Public Works and Government Services Canada

Requisition No. EZ899-212385/A

Buy & Sell I.D. No. _____

SPECIFICATIONS
for
Matsqui M2C Excavation and Sewer Repairs

Matsqui Institution (Project No. R.102679.001)
Abbotsford, B.C

January 2021

APPROVED BY:

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Date: 2021.01.18 16:18:01 -08'00'

Regional Manager, AES _____ Date

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Real Property Services Branch, Professional and Technical Services, Pacific Region
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LIST OF DRAWINGS (Bound Separately)

Sheet No.	Description
01	Cover Page
02	Sanitary Sewer Replacement Pre-Locate Plan
03	Sanitary Sewer Replacement Plan & Profile
04	Sanitary Sewer Replacement Details 1 of 2
05	Sanitary Sewer Replacement Details 2 of 2

1. CODES

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

2. DESCRIPTION OF WORK

.1 Work under this Contract comprises construction at the Matsqui Institution in Abbotsford, BC. Work includes installation of new 200mm diameter solid PVC sanitary main complete with clear crush gravel surround and trench backfill, and manholes. The project also includes installation of individual services to the M2C building, sealing of abandoned service connections in existing sewer, and restoration and cctv inspection following construction. The project also requires the removal of remaining rock retaining wall and replacing it with a lock block retaining wall. The work will occur within the secure area of the Matsqui Institution inside and around the courtyard of the M2C building.

.2 Work to be performed under this Contract includes, but is not limited to, the following items covered further in the Contract documents:

.1 Submit Traffic Management Plan to Departmental Representative for review prior to mobilizing to site. Arrange for satisfactory clearance from CSC for all workers on site in advance.

.2 Pre-locate existing utilities by vactor.

.3 Install 200mm diameter piping complete with clear crush gravel surround and trench backfill, and manholes.

.4 Install 100mm diameter services from M2C building to 200mm diameter sanitary main complete with inspection chambers at tie-in locations to existing services outside of each cell pair.

.5 Seal off abandoned services in existing 200mm diameter sanitary sewer from within the sewer.

.6 Complete CCTV inspection of all constructed sanitary sewer works following construction.

.7 Remove existing stacked rock retaining wall and replace with two layer lock block wall.

.8 Complete site restorations including asphalt paving along access roadway and near security gates and restoration of grassed areas to equal or better condition.

.9 Provide the Department Representative with all test reports and final documentation.

3. CONTRACT DOCUMENTS

.1 The Contract documents, drawings and specifications are intended to complement each other, and to provide for and include everything necessary for the completion of the work.

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

4. OTHER CONTRACTS

.1 Cooperate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.

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

5. DIVISION OF SPECIFICATIONS

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

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

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

6. TIME OF COMPLETION

.1 Total completion of the site work shall be no later than 8 weeks from contract award date.

7. HOURS OF WORK

.1 Hours of work shall accommodate operation of the Matsqui Institution, which is a 24/7 facility operation.

8. WORK SCHEDULE

.1 Carry on work as follows:

.1 Within 5 working days after Contract award, provide a schedule showing anticipated progress stages and final completion of the work within the time period required by the Contract documents. Indicate the following:

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

.2 Commencement and completion of work of each section of the specifications or

trade for each phase as outlined.
.3 Final completion date within the time period required by the Contract documents.

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

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

9. COST BREAKDOWN .1 Before submitting the first progress claim, submit a breakdown of the Contract unit prices in detail and as directed by the Departmental Representative and aggregating Contract price, for the details shown in the schedule of quantities provided.

10. CODES, BYLAWS, STANDARDS .1 Perform work in accordance with the National Building Code of Canada, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application, including MMCD (Platinum) Edition.

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

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

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

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

12. REGULATORY REQUIREMENTS .1 Obtain and pay for - Building Permit, Certificates, Licenses and other permits required by regulatory municipal, provincial or federal authorities to complete the work.

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

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

13. CONTRACTOR'S USE OF SITE .1 Site located on Matsqui Institution property in Abbotsford, British Columbia.

.2 Use of site:
- .1 Assume responsibilities for work areas for performance of this work.
- .2 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Departmental Representative.
- .3 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with indicated phasing.
- .4 Do not unreasonably encumber site with material or equipment.
- .5 Accept liability for damage, safety of equipment and overloading of existing equipment.
- .6 Provide portable toilet for use by crew during construction.

.3 The Matsqui Institution will remain fully operational during entire construction period and the contractor is expected to work with CSC to minimize any disruptions.

.4 Co-operate with Department Representative in scheduling operations to minimize conflict with CSC or public.

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

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

.7 At completion of operations condition of existing work shall be equal to or better than that which existed before new work started.

.8 Attend progress, safety and site security orientation meetings.

14. EXAMINATION

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

.2 Provide photographs of existing conditions, objects and structures prior to the start of the project.

15. 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 the Departmental Representative 48 hours notice for necessary interruption throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, vehicular traffic and tenant operations.

.3 Provide alternative routes and parking access for personnel and pedestrian and vehicular traffic as applicable.

.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 Full closure of the access road will not be permitted during construction.

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

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

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

16. 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 their approval for actual location.

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

17. SETTING OUT OF WORK

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

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

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

18. QUALITY OF WORK

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

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

19. WORKS COORDINATION

.1 Coordinate work of subtrades:
- .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
- .2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.

.2 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.

.3 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
- .1 Pay particularly close attention to overhead work and within or near to building structural elements.
- .2 Identify on coordination drawings: building elements, services lines, rough-in points and indicate location services entrance to site.

.3 Facilitate meetings and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
.4 Publish minutes of each meeting.
.5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
.6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.

.4 Work cooperation:
.1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
.2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.
.3 Ensure disputes between subcontractors are resolved.

.5 The Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.

.6 Maintain efficient and continuous supervision.

20. APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

.2 Allow sufficient time for the following:
.1 Review of product data.
.2 Approval of shop drawings.
.3 Review of re-submission.

21. PROJECT MEETINGS

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

22. TESTING AND INSPECTIONS

.1 See Section 01 45 00 – QUALITY CONTROL

.2 The contractor shall engage and pay for the services of an approved independent testing agency of test laboratory to complete all testing at indicated in Section 01 45 00.

.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 re-testing and re-inspection.

23. AS-BUILT DOCUMENTS .1 The Departmental Representative will provide 2 sets of drawings, and 2 sets of specifications for "as-built" purposes.

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

.3 Closeout submittals in accordance with Section 01 78 00.

24. CLEANING .1 Conduct daily cleaning and disposal operations. Comply with local ordinances and anti-pollution laws.

.2 Ensure cleanup of the work areas each day after completion of work.

25. ENVIRONMENTAL PROTECTION .1 Prepare an Erosion and Sediment Control Plan and provide monitoring and maintenance as per Section 01 35 43 - ENVIRONMENTAL PROCEDURES

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

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

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

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

28. SUBMISSION OF TENDER .1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and is fully conversant with all conditions and site requirements.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 35 00.06-Special Procedures for Traffic Control.

.2 Section 01 35 33-Health and Safety Requirements.

1.2 PURPOSE

.1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

1.3 DEFINITIONS

.1 "Contraband" means:

.1 an intoxicant, including alcoholic beverages, drugs and narcotics,

.2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,

.3 an explosive or a bomb or a component thereof,

.4 currency over any applicable prescribed limit, when possessed by an inmate without prior authorization, and

.5 any item not described in paragraphs (.1) to (.4) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.

.2 “Unauthorized smoking and related Items” means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches, and lighters.

.3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.

.4 "CSC" means Correctional Service Canada.

.5 "Director" means Director, Warden or Superintendent of the Institution as applicable.

.6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.

.7 "Departmental Representative" means the Public Works and Government Services Canada representative defined in General Conditions.

.8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.

.9 "Construction limits" means the area, as indicated in the contract documents, that the contractor will be allowed to work". This area may or may not be isolated from the security area of the institution. Limits to be confirmed at construction start-up meeting.

1.4 PRELIMINARY PROCEEDINGS .1 At construction start-up meeting:
.1 Discuss the nature and extent of all activities involved in the Project.
.2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.

.2 The contractors' responsibilities:
.1 Ensure that all construction employees are aware of the security requirements.
.2 Ensure that a copy of the security requirements is always prominently on display at the job site.
.3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

1.5 CONSTRUCTION EMPLOYEES .1 Submit to the Departmental Representative a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee. Access is authorized by a gate pass signed by the Warden.

.2 Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at this institution except as approved otherwise.

.3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that these photographs be displayed prominently on the construction employees clothing while employees are in the institution.

.4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.

.5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:

.1 appear to be under the influence of alcohol, drugs or narcotics.

.2 behave in an unusual or disorderly manner.

.3 are in possession of contraband.

1.6 VEHICLES

.1 All unattended vehicles on CSC property must have windows closed; fuel caps locked, doors and trunks locked and keys removed. The keys must be securely in the possession of the owner or an employee of the company that owns the vehicle.

.2 The director may limit at any time the number and type of vehicles allowed within the Institution.

.3 Drivers of delivery vehicles for material required by the project will require security clearances and must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or PWGSC Construction Escorts while in the Institution.

.4 If the Director permits trailers to be left inside the secure perimeter of the Institution, the trailer doors must be locked at all times. All windows must have security bars and be securely locked when left unoccupied. Cover all windows with expanded metal mesh. When not in use lock all storage trailers located inside and outside the perimeter.

1.7 PARKING

.1 The parking area(s) to be used by construction employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

1.8 SHIPMENTS

.1 To avoid confusion with the institution's own shipments, address all shipments of project material, equipment and tools in the Contractor’s name and have a representative on site to receive any deliveries or shipments. CSC or PWGSC staff will NOT accept receipt of deliveries or shipments of any material equipment or tools.

1.9 TELEPHONES

.1 The installation of telephones, facsimile machines and computers with Internet connections is not permitted within the Institution perimeter unless prior approval by the Director.

.2 The Director will ensure that approved telephones, facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an Internet connection to unauthorized personnel.

.3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, Blackberries, telephones used as 2-way radios are not permitted within the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.

.4 The Director may approve but limit the use of two way radios.

1.10 WORK HOURS

.1 Conform to Section 01 11 55-General Instructions.

.2 Work is not permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waved by the Director.

1.11 OVER TIME WORK

.1 Conform to Section 01 11 55-General Instructions.

.2 Provide 48 hours advance notice to Director for all work to be performed after normal working hours of the Institution. Notify Director immediately if emergency work is required, such as to complete a concrete pour or make the construction site safe and secure.

