect air source to inlet tap and slowly add air until pressure equals 4.0 psig greater than the average back pressure from groundwater.

.1 Do not exceed 9.0 psig.

.5 Control pressure to maintain pressure for minimum 2 minutes until pressure stabilizes.

.6 Disconnect air supply and decrease pressure slightly to range: 3.5 psig – 4.0 psig greater than the average back pressure from groundwater.

.7 Begin timing test.

.8 Record pressure following T seconds.

.9 Test fails if pressure drop of 1.0 psig or greater occurs.

.12 Repair and retest sewer line as required, until test results are within limits specified.

.13 Repair visible leaks regardless of test results.

.14 Television and photographic inspections:

.1 Carry out inspection of installed sewers by video camera, digital camera or by other related means.

.2 Provide means of access to permit Departmental Representative to do inspections.

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 reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 03 30 00 – Cast in Place Concrete.

.4 Section 31 00 99 – Earthworks for Minor Works.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C 117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

.4 ASTM D 2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.5 ASTM D 3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.6 ASTM F 405-05, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

.7 ASTM F 667-06, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

.8 ASTM F 794-03(2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.9 ASTM F1417 (2015) - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.2 CAN/CGSB-34.9-94, Asbestos-Cement Sewer Pipe.

.3 CSA International

.1 CAN/CSA-A3000-08, Cementitious Materials Compendium.

.2 CSA G401-07, Corrugated Steel Pipe Products.

1.3 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.

.4 Certification to be marked on pipe.

.5 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.6 Manufacturer's Instructions: submit to Departmental Representative 1 copy of manufacturer's installation instructions.

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 in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 PLASTIC PIPE

.1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D 3034 or CAN/CSA-B1800.

.1 Standard Dimensional Ratio (SDR): 35.

.2 Locked-in gasket and integral bell system.

.3 Nominal lengths: 4 m.

.2 Large diameter, ribbed PVC sewer pipe and fittings: to ASTM F 794 or CAN/CSA-B1800.

.3 Acrylonitrile - Butadiene - Styrene (ABS): to ASTM D 2680 or CAN/CSA-B1800.

2.2 CORRUGATED DOUBLE WALLED HDPE PIPE

.1 Double Walled Corrugated High Density Polyethylene (HDPE): to ASTM D3350 or CSA-B182.6.

.1 Loading: HS-25 rated with minimum cover of 300mm

.2 Stiffness: 320 kPa to ASTM D 2412

.3 Joining System: Water Tight

.1 To CSA B182.8, Type 1

.2 To meet 74 kPa water pressure / vacuum lab testing requirements

.3 Gaskets to be polyisoprene meeting the requirements of ASTM F477

.4 Gaskets to be covered with a removable, protective wrap.

.5 300 to 1500 mm pipe to have a reinforced bell with a polymer composite band installed by the manufacturer.

.4 Fittings:

.1 All fabricated fittings and couplings supplied by the manufacturer shall be constructed to ensure no loss of structural integrity or joint tightness at joints.

.2 Only those fittings supplied by or recommended by the manufacturer shall be used.

.2 Applicable Standards

.1 CSA B182.8

2.3 STEEL REINFORCED POLYETHYLENE PIPE

.1 Steel Reinforced polyethylene pipe (SRPE): to ASTM F2562, Standard Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage.

.1 Resin:

.1 Conforms to ASTM D3350-12, Standard Specification for Polyethylene Plastics Pipe and Fitting Materials.

.2 Fittings:

.1 All fabricated fittings and couplings supplied by the manufacturer shall be constructed to ensure no loss of structural integrity or joint tightness at joints.

.2 Only those fittings supplied by or recommended by the manufacturer shall be used.

.3 Reinforcing Steel:

.1 550 kPa steel reinforcing.