1.12 TOOLS AND EQUIPMENT

.1 Maintain a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required by the Institution.

.2 Throughout the construction project maintain up-to-date the list of tools and equipment specified above. Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.

.3 Store all tools and equipment in approved secure locations.

.4 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor. Secure and lock scaffolding when not erected and when erected secure in a manner agreed upon with the Institution designate.

.5 All missing or lost tools or equipment shall be reported immediately to the Departmental Representative/Director.

.6 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:
.1 At the beginning and conclusion of every work day or shift upon entering and exiting the Institution.
.2 At any time when contractor is on Institution property.

.7 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day. Maintain up to date inventory of all used blades/cartridges.

.8 If propane or natural gas is used for heating the construction, the institution will require that the contractor supervise the construction site during non-working hours.

1.13 KEYS

.1 Security Hardware Keys
.1 Arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).
.2 The SMO will provide a receipt to the Contractor for security hardware keys.
.3 Provide a copy of the receipt to the Departmental Representative.

.2 Other Keys
.1 Use standard construction cylinders for locks for this use during the construction period.

.2 Issue instructions to employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.

.3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
.1 Prepare an operational keying schedule
.2 Accept the operational keys and cylinders directly from the lock manufacturer.
.3 Arrange for removal and return of the construction cores and install the operational core in all locks.

.3 Upon putting operational security keys into use, the PWGSC construction escort shall obtain these keys as they are required from the SMO and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the PWGSC construction escort.

.4 Security Hardware
.1 Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.

1.14 PRESCRIPTION DRUGS

.1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

1.15 SMOKING RESTRICTIONS

.1 Smoking is not permitted inside correctional facilities or outdoors within the perimeter of a correctional facility and persons must not posses unauthorized smoking items within the perimeter of a correctional facility.

.2 Persons in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist will be directed to leave the Institution.

.3 Smoking is permitted outside the perimeter of a correction facility in an area designated by the Director.

1.16 CONTRABAND

.1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.

.2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.

.3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.

.4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

1.17 SEARCHES

.1 All vehicles and persons entering institutional property may be subject to search.

.2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband, he may order that person to be searched.

.3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

1.18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL

.1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

1.19 MOVEMENT OF VEHICLES

.1 Escorted commercial vehicles may not be allowed to enter or leave the institution through the vehicle access gate during the regular “inmate count” occurring at breakfast, lunch and dinner hour as established by the Institution. Confirm “count” times with Director or Departmental Representative to reduce down times for deliveries to Institution and movement of contractors vehicles through Institution vehicle access gate.

.2 Construction vehicles shall not leave the Institution until an inmate count is completed.

.3 The contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.

.4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or PWGSC construction escorts working under the authority of the Director.

.5 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.

.6 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution. Arrange with Director for parking of contractor’s vehicles at minimum security Institutions.

.7 Private vehicles of construction employees will not be allowed within the security wall or fence of medium or maximum security institutions without the permission of the Director.

.8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.

.9 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another solid object.

1.20 SURVEILLANCE AND INSPECTION

.1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.

.2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

1.21 STOPPAGE OF WORK

.1 The director may request at any time that the contractor, his employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.

.2 The contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

1.22 CONTACT WITH INMATES

.1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his security clearance revoked.

.2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

1.23 COMPLETION OF CONSTRUCTION PROJECTS

.1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 ADMINISTRATIVE

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

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

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

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

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

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

.7 Verify field measurements and affected adjacent Work are coordinated.

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

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

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

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

.4 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.

.5 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.

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

.7 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.

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

.9 Submit one PDF of shop drawings for each requirement requested in specification sections and as Departmental Representative may reasonably request.

.10 Delete information not applicable to project.

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

.12 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, transparency 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.

.13 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
.1 This review shall not mean that PSPC 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 CERTIFICATES AND TRANSCRIPTS	.1	Immediately after award of Contract, submit WorkSafe BC status.
1.4 APPROVALS	.1	Approval of shop drawings: refer to Section 01 11 55, clause 20.0.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 55-General Instructions.

1.2 REFERENCES

.1 Manual of Uniform Traffic Control Devices for Streets and Highways for Canada, Transportation Association of Canada.

.2 Traffic Control Manual for Work on Roadways, BC Ministry of Transportation

1.3 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.

.2 Comply with most recent editions of the Traffic Control Manual for Work on Roadways published by the BC Ministry of Transportation and the Manual of Uniform Traffic Control Devices for Streets and Highways for Canada published by the Transportation Association of Canada.

.3 During progress of the Work, make adequate provision to accommodate normal traffic along roads and highways immediately adjacent to or crossing the works so as to cause minimum inconvenience to the general public and CSC.

.4 When working on travelled way:
- .1 Place equipment in position to present minimum of interference and hazard to travelling public.
- .2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
- .3 Do not leave equipment on travelled way overnight.

.5 Do not close any lanes of road without prior approval of Departmental Representative. Before re-routing traffic erect suitable signs and devices in accordance with instructions reference manuals.

.6 Keep travelled way graded, free of pot holes and of sufficient width for required number of lanes of traffic.

.7 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, unless other means of road access exist that meet approval of

Departmental Representative.

1.4 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified reference manuals.

.3 Place signs and other devices in locations recommended in the reference manuals.

.4 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Departmental Representative.

.5 Continually maintain traffic control devices in use by:
- .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
- .2 Removing or covering signs which do not apply to conditions existing from day to day.

1.5 CONTROL OF PUBLIC TRAFFIC

.1 Provide competent flag persons, trained in accordance with, and properly equipped as specified in the reference manuals in following situations:
- .1 When traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.
- .2 When it is necessary to institute one-way traffic system through construction area or other blockage.
- .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
- .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
- .5 For emergency protection when other traffic control devices are not readily available.
- .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
- .7 At each end of restricted sections where pilot cars are required.

.8 Delays to traffic due to contractor's operators: maximum 5 minutes.

1.6 OPERATIONAL REQUIREMENTS .1 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified and approved by Departmental Representative to protect and control traffic.

----------END OF SECTION----------

1. REFERENCES

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

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

.3 The Canadian Electric Code (as amended)

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

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

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

.7 Province of British Columbia:
- .1 Workers Compensation Act Part 3-Occupational Health and Safety.
- .2 Occupational Health and Safety Regulations
- .3 B.C. Ministry of Transportation and Infrastructure Traffic Control Manual for Work on Roadways (as amended)

2. RELATED SECTIONS

.1 Refer to the following current sections as required:
- .1 Submittals procedures: Section 01 33 00
- .2 Special Procedures for Traffic Control: Section 01 35 00.06

3. WORKERS' COMPENSATION BOARD COVERAGE

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

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

4. COMPLIANCE WITH REGULATIONS

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

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

5. SUBMITTALS

.1 Submit to Departmental Representative submittals listed for review. (in accordance with Section 01 33 00)

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

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

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

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

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

.3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

6. RESPONSIBILITY

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

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

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

7. HEALTH AND SAFETY COORDINATOR

.1 The Health and Safety Coordinator will:

.1 Be responsible for completing all health and safety training and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.

.2 Be responsible for implementing, revising, daily enforcing, and monitoring the Site Specific Health and Safety Plan.

.3 Be on site during execution of work.

8. GENERAL CONDITIONS

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

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site at night time (or provide security guard) as deemed necessary to protect site against entry.

9. PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Multi-employer work site.

.2 Federal employees and general public.

.3 Energized electrical services.

.4 Working in the open exposed to unpredictable weather.

10. UTILITY CLEARANCES

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

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

11. REGULATORY REQUIREMENTS

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

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

12. WORK PERMITS

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

13. FILING OF NOTICE

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

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

14. HEALTH AND SAFETY PLAN

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

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

.1 Primary requirements:

- .1 Contractor's safety policy.
- .2 Identification of applicable compliance obligations.
- .3 Definition of responsibilities for project safety/organization chart for project.
- .4 General safety rules for project.
- .5 Job-specific safe work procedures.
- .6 Inspection policy and procedures.
- .7 Incident reporting and investigation policy and Procedures.
- .8 Occupational Health and Safety Committee/Representative procedures.
- .9 Occupational Health and Safety meetings.
- .10 Occupational Health and Safety communications and record keeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
.3 List hazardous materials to be brought on site as required by work.
.4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
.5 Identify personal protective equipment (PPE) to be used by workers.
.6 Identify personnel and alternates responsible for site safety and health.
.7 Identify personnel training requirements and training plan, including site orientation for new workers.

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

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

.5 Departmental Representative's review: the review of Site Specific Health and Safety Plan by PSPC shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

15. EMERGENCY PROCEDURES

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

.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.

16. HAZARDOUS PRODUCTS

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

.2 Where use of hazardous and toxic products cannot be avoided:
.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00.
.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.
.4 The contractor shall ensure that the product is applied as per manufacturers recommendations.
.5 The contractor shall ensure that only pre-approved products are brought onto the work site in an adequate quantity to complete the work.

17. ASBESTOS HAZARD

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

.2 Removal and handling of asbestos will be performed as indicated.

18.ELECTRICAL SAFETY REQUIREMENTS

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing

facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

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

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

19. ELECTRICAL LOCKOUT

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

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

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

20. OVERLOADING

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

21. CONFINED SPACES

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

22.FIRE SAFETY AND HOT WORK

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

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

23.FIRE SAFETY EQUIREMENTS

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

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

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

24.FIRE PROTECTION AND ALARM SYSTEM

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

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

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

25. UNFORESEEN HAZARDS

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

26. POSTED DOCUMENTS

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

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

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

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

28.CORRECTION OF NON-COMPLIANCE .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

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

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

----------END OF SECTION----------

PART 1 – GENERAL

1.1 DEFINITIONS

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

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

1.2 FIRES

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

1.3 DISPOSAL OF WASTES

.1 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.

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

.3 Safely dispose of wet concrete and pipe grout off-site in accordance with Municipal, Provincial and Federal authorities' requirements.

1.4 EROSION AND SEDIMENT CONTROL / DRAINAGE

.1 In stream works to be avoided during presence of flow in the channel.

.2 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust that complies with the most stringent requirements of the authorities having jurisdiction.

.3 The contractor shall inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.4 All work shall be undertaken and completed in such a manner as to prevent the release of sediment, silt, or sediment laden water, concrete or concrete leachate or any other deleterious substance into any ditch or water course.

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

.6 The contractor shall keep all portions of the work drained during construction until completion. Where necessary, catch water ditch shall be constructed along the tops of excavations or fill slopes to prevent water flowing into or over the excavated or filled area. The contractor will be responsible for the repair for the damage, directly resulting for their operations and for the removal or dirt or debris from existing system, which may be caused by or which may result from water backing up or overflowing through, from, or along any part of the work or adjacent properties. The contractor shall bear all costs associated with these repairs until works are complete and accepted by the Department Representative.

.7 The contractor shall modify and/or provide additional silt control measures as necessary to accommodate construction activities and satisfy the requirements or the governing agencies.

.8 The contractor shall maintain all silt control facilities on an as-needed basis

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

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

1.5 SITE CLEARING AND PLANT PROTECTION

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

1.6 POLLUTION CONTROL

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

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

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

1.7 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.

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

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

----------END OF SECTION----------

PART 1 – GENERAL

1.1 INSPECTION

.1 The Contractor shall as part of the work perform, or cause to be performed, all tests, inspections and approvals of the work as required by the Contract Documents, and if a test, inspection or approval requires a representative sample of materials or workmanship the Contractor shall at the Contractor's own cost supply the labour and materials necessary to provide the sample.

.2 If any portion of the work is designated for special tests, inspections or approvals (either as a requirement in the Contract Documents, or by the Department Representative's instructions, or by the laws or regulations applicable at the place of the work), then:

.1 if the Department Representative is to perform or arrange for the test, inspection or approval the Contractor shall give the Department Representative timely notice requesting such test, inspection or approval; and

.2 if other authorities are to perform the test, inspection or approval the Contractor shall arrange for such test, inspection or approval and shall give the Department Representative timely notice of the date and time for such test, inspection or approval.

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

.4 If the Contractor disagrees with Department Representative's determination of the Work not meeting the Specifications based on the results of inspection or testing required in the Contract Documents or ordered by the Department Representative, the Contractor may elect to carry out such further inspection or testing which the Department Representative agrees is acceptable for the purpose of determining whether the work complies with the requirements of the Contract Documents. If such further inspection or testing determines that the Work is not in accordance with the requirements of the Contract Documents, then the Contractor shall correct such Work and pay the

costs of the inspection and testing including all costs of the correction and further testing. If such further inspection or testing determines that the Work is in accordance with the requirements of the Contract Documents, then then Department shall pay all costs of the inspection and testing.

.5 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 at the Contractor's own expense, and Contractor shall comply with such direction.

.6 The Contractor shall promptly provide the Department Representative with 4 copies of all certificates, inspection and testing reports required by the Contract Documents or ordered by the Department Representative.

.7 The Contractor shall not undertake any Work outside the working hours, as specified in the Contract Documents, which under the Contract Documents requires tests, inspection, or approval by the Department Representative unless the Contractor obtains the Department Representative's prior approval. The Contractor shall reimburse the Department for any additional costs incurred to provide tests, inspections or approvals outside such specified working hours.

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

.9 Submit for approval by Departmental Representative proposed Independent Inspection / Testing Agencies.

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

.11 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 re-testing and re-inspection.

1.2. ACCESS TO WORK .1 Allow Department 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.

1.3 TESTING FREQUENCY

.1 The following outlines the minimum testing frequency for various components of the Work

.2 Asphalt Cores to confirm Density and Thickness:
- .1 One per 500m^2.
- .2 For asphalt pavement areas less than 500m^2, pavement is deemed to have met specifications if results from all cores average the design thickness ± 5mm with no individual core greater than 10mm less than the design thickness.
- .3 Core holes shall be reinstated to the satisfaction of the Department Representative.

.3 Road Subbase and Granular Base Densities:
- .1 One per 500 sq.m.

.4 Sieve Analyses and Proctors:
- .1 One prior to commencing work.
- .2 One every 200 tonne.

.5 Asphalt Marshall Test:
- .1 One per asphalt type.
- .2 Minimum one per full paving day.

.6 Concrete:
- .1 One per 50m^3.
- .2 Minimum one per day.

.7 Trench Densities:
- .1 One per 100 lineal metres per 300mm lift.

1.4 REPORTS

.1 Submit copies of inspection and test reports to Departmental Representative. The inspection and certification report are to submitted in PDF format during the construction stage with hard copies included in the Close Out documentation.

1.5 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 01 35 43-Environmental Procedures.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.4 DEWATERING

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

.2 Ensure that the temporary pumping system is kept in operation during the work and until commissioning of the new system.

1.5 WATER SUPPLY

.1 Contractor shall provide supply of potable water for construction use.

1.6 FIRE PROTECTION

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

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

PART 2 - EXECUTION

2.1 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.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 PROJECT CLEANLINESS

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

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

.3 Clear snow and ice from site to provide a safe working areas.

.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. Dispose of waste materials and debris off site.

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

1.2 FINAL CLEANING

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

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

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

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

.5 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds. Remove dirt and other disfiguration from exterior surfaces. Sweep and wash clean paved areas.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 01 45 00-Quality Control

1.2 SUBMITTALS

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

.2 Copy will be returned after final inspection with Departmental Representative comments.

.3 Revise content of documents as required prior to final submittal.

.4 Furnish evidence, for type, source and quality of products provided.

.5 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.6 Pay costs of transportation.

.7 Submit to Department Representative, final copies of all test reports completed for this project including compaction tests, granular material gradations, asphatic concrete densities, thickness and marshall characteristics, a minimum 2 weeks prior to Substantial Performance of the Work.

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 216 x 279mm with spine and face pockets.

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

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

.5 Arrange content by process flow, 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. Bind in with text; fold larger drawings to size of text pages.

1.4 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

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

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

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

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

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

1.5 AS-BUILTS

.1 Maintain, in addition to requirements in General Conditions, 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 in field office apart from documents used for construction. Provide files, racks, and secure storage.

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

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

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

1.6 RECORDING ACTUAL SITE CONDITIONS

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

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

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

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

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

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections to provide certification that all works have been completed as specified and that works are ready for tie-in.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 03 30 02-Cast-In-Place Concrete.

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

1.2 REFERENCES

.1 American Concrete Institute (ACI)
- .1 SP-66, ACI Detailing Manual 2004.
  - .1 ACI 315, Details and Detailing of Concrete Reinforcement.
  - .2 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 143/A 143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- .2 ASTM A 775/A 775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 ASTM A 1064/A 1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .4 ASTM F3125/F3125M-15a, Standard Specification for high strength structural bolts, steel and alloy steel, heat treated, 120 ksi (830 MPa) and 105 ksi (1040 MPa) minimum tensile strength, inch and metric dimensions.

.3 Canadian Standards Association (CSA International)
- .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-A23.3, Design of Concrete Structures.
- .3 CAN/CSA- G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .4 CAN/CSA- S16-09, Design of Steel Structures.
- .5 CAN/CSA- W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .6 CSA- W59-13, Welded Steel Construction (Metal Arc Welding).
- .7 CSA-G40.20-13/CSA-G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 Reinforcing Steel Institute of Canada (RSIC)
- .1 SIC, Reinforcing Steel Manual of Standard Practice.

.5 National Building Code of Canada 2015.

1.3 SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with ACI 315.

.3 Submit shop drawings including placing of reinforcement and indicate:
.1 Bar bending details.
.2 Lists.
.3 Quantities of reinforcement.
.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.4 Detail lap lengths and bar development lengths to CSA-A23.3.

.5 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

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

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 as specified on contract drawings deformed bars to CAN/CSA-G30.12, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.16.

.4 Cold-drawn annealed steel wire ties: to CSA G30.3.

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

.6 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m^2.
.1 Protect galvanized reinforcing steel with

chromate treatment to prevent reaction with Portland cement paste.

.2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

.1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.

.3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.

.1 In this case, no restriction applies to temperature of solution.

.4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.

.1 Provide product description as described in PART 1 - SUBMITTALS

.7 Chairs, bolsters, bar supports, spacers: to CSA-A23.1.

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

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

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1 and ACI 315.

.1 ACI 315R unless indicated otherwise.

.2 Obtain Departmental Representative's 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.

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.

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

2.4 STRUCTURAL STEEL WORK

.1 Unless noted otherwise on drawings:

.1 All structural steel shall conform to CAN/CSA-G40.20/G40.21-92 grade 300W.

.2 Welding shall be carried out in accordance with CSA W59.

.3 All steel plates, threaded rods, washers and nuts shall be galvanized in accordance with CAN/CSA G164-M92.

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 Use plain round bars as slip dowels in concrete.
.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
.2 When paint is dry, apply thick even film of mineral lubricating grease.

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

.4 Minimum concrete cover to reinforcing steel, unless shown otherwise in the drawings:
.1 faces cast and permanently exposed against earth = 75mm
.2 inside faces of walls = 50mm
.3 slabs and other formed walls = 40mm

.5 Ensure cover to reinforcement is maintained during concrete pour.

.6 Protect coated portions of bars with covering during transportation and handling.

.7 Splices shall be staggered so that no more than 50% of the reinforcing is spliced at any one location, unless shown otherwise on the drawings.

.8 All exposed edges of concrete to be chamfered 19mm.

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.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 GENERAL

.1 Section 03 30 02 refers to those portions of the cast-in-place work that are unique to the construction of pavements, sidewalks, curbs and gutters, manholes and catchbasins, concrete works associated with the installation of watermains and sewers, and similar works incidental to municipal services type construction. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 This specification is NOT to be used for any structural facilities such as buildings, bridges, retaining walls, or any similar structure requiring site specific structural engineering design.

1.2 RELATED SECTIONS

.1 Section 31 23 33.01-Excavating, Trenching and Backfilling.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 260/C 260M, Standard Specification for Air-Entraining Admixtures for Concrete.
.2 ASTM C 309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
.3 ASTM C 494/C 494M, Standard Specification for Chemical Admixtures for Concrete.
.4 ASTM C 1017/C 1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
.5 ASTM D 412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
.6 ASTM D 624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
.7 ASTM D 1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
.8 ASTM D 1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 Canadian Standards Association (CSA International)
.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CSA A283, Qualification Code for Concrete Testing Laboratories.
.3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
.2 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.4 CERTIFICATION

.1 Minimum 2 weeks prior to starting concrete work submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
.1 Portland cement.
.2 Blended hydraulic cement.
.3 Supplementary cementing materials.
.4 Grout.
.5 Admixtures.
.6 Aggregates.
.7 Water
.8 Waterstops.
.9 Waterstop joints.
.10 Joint filler

.2 Provide certification from Materials Representative that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1

.3 Provide certification from Materials Representative that mix proportions selected will produce concrete of specified quality, durability and yield and that strength will comply with CAN/CSA-A23.1.

1.5 CONSTRUCTION QUALITY CONTROL

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

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.3 Submit proposed quality control procedures for Departmental Representative's approval. Submit in accordance to 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Portland Cement: to CAN/CSA-5.