2.4 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material in accordance with Section 31 00 99 – Earthworks for Minor Works and following requirements:

.1 Crushed or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.2 Table:

Sieve Size (mm)	Stone/Gravel
31.5	100
25	60-100
19	15-100
2.36	10-100
.075	0-5

.3 Concrete mixes and materials for thrust blocks in accordance with Section 03 30 00 - Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

.1 Per section 31 00 99 – Earthworks for Minor Works

2.6 JOINT MORTAR

.1 Portland cement: to CAN/CSA-A3000, normal type 10.

.2 Mortar: one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

Part 3 Execution

3.1 PREPARATION

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 00 99 – Earthworks for Minor Works

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

.4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by Departmental Representative.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.1 Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95 % Modified Proctor Density in compliance with ASTM D1557.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

3.4 INSTALLATION

.1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.2 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.3 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.4 Install Pipes to the following tolerances:

.1 Horizontal tolerances: plus or minus 50 mm from specified alignment.

.2 Vertical tolerances: plus or minus 10 mm from specified grade. Reverse grade is not acceptable

.5 Joints:

.1 Install gaskets as recommended by manufacturer on all pipe unless specified otherwise.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes carefully before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.6 Joint deflection permitted within limits recommended by pipe manufacturer.

.7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.

.9 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.

.10 Cut pipes as required for special inserts as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.11 Make watertight connections to manholes and catch basins.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within 1 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to underside of pipe to at least 95 % Modified Proctor.

.6 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

.7 Surround material should be compacted with a hand compactor.

3.6 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 200 mm compacted thickness up to grades as indicated.

.3 Per section 31 00 99 – Earthworks for Minor Works.

3.7 FIELD TESTS AND INSPECTIONS

.1 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.

.2 Do infiltration and exfiltration testing as specified herein and as directed by Departmental Representative.

.1 Perform tests in presence of Departmental Representative.

.2 Notify Departmental Representative 24 hours in advance of proposed tests.

.3 Carry out tests on each section of sewer between successive manholes including service connections.

.4 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.

.5 Exfiltration test.

.1 Fill test section with water to displace air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are begun.

.2 Immediately prior to test period add water to pipeline until there is head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.

.3 Duration of exfiltration test: 2 hours.

.4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.

.6 Infiltration test.

.1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.

.2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.

.3 Install watertight plug at upstream end of pipeline test section.

.4 Discontinue pumping operations for at least 3 days before test measurements are to begin and during this time, keep thoroughly wet at least one third of pipe invert perimeter.

.5 Prevent damage to pipe and bedding material due to flotation and erosion.

.6 Place 90 degrees V-notch weir, or other measuring device approved by Departmental Representative in invert of sewer at each manhole.

.7 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.

.7 Leakage: not to exceed following limits in litres per hour per mm of diameter per 100 m of sewer including service connections.

.1 Exfiltration, based on 600 mm head: 0.175 L.

.2 Infiltration: 0.150 L.

.8 Low Pressure Air Test:

.1 Perform in accordance with ASTM F1417 and UNI B-6-90.

.2 Equipment:

.1 Provided by Contractor.

.2 Properly calibrated and oil-free.

.3 Provide separate lines for:

.1 Introduction of low pressure air.

.2 Constant monitoring of air pressure build-up in line.

.3 Inflation of pneumatic plugs from the control panel.

.4 Mechanical or pneumatic plugs may be used to isolate pipe sections.

.5 Procedure:

.1 Ensure lines have been flushed and video inspected prior to beginning low pressure air test.

.2 Isolate sewer line to be tested with plugs.

.1 Inspect manhole inverts for damage prior to installing plug.

.3 Conduct for time duration: T (seconds) =0.085DK/Q

K = 0.000419DL, but not less than 1.0

Q = 0.0015 ft^3/min/square foot internal pipe surface area

D = nominal pipe diameter in inches

L = length of pipe being tested in feet

.1 Minimum time (min:sec):

.1 100mm dia – 3:46

.2 150mm dia – 5:40

.3 200mm dia – 7:34

.4 250mm dia – 11:20

.4 Connect air source to inlet tap and slowly add air until pressure equals 4.0 psig greater than the average back pressure from groundwater.