.2 Supplementary Cementing Materials: to CSA-A23.5.

.3 Water: to CSA-A23.1.

.4 Aggregates: to CAN/CSA-A23.1.

.5 Air entraining admixture: to CAN/CSA-A266.1.

.6 Chemical admixtures: to CAN/CSA-A266.2. Departmental Representative to approve acceleration or set retarding admixtures during cold and hot weather placing.

.7 Grout:
.1 Provide grout certification prior to use.
.2 To be as specified in Contract Documents. Alternative to be approved by Departmental Representative.
.3 Use in accordance with manufacturer's recommendations.

.8 Curing Compound:
.1 To be spray applied, liquid type conforming to ASTM C309 containing a fugitive dye.
.2 To be applied in accordance with manufacturer's recommendations.
.3 Other curing methods such as sheet material and burlap mats, subject to Departmental Representative's approval.

.9 Premoulded Joint Fillers (expansion joint): Bituminous impregnated fibre board: to ASTM D1751.

2.2 CONCRETE MIXES

.1 Proportion concrete in accordance with CAN/CSA-A23.1, Table 11. Alternative 1 and to specific design criteria specified on Contract Drawings. Minimum 28 day compressive strength to be 32 MPa.

2.3 FORMS

.1 Forms to CAN/CSA-A23.1.11.

.2 Free from surface defects for all concrete faces exposed to view.

.3 Form ties to be metal and of type such that no metal left within 25mm of concrete surface when forms removed.

2.4 FORM RELEASE AGENT

.1 Non-staining material type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.

PART 3 - EXECUTION

3.1 GENERAL

.1 Do cast-in-place concrete work, including surface tolerances, finishing and field quality control, in accordance with CAN/CSA-A23.1 except where specifically stated otherwise.

3.2 FORMWORK

.1 Formwork to conform to shape, lines and dimensions shown on Contract Drawings.

.2 Formwork to be substantial, sufficiently tight to prevent leakage of mortar and braced and tied to maintain position and shape.

.3 Formwork to be unlined unless specified otherwise.

3.3 CONSTRUCTION

.1 Obtain Departmental Representative's approval before placing concrete. Providing minimum 24h notice prior to placing of concrete.

.2 Pumping of concrete is permitted only after Departmental Representative's approval of equipment and mix.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.

.5 Ensure placement and compaction procedures to CAN/CSA-A23.1 and to approval of Departmental Representative.

.6 Protect exposed surfaces from weather and vandalism during initial set period.

.7 Strip forms ensuring no damage to concrete.

.8 Ensure curing procedures consistent with weather and temperature conditions.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 Do not place load upon new concrete until authorized by Departmental Representative.

3.4 JOINT FILLERS

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless authorized otherwise by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.2 Locate and form all joints as shown on Contract Drawings or as otherwise require. Install joint filler where applicable.

.3 Use 13mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to finished slab surface unless indicated at bottom.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 GENERAL

.1 Section 03 45 00 refers to those portions of the cast-in-place work that are unique to the construction of pavements, sidewalks, curbs and gutters, manholes and catchbasins, concrete works associated with the installation of watermains and sewers, and similar works incidental to municipal services type construction. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 This specification is NOT to be used for any structural facilities such as buildings, bridges, retaining walls, or any similar structure requiring site specific structural engineering design.

.3 Except where specifically stated otherwise, all materials and methods in this Section to conform to requirements of the latest version of CAN/CSA-A23.1.

1.2 RELATED SECTIONS

.1 Section 03 20 02-Concrete Reinforcing.

.2 Section 31 23 33.01-Excavating, Trenching and Backfilling

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 260/C 260M, Standard Specification for Air-Entraining Admixtures for Concrete.
.2 ASTM C 309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
.3 ASTM C 494/C 494M, Standard Specification for Chemical Admixtures for Concrete.
.4 ASTM C 1017/C 1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
.5 ASTM D 412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
.6 ASTM D 624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
.7 ASTM D 1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
.8 ASTM D 1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 Canadian Standards Association (CSA International)
.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard

Practices for Concrete.
.2 CSA A283, Qualification Code for Concrete Testing Laboratories.
.3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
.2 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.4 CERTIFICATION

.1 Minimum 2 weeks prior to starting concrete work submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
.1 Portland cement.
.2 Blended hydraulic cement.
.3 Supplementary cementing materials.
.4 Grout.
.5 Admixtures.
.6 Aggregates.
.7 Water
.8 Waterstops.
.9 Waterstop joints.
.10 Joint filler

.2 Provide certification from Materials Representative that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1

.3 Provide certification from Materials Representative that mix proportions selected will produce concrete of specified quality, durability and yield and that strength will comply with CAN/CSA-A23.1.

1.5 CONSTRUCTION QUALITY CONTROL

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

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

.3 Submit proposed quality control procedures for Departmental Representative's approval. Submit in accordance to 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Precast concrete units to be constructed in accordance with CAN/CSA-A23.1 unless stated otherwise.

PART 3 - EXECUTION

3.1 GENERAL

.1 Install precast concrete units, including surface tolerances, finishing and field quality control, in accordance with specifications and Contract Drawings.

.2 Protection, storage and handling of precast concrete units to Manufacturer's recommendations.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

1. Section 01 33 00-Submittal Procedures.
2. Section 32 11 23-Aggregate Base Courses.

1.2 REFERENCES

1. ASTM; AWWA; CAN – As specified in the contract document

1.3 SOURCE QUALITY CONTROL

1. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
2. Inform Department Representative of proposed source and provide samples or access for sampling at least 2 weeks prior to commencing production.
3. If, in opinion of Department Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
4. Should a change of material source be proposed during work, advise Department Representative 2 weeks in advance of proposed change to allow sampling and testing.
5. Acceptance of material does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified.
6. Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

1. Divert unused granular materials from landfill to local facility as approved by Department Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

1. Gravel to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM test procedure C-88 or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.
2. All crushed gravel when tested according to ASTM C-136 and ASTM C-117, or latest revised issue, to have a generally uniform gradation and conform to following gradation limits and 60% of the material passing each sieve must have one or more fractured faces. Determination of the amount of fractured material shall be in accordance with the Ministry of

Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "A", which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.

2.2 NATIVE MATERIAL

1. To be any workable soil free of organic or foreign matter; any material obtained within limits of Contract may be approved by the Department Representative. Native material content or compact to specified density.

2.3 PIT RUN GRAVEL

.1 To be well graded granular material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description (300 mm Pit Run Gravel, 200 mm Pit Run Gravel, 100 mm Pit Run Gravel). Material to compact to specified density and conform to following gradations:

Sieve Designation	Percent Passing
(300mm dia)	(100)
(200mm dia)	(100)
(100mm dia)	(100)
75mm	100
50mm	70-100
25mm	50-100
4.75mm	22-100
2.36mm	10-85
0.075mm	2-8

Recycled concrete free from contaminated and other extraneous material, conforming to the specified gradations may be used as pit run gravel.

2.4 PIT RUN SAND

1. To be well graded pit run sand, free from organic materials and conform to following gradations:

Sieve Designation	Percent Passing
12.5mm	100
4.75mm	35-100
2.36mm	20-70
1.18mm	13-50
0.600mm	8-35
0.300mm	5-25
0.150mm	2-15
0.075mm	0-6

2.5 RIVER SAND

1. River sand, to be used only where shown on Contract Drawings or otherwise specified and approved by Department Representative, to be free of organic material, salt and foreign objects and conform to following gradations:

Sieve Designation	Percent Passing
19mm	100
4.75mm	80-100
0.600mm	20-80
0.150mm	0-20
0.075mm	0-8

2.6 DRAIN ROCK

.1 To consist of clean round stone or crushed rock conforming to the following gradations:

Sieve Designation	Percent Passing Course	Fine
25.0mm	100	
19.0mm	0-100	
9.5mm	0-5	100
4.75mm	0	50-100
2.36mm		10-35
1.18mm		5-15
0.600mm		0-8
0.300mm		0-5
0.150mm		0-2
0.075mm		0

.2 Drain rock to be used only where specified on Contract Drawings. Use of drain rock other than as specified requires approval of Departmental Representative after examination of soils against which drain rock will be placed.

2.7 GRANULAR PIPE BEDDING AND SURROUND MATERIAL

.1 Crushed or graded gravels to conform to following gradations:

Sieve Designation	Percent Passing Type 1*	Type 2*
25.0mm	100	100
19.0mm	90-100	90-100
12.5mm	65-85	70-100
9.5mm	50-75	
4.75mm	25-50	40-70
2.36mm	10-35	25-52
1.18mm	6-26	15-38
0.600mm	3-17	6-27
0.300mm		3-20
0.075mm	0-5	0-8

Type 1* standard gradation
Type 2* to be used only in dry trench conditions and with Departmental Representative's prior approval

Recycled concrete free from contaminated and other

extraneous material, conforming to the Type 1 gradations, may be used as pipe bedding and surround material.

.2 Other permissible materials: only where shown on Contract Drawings or directed by Departmental Representative shall drain rock, pit run sand or approved native material be used for bedding and pipe surround.

2.8 SELECT GRANULAR SUB-BASE 1. To be well graded granular material, substantially free from lumps and organic matter, screened if required to conform to following gradations:

Sieve Designation	Percent Passing
75mm	100
25mm	50-85
0.150mm	0-15
0.075mm	0-8

2.9 CRUSHED GRANULAR SUB-BASE .1 To be 75mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing
80mm	
75mm	100
38mm	60-100
25.0mm	-
19.0mm	35-80
12.5mm	-
9.5mm	26-60
4.75mm	20-40
2.36mm	15-30
1.18mm	10-20
0.60um	5-15
0.30um	3-10
0.18um	-
0.15um	-
0.075um	0-5

2.10 GRANULAR BASE AND SHOULDER GRAVEL .1 To be 19mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing
19.0mm	100
12.5mm	75-100
9.5mm	60-90
4.75mm	40-70
2.36mm	27-55
1.18mm	16-42
0.600mm	8-30
0.300mm	5-20
0.075mm	2-8

2.11 RECYCLED AGGREGATE MATERIAL .1 Aggregates containing recycled material may be utilized if approved by the Department Representative. In addition to meeting all other conditions of this

specification, recycled material should not reduce the quality of construction achievable with quarried materials. Recycled material should consist only of crushed Portland cement concrete; other construction and demolition materials such as asphaltic pavements, bricks, plaster, etc. are not acceptable.

PART 3 - EXECUTION

3.1 HANDLING

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.2 Do not use intermixed or contaminated materials. Remove and dispose rejected materials within 48 h of rejection.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 16-Aggregate Materials.

.2 Section 33 05 13-Manholes and Catchbasin Structures.

.3 Section 33 31 13-Public Sanitary Utility Sewerage Piping.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 117, Standard Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
.2 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
.3 ASTM D 422-63, Standard Test Method for Particle-Size Analysis of Soils.
.4 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
.5 ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort(2,700 kN-m/m^3).
.6 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)
.1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.1 CSA-A3001, Cementitious Materials for Use in Concrete.
.2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 DEFINITIONS

.1 Excavation classes: two class of excavation will be recognized:
.1 Rock : solid material in excess of 1.00m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 1.0m^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 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.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.4 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-8.1.
.2 Coarse grained soils containing more than 10% by mass passing 0.075 mm sieve.

1.4 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability by Contractor for temporary supports.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of BC, Canada. Provide in advance for review by Departmental Representative.

.3 Keep design and supporting data on site.

.4 Engage services of qualified professional Engineer who is registered or licensed in Province of BC, to design and inspect temporary utility supports, shoring, bracing and underpinning required for Work.

.5 Health and Safety Requirements:
.1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.5 EXISTING CONDITIONS

.1 Buried services:
.1 Before commencing work establish location of buried services on and adjacent to site.
.2 Arrange with appropriate authority for relocation or temporary supports of buried services that interfere with execution of work: pay costs of temporary supports or relocating services.
.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs, as shown on the Drawings.
.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not

guaranteed.
.5 Prior to beginning excavation Work, notify applicable Departmental Representative, establish location and state of use of buried utilities and structures.
.6 Confirm locations of buried utilities by careful soil hydrovac methods.
.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
.8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing/re-routing.
.9 Record location of maintained, re-routed and abandoned underground lines.

.2 Existing surface features:
.1 Conduct, with Departmental Representative, condition survey of 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 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.

.2 Table

Sieve Designation	Percent Passing
75mm	100
50mm	70-100
25mm	50-100
4.75mm	22-100
2.36mm	10-85
0.075mm	0-5

.3 Type 3 fill: selected material from excavation or other sources, approved by Departmental

Representative for use intended, unfrozen and free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENT CONTROL

.1 All Erosion and Sediment Control to be completed as per Section 01 35 43 Environmental Procedures.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Sawcut pavement neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/ PROTECTION

.1 Protect existing features.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Protect natural and man-made features required to remain undisturbed.

.4 Protect buried services that are required to remain undisturbed, i.e. water and gas.

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 33 - Health and Safety Requirements.

.2 During backfill operation:
.1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
.2 Do not remove bracing until backfilling has reached respective levels of such bracing.
.3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500mm above toe of sheeting.

3.6 DEWATERING AND HEAVE PREVENTION

.1 Culvert installation are to be done in dry conditions.

.2 Keep excavations free of water while Work is in progress.

.3 Provide for Departmental Representative's review details of proposed dewatering methods.

.4 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.

.5 Protect open excavations against flooding and damage due to surface run-off.

.6 Dispose of water in a manner not detrimental to environment and property, or portion of Work completed or under construction.
.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.7 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated on the Drawings.

.2 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.3 Restrict vehicle operations directly adjacent to open trenches.

.4 Dispose of surplus and unsuitable excavated material off site.

.5 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.6 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.7 Correct unauthorized over-excavation as follows:
.1 Fill under bearing surfaces and footings with MMCD granular pipe bedding and surround material, Type 1 fill compacted to not less than 95% of modified Proctor maximum dry density.

.8 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.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated, and compacted to 95% modified Proctor maximum dry density.

.2 Place bedding and surround material in unfrozen condition.

.3 Where culvert subgrade is sensitive to disturbance, and compaction is difficult, provide 300mm thickness of 19mm clear stone over non woven geotextile to surround the stone and provide a stable base under the Departmental Representative supervision.

3.9 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:
.1 Departmental Representative has inspected and approved installations.
.2 Departmental Representative has inspected and approved of construction below finish grade.
.3 Inspection, testing, approval, and recording location of underground utilities.
.4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 300mm compacted thickness. Compact each layer before placing succeeding layer.

.5 Backfill material to be free draining sand and gravel with no more than 5% passing the #200 sieve. Backfill shall be compacted in lifts to at least 95% modified proctor maximum dry density.

.6 Backfilling around installations:
.1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
.2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.30 m.

3.10 RESTORATION

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace slope riprap and topsoil as directed by Departmental Representative.

.3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.4 Clean and reinstate areas affected by Work as directed by Departmental Representative.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation of polymeric geosynthetics used in revetments, retaining wall structures, filtration, drainage structures and roadbeds 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 35 43-Environmental Procedures.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
.1 ASTM A 123/A 123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.2 ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
.3 ASTM D 4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
.4 ASTM D 4716, Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
.5 ASTM D 4751, 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, 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, Methods of Testing Geosynthetics - Mass per Unit Area.
.2 No.3, Methods of Testing Geosynthetics - Thickness of Geotextiles.
.3 No.6.1, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
.4 No.7.3, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
.5 No. 10, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.3 Canadian Standards Association (CSA International)
.1 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 MATERIAL CERTIFICATION

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

2. Submit a "General Product Certification Sheet" clearly showing "Minimum Average Roll Values", as governed by ASTM D4354. All values to meet or exceed specified requirements.

3. At least 2 weeks prior to commencing work, and prior to material being accepted on site, submit original manufacturer's "Mill Certificates", showing actual MINIMUM test values and clearly identifying roll and batch numbers. Any material arriving on site which does not meet or exceed accepted "Minimum Average Roll Values" or that are not identified on original manufacturer's mill certification document to be removed at no cost to Owner.

4. All rolls of geosynthetic arriving on site to be clearly labeled identifying roll and batch number, original manufacturer's product identification number, and width and length of material contained within roll.

1.5 DELIVERY, STORAGE AND HANDLING

1. During delivery and storage, protect geosynthetics from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

2. Use equipment that does not contact material itself during loading, unloading and handling. Slings or other lifting devices to provide adequate support without damaging material. Off-load in a minimum of steps directly to storage or installation area.

3. Sore all rolls of geosynthetic on smooth, flat surfaces raised above ground that provide continuous support to rolls. Maintain additional protective cover if rolls are to be stored in excess of 30 days.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

PART 2 - PRODUCTS

2.1 MATERIAL

1. Geosynthetic: non-woven synthetic fibre fabric, supplied in rolls as shown on Contract Drawings.

2. Notwithstanding above, all specified properties represent "Minimum Average Roll Values" as governed by ASTM D4354.

3. Sewn seams (geotextiles) to be constructed using a 'j' configuration with 5 to 8 stiches per 25 mm in each of 2 lines of stitching separated by at least 12 mm. Stitches to be such that they will have an elongation at break equal to or greater than geosynthetic when tested in plane of seam. Ultimate grab strength perpendicular to seam to be equal to or exceed 90% of grab tensile strength or geosynthetic specified.

4. Thread for sewn seams (geotextiles) to have an equal or better resistance to chemical and biological degradation as that of geosynthetic. For inspection purposes, thread used to be of a colour that will contrast with original geosynthetic. Threads comprising of any organic fibres (such as cotton) or nylon will not be accepted.

5. Seams for all other geosynthetics to be to manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

1. Where fabric seams are not sewn, ensure overlaps as shown on Contract Drawings, but under no circumstance less than 600mm.

2. When placing fabric which incorporates a sewn seam, place seam "thread up" to facilitate inspection and repair.

3. Place pins or staples, where used, at a maximum of 2 m intervals.

4. Minimum granular thicknesses:
    1. Minimum lift thickness, prior to compaction with non-vibratory equipment to be 300 mm.
    2. Minimum base course thickness prior to further compaction with vibratory equipment to be 600 mm (pre-compacted) as above.

5. Protect installed geosynthetic material from displacement, damage or deterioration before, during and after placement of material layers.

6. After installation, cover with overlying layer within 4h of placement.

7. Replace damaged or deteriorated geosynthetic to approval of the Departmental Representative.

8. Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

3.2 PROTECTION

1. Do not permit passage of any vehicle directly on geosynthetic at any time. Place fill by end-dumping or long-reach equipment.

2. Maximum drop height for fill directly onto geosynthetic to not exceed 1 m.

3.3 REPAIRS

1. Repair seams which open, and tears and punctures, by removing fill and resetting fabric. Additional geosynthetic to be placed over are, extending beyond perimeter of failure a distance corresponding to lapping requirements for project. Where practical, repaired geosynthetic to be pinned, bonded or stapled into place at intervals equal to or less than one-eighth perimeter of damage or 2 m, whichever is lesser.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 31 23 33.01-Excavating, Trenching and Backfilling.

1.2 REFERENCES

.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 (600kN-m/m^3).

.6 ASTM D 1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m^3).

.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 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).

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.4 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 SUBMITTALS

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

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	% Passing			
100 mm	-	-	-	-
75 mm	100	100	100	-
50 mm	-	-	-	100
37.5 mm	-	-	-	-
25 mm	55-100	-	-	60-100
19 mm	-	-	-	-
12.5 mm	-	-	-	38-70
9.5 mm	-	-	-	-
4.75 mm	25-100	25-85	-	22-55
2.00 mm	15-80	-	-	13-42
0.425 mm	4-50	5-30	0-30	5-28
0.180 mm	-	-	-	-
0.075 mm	0-8	0-10	0-8	2-10

.4 Other properties as follows:

.1 Liquid Limit: to ASTM D 4318, Maximum 25.

.2 Plasticity Index: to ASTM D 4318, Maximum 6.

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
.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.
.1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density not less than 95% Modified Proctor density.

.3 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.

.4 Equipped with device that records hours of actual work, not motor running hours.

.5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.6 Apply water as necessary during compaction to obtain specified density.

.7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

.2 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.

.3 Proof roll at level in sub-base as indicated.
.1 If non standard proof rolling equipment is approved, Departmental Representative will determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:
.1 Remove 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.

.6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 CLEANING

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

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

3.7 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 31 23 33.01-Excavating, Trenching and Backfilling.

1.2 REFERENCES

.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 (600kN-m/m^3).
.5 ASTM D 1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700kN-m/m^3).
.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 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).