.1 Do not exceed 9.0 psig.

.5 Control pressure to maintain pressure for minimum 2 minutes until pressure stabilizes.

.6 Disconnect air supply and decrease pressure slightly to range: 3.5 psig – 4.0 psig greater than the average back pressure from groundwater.

.7 Begin timing test.

.8 Record pressure following T seconds.

.6 Test fails if pressure drop of 1.0 psig or greater occurs.

.9 Repair and retest sewer line as required, until test results are within limits specified.

.10 Repair visible leaks regardless of test results.

3.8 **VIDEO INSPECTION**

.1 The Contractor shall video inspect completed storm sewers following completion of installation. The video inspection report shall be in the form specified in Section 01 33 00 – Submittal Procedures.

.2 Should video inspection indicate apparent deficiencies, the Departmental Representative may direct Contractor to perform additional testing.

3.9 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 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 35 43 – Environmental Procedures

.2 Section 31 00 99 – Earthworks for Minor Works

.3 Section 31 37 00 – Rip Rap

.4 Section 32 92 10.16 – Hydraulic Seeding

1.2 ENVIRONMENTAL REQUIREMENTS

.1 Operation of construction equipment in water is prohibited.

.2 Use borrow material from watercourse beds only after receipt of written approval from Departmental Representative and authority having jurisdiction.

.3 Design and construct temporary crossings to minimize environmental impact to watercourse and wetland.

.4 Constructing temporary crossings of watercourses where spawning beds are indicated is prohibited.

.5 Dumping excavated fill, waste material, or debris in watercourse or wetland is prohibited.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit conceptual intercepted water management plan in accordance with Section 01 35 43 – Environmental Procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 EXISTING CONDITIONS

.1 Maintain existing flow pattern in natural watercourse systems.

.2 In natural systems maintain existing riffle pool and step pool patterns.

.3 In wetland systems, maintain existing hydrological conditions.

3.2 SITE CLEARING AND PLANT PROTECTION

.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.

.4 Temporary Erosion and Sedimentation Control to be implemented in accordance with Section 01 35 43 – Environmental Procedures.

.2 Minimize disturbance to vegetated buffer zones and protect trees and plants on site and adjacent properties where indicated.

.3 Wrap trees and shrubs adjacent to construction work, storage areas and trucking lanes in burlap.

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

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

.5 Leave cuttings from trees and other vegetation on site as brush piles as habitat structure and to allow for natural degradation.

.1 Secure large piles with degradable materials to prevent interference with watercourse.

.6 Remove only trees that may offer future blockage problems as instructed by Departmental Representative.

.7 Leave root mass and stumps in place.

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

3.3 FISH AND WILDLIFE PROTECTION

.1 Allow Parks Canada or qualified professionals designated by Departmental Representative to conduct fish and/or wildlife salvage prior to and during instream works Notify the Departmental Representative a minimum of two calendar weeks in advance of such activities so that the Departmental Representative can coordinate fish and wildlife salvage.

3.4 TEMPORARY STREAM DIVERSION AND DISCHARGE

.1 Methods of stream diversion include dam and pump, and dam and flume.

.2 Fish salvage must occur prior to de-watering of work areas.

.3 Adequately sized pump(s) shall be used to accommodate flows up to bankfull.

.4 Electric pumps are preferred to gasoline pumps at sites with access to a nearby source of electricity. Back-up pumps must be kept on-site in case of pump failure.

.5 Ensure pump inlet(s) is protected using an appropriately designed and sized fixed screen or other device to prevent debris blockage and fish entrainment. Screens may need to be designed and fabricated to be "fit for purpose". DFO's "Freshwater Intake End-of-Pipe Fish Screen Guideline" provides further guidance.