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.4 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 SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 31 05 16 - Aggregate Materials and 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.3 Replace defective or damaged materials with new.
.4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
.1 Crushed stone or gravel.
.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2 .
.1 Gradation Method #1 to:

Sieve Designation	% Passing (1)	(2)	(3)
100 mm	-	-	-
75 mm	-	-	-
50 mm	100	-	-
37.5 mm	70-100	-	-
25 mm	-	100	-
19 mm	50-75	-	100
12.5 mm	-	65-100	70-100
9.5 mm	40-65	-	-
4.75 mm	30-50	35-60	40-70
2.00 mm	-	22-45	23-50
0.425 mm	10-30	10-25	7-25
0.180 mm	-	-	-
0.075 mm	3-8	3-8	3-8

.2 Gradation Method #2 to: MMCD Platinum Edition except that percentage finer than 0.075 mm not to exceed 8%.
.3 Material to level surface depressions to meet gradation (2) limits in accordance with Method #1.
.4 Liquid limit: to ASTM 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
50 mm	to	25 mm
25 mm	to	19.0 mm
19.0 mm	to	4.75 mm

.8 Soaked CBR: to ASTM D 1883, minimum 80, when compacted to 100% of ASTM D 1557.

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 plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PLACEMENT AND INSTALLATION

.1 Place granular base after sub-base surface is inspected and approved in writing by 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 Place material using methods which do not lead to segregation or degradation of aggregate.
.5 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.
.1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
.6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
.7 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment:
.1 Ensure compaction equipment is capable of obtaining required material densities.
.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received

from Departmental Representative before use.
.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compacting:
.1 Compact to density not less than 95% corrected maximum dry density.
.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.

3.5 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 SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 31 23 33.01-Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO)
.1 AASHTO M081-92-UL-04, Standard Specification for Cutback Asphalt (Rapid-Curing Type).

.2 ASTM International
.1 ASTM D140/D140M-09, Standard Practice for Sampling Bituminous Materials.
.2 ASTM D 633-11, Standard Volume Correction Table for Road Tar.
.3 ASTM D 1250-08, Standard Guide for Use of the Petroleum Measurement Tables.

.3 Canada Green Building Council (CaGBC)
.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).
.2 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
.3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
.4 LEED Canada-EB: O&M-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.

.4 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.

1.3 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for asphalt tack coat and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit two - 4 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth jars or bottles made with plastic or plastic lined cans to Departmental Representative,

at least 2 weeks prior to beginning Work.
.2 Sample asphalt tack coat material to: ASTM D 140.
.3 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work to ASTM D 140.

1.4 QUALITY ASSURANCE

.1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect asphalt tack coats from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Deliver, store and handle materials in accordance with ASTM D 140.

.5 Provide, maintain and restore asphalt storage area.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with the Waste Reduction Workplan.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Anionic emulsified asphalt: to CAN/CGSB-16.2, grade: SS-1.

.2 Cut-back asphalt; to AASHTO M081-92-UL, grade RC-70 or RC-250.

.3 Water: clean, potable, free from foreign matter.

2.2 EQUIPMENT

.1 Equipment required for Work of this Section to be in satisfactory working condition and maintained for duration of Work.

.2 Pressure distributor:
.1 Designed, equipped, maintained and operated so that asphalt material can be:
.1 Maintained at even temperature.

.2 Applied uniformly on variable widths of surface up to 5 m.
.3 Applied at readily determined and controlled rates from 0.2 to 5.4 L/m^2 with uniform pressure, and with allowable variation from any specified rate not exceeding 0.1 L/m^2.
.4 Distribute in uniform spray without atomization at temperature required.

.2 Equipped with meter, registering travel in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
.3 Equipped with pump having flow metre graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
.4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
.1 Measure temperature to closest whole number.
.5 Equipped with accurate volume measuring device or calibrated tank.
.6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
.7 Equipped with nozzle spray bar, with operational height adjustment in increments of 0.6 metres and capable of being raised or lowered.
.8 Cleaned if previously used with incompatible asphalt material.

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 tack coat 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 APPLICATION

.1 Apply asphalt tack coat only on clean and dry surface.

.2 Dilute asphalt emulsion with water at 1:1 ratio for application.
.1 Mix thoroughly by pumping or other method approved by Departmental Representative.

.3 Apply asphalt tack coat evenly to pavement surface at rate as directed by Departmental Representative, as required but not to exceed 0.7 L/m^2.

.4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.

.5 Apply asphalt tack coat only when air temperature greater than 10 degrees C and when rain is not forecast within 2 hours minimum of application.

.6 Apply asphalt tack coat only on unfrozen surface.

.7 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.

.8 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
.1 Control traffic in accordance with Section 01 35 00.06 - Special Procedures for Traffic Control.

.9 Keep traffic off tacked areas until asphalt tack coat has set.

.10 Re-tack contaminated or disturbed areas as directed by Departmental Representative.

.11 Permit asphalt tack coat to set before placing asphalt pavement.

.12 Submit summary report within 7 days minimum of date of application and include information as follows:
.1 Total area tack coated.
.2 Quantity of tack coat used.
.3 Mean application rate.
.4 Actual product quantity used when using equipment on pressure distributors.
.5 Dipstick measurements or electronic printouts are acceptable.

.13 Carry out measurements in presence of Departmental Representative upon request.

.14 Inspect tack coat application to ensure uniformity.
.1 Re-spray areas of insufficient or non-uniform tack coat coverage as directed by Departmental Representative.
.2 Ensure tack coating performed using hand held devices is consistent in appearance with adjacent areas of machine applied material.

3.3 CLEANING

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

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

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 32 12 16-Asphalt Paving.

.3 Section 32 12 13.16- Asphalt Tack Coats

1.2 REFERENCES

.1 ASTM International
.1 ASTM D 140/D 140M-09, Standard Practice for Sampling Bituminous Materials.

.2 Canada Green Building Council (CaGBC)
.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).
.2 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
.3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
.4 LEED Canada-EB: O&M-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
.2 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.

1.3 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for asphalt prime coat and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit two 4 L samples of asphalt prime proposed for use in new, clean, air tight sealed, wide mouth, jars or bottles made with plastic, plastic lined cans, to Departmental Representative, 2 weeks prior to commencing Work.
.2 Sample asphalt prime coat materials in accordance with ASTM D 140.
.3 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work, in accordance with ASTM D 140.

1.4 QUALITY ASSURANCE

.1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in accordance with Section 01 14 10 – Security Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
.1 Arrange points of delivery and quantity to be shipped with vendor
.2 Make deliveries during normal work hours.
.3 Include copy of orders and instructions respecting shipment upon request by Departmental Representative.
.4 Include suitable unloading facilities and unload asphalt as directed Departmental Representative.
.5 Provide, maintain and restore asphalt storage area.

.3 Storage and Handling Requirements:
.1 Deliver, store and handle materials to ASTM D 140.
.2 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.3 Store and protect asphalt prime coats from nicks, scratches, and blemishes.
.4 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Asphalt material: to CAN/CGSB-16.2 grade: SS-1.

.2 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.

.3 Water: clean, potable, free from foreign matter.

2.2 EQUIPMENT

.1 Pressure distributor:
.1 Designed, equipped, maintained and operated so that asphalt material can be:
.1 Maintained at even temperature.
.2 Applied uniformly on variable widths of surface up to 5 m.
.3 Applied at controlled rates from 0.2 to 5.4 L/m^2 with uniform pressure, and allowable variation from any specified rate not exceeding

0.1 L/m^2.
.4 Distributed in uniform spray without atomization at temperature required.

.2 Equipped with metre registering travel distance in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.

.3 Equipped with pump having flow metre graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator.
.1 Pump power unit to be independent of truck power unit.

.4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
.1 Temperature to be measured to nearest whole number.

.5 Equipped with accurate volume measuring device or calibrated tank.

.6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.

.7 Equipped with nozzle spray bar, with operational height adjustment in increments of 0.6 metres and capable of being raised or lowered.

.8 Cleaned if previously used with incompatible asphalt material.

.2 Aggregate Spreader:
.1 Apply blotter sand to primed surfaces using roll type spreader, or rotating disc sander capable of applying aggregate at variable widths and at variable rates.

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 prime coat 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 APPLICATION

.1 Proceed with application of tack coat only after receipt of written approval of granular base surface from Departmental Representative.

.2 Cutback asphalt:
.1 Heat asphalt prime to between 60 and 70 degrees C for pumping and spraying.
.2 Apply asphalt prime to granular base at rate as directed by Departmental Representative, as required but not to exceed 2 L/m^2.
.3 Apply on dry surface unless otherwise directed by Departmental Representative.

.3 Anionic emulsified asphalt:
.1 Dilute asphalt emulsion with clean water at 1:1 ratio for application.
.2 Mix thoroughly by pumping or other method approved by Departmental Representative.
.3 Apply diluted asphalt emulsion at rate as directed by Departmental Representative, as required but do not exceed 5 L/m^2.
.4 Apply diluted asphalt emulsion on damp surface unless otherwise directed by Departmental Representative.

.4 Apply asphalt prime only on unfrozen surface.

.5 Apply asphalt tack coat only when air temperature is greater than 10 degrees C and when rain is not forecast within 2 hours minimum of application.

.6 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt prime material.

.7 Where traffic is to be maintained, treat no more than one-half width of surface in one application.

.8 Prevent overlap at junction of applications.

.9 Do not prime surfaces that will be visible when paving is complete.

.10 Apply additional material to areas not sufficiently covered as directed by Departmental Representative.

.11 Keep traffic off primed areas until asphalt prime has set.
.1 Control traffic in accordance with Section 01 35 00.06-Special Procedures for Traffic Control.

.12 Permit prime to set before placing asphalt paving.

3.3 USE OF SAND BLOTTER

.1 If asphalt prime fails to penetrate within 24 hours, spread sand blotter material in amounts required to absorb excess material.

.2 Allow sufficient time for excess prime to be absorbed as directed by Departmental Representative.

.3 Apply second application of sand blotter as required.

.4 Do not roll blotter sand.

.5 Sweep and remove excess blotter material.

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.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for asphalt concrete paving for roads and parking areas.

1.2 RELATED SECTIONS

1. Section 01 33 00-Submittal Procedures.
2. Section 01 35 00.06-Special Procedures for Traffic Control.
3. Section 31 05 16-Aggregate Materials.

1.3 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO)
- .1 AASHTO M320, Standard Specification for Performance Graded Asphalt Binder.
- .2 AASHTO R29, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
- .3 AASHTO T245, Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

.2 Asphalt Institute (AI)
- .1 AI MS2 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.3 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C 117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C 123, Standard Test Method for Lightweight Particles in Aggregate.
- .4 ASTM C 127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
- .5 ASTM C 128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
- .6 ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .7 ASTM C 136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .8 ASTM C 207, Standard Specification for Hydrated Lime for Masonry Purposes.
- .9 ASTM D 995, Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .10 ASTM D 2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.11 ASTM D 3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
.12 ASTM D 4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.4 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.1, Sieves Testing, Woven Wire, Inch Series.
.2 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
.3 CAN/CGSB-16.3, Asphalt Cements for Road Purposes.

1.4 PRODUCT DATA

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

.2 Submit manufacturer's test data and certification that asphalt cement meets requirements of this Section.

.3 Submit asphalt concrete mix design and trial mix test results to Department Representative for review at least 4 weeks prior to beginning Work.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.

.4 Divert unused asphalt from landfill to facility capable of recycling materials.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Asphalt cement: to CAN/CGSB-16.3-M90, grade: 80-100.

.2 Reclaimed asphalt pavement:
.1 Crushed and screened so that 100% of RAP material passes 37.5 mm screen before mixing.

.3 Aggregates: in accordance with Section 31 05 16 - Aggregate Materials: General following requirements:
.1 Crushed stone or gravel consisting of hard, durable angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
.2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117.

.3 Table:

Sieve Size (UC#2)	Percent Passing
12.5 mm	100
4.75 mm	55-75
2.36 mm	38-58
1.18 mm	28-47
0.600 mm	20-36
0.300 mm	10-26
0.150 mm	4-17
0.075 mm	3-8

Sieve Size (LC#2)	Percent Passing
19 mm	100
12.5 mm	84-99
9.5 mm	73-88
4.75 mm	50-68
2.36 mm	35-55
1.18 mm	27-46
0.600 mm	18-36
0.300 mm	10-26
0.150 mm	4-17
0.075 mm	3-8

.4 Coarse aggregate: aggregate retained on 4.75mm sieve and fine aggregate is aggregate passing 4.75mm sieve when tested to ASTM C 136.

.5 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75mm sieve and stockpile separately from coarse aggregate.

.6 Do not use aggregates having known polishing characteristics in mixes for surface courses.

.7 Sand equivalent: ASTM D 2419 Min: 40.

.8 Magnesium Sulphate soundness: to ASTM C 88 Max% loss by mass after five cycles:
- .1 Coarse aggregate: 15%.
- .2 Fine aggregate: 18%.

.9 Los Angeles abrasion: Grading B, to ASTM C 131 Max % loss by mass:
- .1 Coarse aggregate, upper course: 25%
- .2 Coarse aggregate, lower course: 35%.

.10 Absorption: to ASTM C 127 Max % by mass:
- .1 Coarse aggregate, upper course: 1.75%.
- .2 Coarse aggregate, lower course: 2.00%.

.11 Loss by washing: to ASTM C 117 Max % passing 0.075 mm sieve:
- .1 Coarse aggregate, upper course: 1.5
- .2 Coarse aggregate, lower course: 2.0

.12 Flat and elongated particles: to ASTM D 4791, (with length to thickness ratio greater than 3): Max% by mass:
- .1 Coarse aggregate, upper course: 10%.
- .2 Coarse aggregate, lower course: 10%.

.13 Crushed fragments: at least 60% of particles by mass within each of following sieve designation

ranges, to have at least 2 freshly fractured face. Material to be tested according to ASTM C 136 and ASTM C117. Determination of amount of fractured material will be inaccordance with Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "B", which determines fractured faces by mass.

Passing		Retained on
25 mm	to	12.5mm
12.5 mm	to	4.75mm

.14 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

.4 Mineral filler:
.1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
.2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.
.3 Mineral filler to be dry and free flowing when added to aggregate.

2.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:
.1 Minimum drum diameter: 1200mm.
.2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
.1 Boxes with tight metal bottoms.
.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
.3 In cool weather or for long hauls, insulate entire contact area of each truck box.
.4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:
.1 Lutes or rakes with covered teeth for spreading and finishing operations.
.2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm^2 for compacting material along curbs, gutters and other structures

inaccessible to roller. Mechanical compaction equipment, when approved by Department Representative may be used instead of tamping irons.

.3 Straight edges, 3.0m in length, to test finished surface.

2.3 MIX DESIGN

.1 Mix design provided by the Contractor (to be developed by testing laboratory) for approval by Department Representative.

.2 Mix to contain maximum 20% by mass of RAP. Department Representative may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.

.3 Design of mix: by Marshall method to requirements below.

.1 Compaction blows on each face of test specimens: 75.

.2 Mix physical requirements:

Property	Roads	
Marshall Stability at 60°C	kN min	5.5 upper course 6.4 lower course
Flow Value	mm	2-4
Air Voids in Mixture	%	3-5 upper course 3-6 lower course
Voids in Mineral Aggregate	% min	15 upper course 2 14 lower course 2
Index of Retained Stability	% minimum	75

.3 Measure physical requirements as follows:

.1 Marshall load and flow value: to ASTM D1559.

.2 Air voids: to ASTM D3203.

.3 Index of Retained Stability: measure in accordance with Marshall Immersion Test (ASTM D1559).

.4 Do not change job-mix without prior approval of Department Representative. When change in material source proposed, new job-mix formula to be reviewed by Department Representative.

PART 3 - EXECUTION

3.1 PLANT AND MIXING REQUIREMENTS

.1 Batch and continuous mixing plants:

.1 To ASTM D 995.

.2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Do not load frozen materials into bins.

.3 Feed cold aggregates to plant in proportions to ensure continuous operations.

.4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.

.5 Before mixing, dry aggregates to moisture content not greater than 0.5% by mass or to lesser moisture content if required to meet mix design requirements.

.6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.

.7 Store hot screened aggregates in manner to minimize segregation and temperature loss.

.8 Heat asphalt cement and aggregate to mixing temperature directed by Department Representative. Do not heat asphalt cement above 160 degrees C.

.9 Maintain temperature of materials within 5 degrees C of specified mix temperature during mixing.

.10 Mixing time:

.1 In batch plants, both dry and wet mixing times as directed by Department Representative. Continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30s or more than 75s.

.2 In continuous mixing plants, mixing time as directed by Department Representative but not less than 45s.

.3 Do not alter mixing time unless directed by Department Representative.

.11 Where RAP is to be incorporated into mix:

.1 Feed from separate cold feed bin specially designed to minimize consolidation of material. Provide 37.5mm scalping screen on cold feed to remove oversized pieces of RAP.

.2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti rollback device to prevent material from sliding backward on feed belt.

.3 Combine RAP and new aggregates in proportions as directed by Department Representative. Dry mix thoroughly, until uniform temperature within plus or minus 5 degrees C of mix temperature, as directed by Department Representative Consultant is achieved prior to adding new asphalt cement. Do not add new asphalt cement where temperature of dried mix material is above 160 degrees C.

.2 Dryer drum mixing plant:

.1 To ASTM D 995.

.2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.

.3 Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

.4 Where RAP is to be incorporated into mix, dryer drum mixer is to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180 degrees C.

.5 Feed RAP from separate cold feed bin designed to minimize reconsolidation of material.

.6 Meter total flow of aggregate and RAP by an electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate RAP and asphalt entering mixer remain constant.

.7 Provide for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.

.8 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved. Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time. Difference between this value and amount shown by plant computer system to differ by not more than plus or minus 2%.

.9 Make provision for conveniently sampling full flow of materials from cold feed.

.10 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.

.11 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.

.12 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each week, if required.

.13 Mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer to be less than 0.5%.

.3 Temporary storage of hot mix:

.1 Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.

.2 Do not store asphalt mix in storage bins in excess of 12 hour.

.4 Mixing tolerances:
.1 Permissible variation in aggregate gradation from job mix (percent of total mass).

4.75 mm sieve and larger	5.5
2.36 mm sieve	4.5
0.600 mm sieve	3.5
0.150 mm sieve	2.5
0.075 mm sieve	1.5

.2 Permissible variation of asphalt cement from job mix: 0.3%.
.3 Permissible variation of mix temperature at discharge from plant: 5 degrees C.

3.2 EQUIPMENT

.1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:
.1 Minimum drum diameter: 1200mm.
.2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
.1 Boxes with tight metal bottoms.
.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
.3 In cool weather or for long hauls, insulate entire contact area of each truck box.
.4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:
.1 Lutes or rakes with covered teeth for spreading and finishing operations.
.2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm^2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Department Representative may be used instead of tamping irons.
.3 Straight edges, 3.0m in length, to test finished surface.

3.3 PREPARATION

.1 Reshape granular road bed, if required.

.2 When paving over existing asphalt surface, clean pavement surface. When leveling course is not

required, patch and correct depressions and other irregularities to approval of Department Representative before beginning paving operations.

.3 Adjust existing castings to new elevations and protect from asphaltic mix.

.4 When matching new pavement with existing pavement make vertical cut between existing pavement and new pavement as shown on Contract Drawings.

.5 Apply prime coat and/or tack coat in accordance with Section 32 12 13.23-Asphalt Prime Coats and/or Section 32 12 13.16-Asphalt Tack Coats prior to paving.

.6 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required. Elevate truck bed and thoroughly drain. No excess solution to remain in truck bed.

.3 Schedule delivery of material for placing in daylight, unless Department Representative approves artificial light.

.4 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by Department Representative, but not less than 125 degrees C.

3.5 PLACING

.1 Obtain Department Representative's approval of base and existing surface and tack coat and prime coat prior to placing asphalt.

.2 Place asphalt concrete to match existing thicknesses on site. Extents to trench restoration detail shown in contract drawings.

.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5 degrees C. Place overlay pavement only when air temperature is above 10 degrees C.

.2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain,

or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as shown on Contract Drawings:
- .1 Levelling courses to thicknesses required but not exceeding 100mm.
- .2 Lower course in layers of 100mm each.
- .3 Surface course in layers of maximum 60mm each.

.5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.6 Spread and strike off mixture with self propelled mechanical finisher.
- .1 Construct longitudinal joints and edges true to line markings. Position and operate paver to follow established line closely.
- .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
- .3 Maintain constant head of mix in auger chamber of paver during placing.
- .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
- .5 Correct irregularities in alignment left by paver by trimming directly behind machine.
- .6 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.
- .7 Do not throw surplus material on freshly screeded surfaces.

.7 When hand spreading is used:
- .1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.
- .2 Distribute material uniformly. Do not broadcast material.
- .3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.
- .4 After placing and before rolling, check surface with templates and straight edges and correct irregularities.
- .5 Provide heating equipment to keep hand tools free from asphalt. Control temperature to avoid burning material. Do not use tools at higher temperature than temperature of mix being placed.

3.6 COMPACTING

.1 Roll asphalt continuously to density not less than 97% of 75 blow Marshall density to ASTM D1559 with no individual test less than 95%.