.6 Create an energy dissipation structure (rock pad or equivalent) at water discharge points as directed by Departmental Representative to prevent in-channel or bank scour and erosion and to accommodate safe surface water entry to watercourse.

.7 Install pump inlets in a deep portion of the channel or construct a depression to ensure the inlet is completely submerged at all times. Clean water may be pumped directly into the receiving water body if no scour potential.

.8 The pumping of turbid water directly back into the waterbody is not permitted. Water exceeding the following performance criteria must be treated or managed appropriately:

.1 Maximum increase of suspended sediment concentration shall not be more than 25 mg/L over background levels during any short term exposure period (i.e., 24 hours). For longer term operations (i.e., more than 30 days), average suspended sediment concentrations shall not be increased by more than 5 mg/L over background levels.

.2 Maximum increase of 8 NTU from background levels for a short-term exposure (i.e., 24 hours). Maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., more than 30 days).

.9 Install a dam across the channel to prevent flow from entering the work site. Suitable dams include aqua-dams, pea gravel bags, concrete block dams, steel or wood wall. The placement of rocks or sheet piling in the watercourse is not appropriate for dam and pump operations with a short duration. Use of loose aggregate should be avoided. If required install a downstream dam to prevent backwatering into the work area.

.10 If flume is preferred, then install flume(s) of adequate size to accommodate flows up to bankfull. Flumes must be sized at minimum to minimize headwater depths. Excessive headwater (inlet) depths as a result of undersized flumes can put excessive pressure on isolation dams and result in overtopping in to the work area.

.11 Determining flume capacity and technical design of this procedure shall be completed by a qualified professional retained by the Contractor.

.12 Begin pumping and allow gravity to passively dewater the work area. A second pump may be required to keep the worksite dry.

.13 Pumping water containing suspended materials into watercourse is prohibited. Remove, treat and discharge residual non-contaminated discharge water in accordance with Section 01 35 43 – Environmental Procedures.

.14 Maintain downstream flow at all times and restore original flow as soon as work is completed.

.15 Once the works have been completed, water shall be diverted back to the channel by removing the downstream followed by the upstream dam. Pump intakes are removed last.

.16 Restore work site to prevent ongoing erosion.

3.5 SITE RESTORATION

.1 Establish vegetated buffer zones with suitable vegetation to minimum 3 m along edge of watercourse banks as determined by Departmental Representative.

.2 Plant vegetation natural to area, suitable for application without requirement for fertilizers, pesticides and other chemicals.

.3 Control stream bank erosion in lower section of watercourse with irregular shaped rip rap underlain with non-toxic filter cloth of size approved by Departmental Representative.

.4 Hydromulching shall be used on steep slopes greater than 2:1 where seedbed cannot be prepared properly and may retain large clods of soil or rocks, and on sites where other soil stabilising, seeding, and mulching practices would not be effective due to unacceptable levels of surface soil disturbance.

.5 Revegetation of all exposed soils shall be undertaken using native seed mixes appropriate for local riparian areas, as soon as practicable, to reduce the risk of soil erosion and sedimentation.

.6 Ensure planting occurs within 7 days after work on watercourse is complete.

END OF SECTION

A	Geotechnical Assessment Report– Levelton Consultants – Pavement	30 pages
B	Geotechnical Technical Memo – WSP – Snow Retention Wall	18 pages
C	Geotechnical Technical Memo – WSP – Culvert Replacement	7 pages
D	Geotechnical Technical Memo – WSP – Test Pits West of Hwy #1	14 pages
E	Retaining Barrier Wall Design Drawings – WSP	3 pages
F	Contaminated Soil Technical Memo – Golder – Test Pits West of Hwy #1	49 pages
G	Environmental Basic Impact Assessment (BIA) - Golder	57 pages
H	BIA Reference Maps - Golder	3 pages
I	Pre-Construction Hazard Assessment	4 pages

APPENDICES