.2 General:

.1 Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be pneumatic tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. For subsequent rolling do not exceed 5 km/h for static steel-wheeled and 8 km/h for pneumatic tired rollers.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.5 Overlap successive passes of roller by minimum of 200mm and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.10 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.11 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.3 Breakdown rolling:

.1 Commence breakdown rolling immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or

super-elevated sections.

.4 Use only experienced roller operators for this work.

.4 Second rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

.5 Finished rolling:

.1 Accomplish finish rolling with steel wheel rollers while material is still warm enough for removal of roller marks.

.2 Conduct rolling operations in close sequence.

3.7 JOINTS

.1 General:

.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 600mm.

.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.

.1 For airfield runway paving, avoid cold joint construction in mid 30 m of runway.

.2 If cold joint can not be avoided, tack face with thin coat of hot asphalt prior to continuing paving.

.3 Overlap previously laid strip with spreader by 100mm.

.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.

.5 Roll longitudinal joints directly behind paving

operation.

.6 When rolling with static roller over onto previously placed lane in order that 100 to 150 mm of drum width rides on newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until thoroughly compacted neat joint is obtained.

.7 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade. Location of feather joints as indicated.

.5 Construct butt joints as indicated.

.6 Wherever practical, locate joints under future traffic markings (paint lines.)

3.8 PAVEMENT PATCHING

.1 Ensure temporary and permanent pavement patching done by handwork conforms to all standards specified for machine place asphaltic concrete.

.2 Subbase and base preparation as specified in Section 32 11 16.01 and 32 11 23, respectively, unless shown otherwise on Contract Drawings.

3.9 SIDEWALKS, DRIVEWAYS AND CURBS

.1 Hot-mix asphalt concrete sidewalks, driveways and curbs as shown on Contract Drawings.

.2 Machine place where practical.

.3 Ensure placement by handwork conforms to all standards specified for machine placed asphaltic concrete.

.4 Other than requirements relating specifically to Portland cement concrete, ensure hot-mix asphalt concrete sidewalks and curbs comply with all requirements of Section 32 16 15-Concrete Walks, Curbs and Gutters.

.5 Ensure hot-mix asphalt concrete driveways comply with all requirements of Section 32 12 16-Asphalt Paving.

3.10 FINISH TOLERANCES

.1 Finished asphalt surface to be within 6mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 6mm when checked with 3 m straight edge placed in any direction.

.3 Water ponding not permitted.

.4 Against concrete gutter, finished asphalt surface to be higher than the gutter by not more than 6mm.

3.11 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.

.2 Repair areas showing checking, rippling, or segregation.

.3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.12 CLEAN-UP

.1 Remove lids or covers from all castings and clean any prime, tack coat or hot-mix asphaltic concrete from frames, lids and covers of all castings.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 33.01-Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 117-04, Standard Test Method for Materials 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 260-86(2001), Standard Specification for Boiled Linseed Oil.
.4 ASTM D 698-00ae1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-3.3-99(March 2004), Kerosene, Amend. No. 1, National Standard of Canada.
.2 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)
.1 CSA-A23.1-04/A23.2 -04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS in accordance with Section 01 33 00 – Submittal Procedures.

.3 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.

.4 If materials have been tested by accredited testing laboratory testing laboratory approved by Departmental Representative within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project. and that strength will comply with CAN/CSA-A23.1.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11 – Cleaning.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 02 - Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 02 - Concrete Reinforcing.

.3 Joint filler: in accordance with Section 03 30 02 - Cast-in-Place Concrete.

.4 Granular base: material to Section 31 05 16 - Aggregate Materials

.5 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

.6 Fill material: to Section 31 05 16 - Aggregate Materials

.7 Boiled linseed oil: to ASTM D 260.

.8 Kerosene: to CAN/CGSB-3.3.

PART 3 - EXECUTION

3.1 GRADE PREPARATION

.1 Do grade preparation work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.
.1 Dispose of surplus and unsuitable excavated material off site.

.3 When constructing embankment provide for minimum 1 m shoulders, where applicable, outside of neat lines of concrete.

.4 Place fill in maximum 300 mm layers and compact to at least 95% of maximum dry density to ASTM D 698.

3.2 GRANULAR BASE

.1 Obtain Departmental Representative's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 300 mm layers to at least 95% of maximum density to ASTM D 698.

3.3 CONCRETE

.1 Obtain Departmental Representative approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 02 - Cast-in-Place Concrete.

.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.4 Provide edging as indicated with 10 mm radius edging tool.

.5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

3.4 TOLERANCE

.1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 4.5 m.

.2 Install expansion joints as indicated, or as directed by Departmental Representative.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints in accordance with Section 03 30 02 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound as directed by Departmental Representative.

.2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.8 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as directed by Departmental Representative.
.1 Compact and shape to required contours as directed by Departmental Representative.

3.9 LINSEED OIL TREATMENT

.1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete is clean and dry.

.2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.

.3 Apply treatment when air temperature above 10 degrees C.

.4 Apply first coat at 135 mL/m^2.

.5 Apply second coat at 90 mL/m^2 when first coat has dried.

3.10 CLEANING

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

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 33.01-Excavating, Trenching and Backfilling.

.2 Section 32 92 23-Sodding.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada
.1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment
.1 PN1340-2005, Guidelines for Compost Quality.

.3 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.

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

1.3 DEFINITIONS

.1 Compost:
.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminates.
.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.4 SUBMITTALS

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

.2 Quality control submittals:
.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11 - Cleaning

.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

.3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 TOPSOIL

.1 Topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
.1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
.2 Contain no toxic elements or growth inhibiting materials.
.3 Finished surface free from:
.1 Debris and stones over 50 mm diameter.
.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
.4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:
.1 Fertility: major soil nutrients present in following amounts:
.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
.5 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
.6 Ph value: 6.5 to 8.0.

.2 Peatmoss:
.1 Derived from partially decomposed species of Sphagnum Mosses.
.2 Elastic and homogeneous, brown in colour.
.3 Free of wood and deleterious material which could prohibit growth.
.4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: compost Category A, B in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.

.6 Limestone:
.1 Ground agricultural limestone.
.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL .1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.

.2 Contractor is responsible for amendments to supply topsoil as specified.

.3 Soil testing by recognized testing facility for PH, P and K, and organic matter.

.4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, specific to site,

that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

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

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

3.2 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as directed by 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 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Stockpile in locations as directed by Departmental Representative.
.1 Stockpile height not to exceed 2 m.

.4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as directed by Departmental Representative.

.5 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.
.1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
.2 Remove debris which protrudes more than 75 mm above surface.
.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 150 mm.
.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Departmental Representative has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil to following minimum depths after settlement.
.1 150 mm for seeded areas.
.2 135 mm for sodded areas.
.3 300 mm for flower beds.
.4 500 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.
.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
.1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.6 ACCEPTANCE

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

3.7 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required where directed by Departmental Representative.

3.8 CLEANING

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

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

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 33.01-Excavating, Trenching and Backfilling.

1.2 REFERENCES

.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).

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for sod, geotextile and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 33 00 - Submittal Procedures.

.3 Samples.
.1 Submit:
.1 Sod for each type specified.
.1 Install approved samples in1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
.2 Bio-degradable geotextile fabric.
.3 0.5 kg container of each type of fertilizer used.
.2 Obtain approval of samples by Departmental Representative.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

.5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

1.5 QUALITY ASSURANCE

.1 Qualifications:
.1 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
.2 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.6 DELIVERY, STORAGE AND HANDING

.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 supplier's recommendations.
.2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

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

.2 Commercial Grade Turf Grass Nursery:

.1 Mow sod at height directed by Departmental Representative within 36 hours prior to lifting, and remove clippings.
.2 Not more than 5 broadleaf weeds and up to 20% native grasses per 40 square metres.

.3 Sod establishment support:
.1 Geotextile fabric: biodegradable square mesh.
.2 Wooden pegs: 17 x 8 x 200 mm.
.3 Biodegradable starch pegs: 17 x 8 x 200 mm.

.4 Water:
.1 Supplied by Departmental Representative at designated source.

.5 Fertilizer:
.1 To Canada "Fertilizers Act" and Fertilizers Regulations.
.2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL .1 Obtain written approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from 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 sod installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Fine grade surface free of humps and hollows to smooth,

even grade, to tolerance of plus or minus 10 mm, for Turf Grass Nursery Sod and plus or minus 15 mm for Commercial Grade Turf Grass Nursery], surface to drain naturally.

.4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

3.3 SOD PLACEMENT

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

.2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.4 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.4 SOD PLACEMENT ON SLOPES AND PEGGING

.1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.

.2 Start laying sod at bottom of slopes.

.3 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:
.1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.
.2 Not less than 3-6 pegs per square metre.
.3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Departmental Representative.
.4 Drive pegs to 20 mm above soil surface of sod sections.

3.5 FERTILIZING PROGRAM

.1 As per Section 32 91 19.12-Topsoil Placement and Grading and this section.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.
.2 Keep pavement and area adjacent to site clean

and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
.1 Clean and reinstate areas affected by Work.

3.7 PROTECTION BARRIERS

.1 Protect newly sodded areas from deterioration as directed by Departmental Representative.

.2 Remove protection as directed by Departmental Representative.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.
.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.
.3 Maintain sodded areas weed free 95%.
.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water well.

.2 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.9 ACCEPTANCE

.1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
.1 Sodded areas are properly established.
.2 Sod is free of bare and dead spots.
.3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.2 Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
.1 Sodded areas are properly established.
.2 Extent of surface soil visible when grass has been cut to height of 60 mm is acceptable.
.3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.
.4 Sodded areas have been cut minimum 2 times prior to acceptance.
.5 Fertilizing in accordance with fertilizer program has been carried out at least once.

.3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

.4 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

.5 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.10 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 water sodded Turf Grass Nursery Sod and Commercial Grade Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.

.3 Cut grass and remove clippings as directed by Departmental Representativeto height as follows:

.1 Turf Grass Nursery Sod:
.1 50 mm during normal growing conditions.

.2 Commercial Grade Turf Grass Nursery Sod:
.1 60 mm during normal growing conditions.

.3 Cut grass as directed by Departmental Representative, but at intervals so that approximately one third of growth is removed in single cut.

.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water well.

.5 Eliminate weeds by mechanical means to extent acceptable to Departmental Representative.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 31 23 33.01-Excavating, Trenching and Backfilling.

.3 Section 33 31 13-Public Sanitary Utility Sewerage Piping.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM A 48/A 48M, Standard Specification for Gray Iron Castings.
.2 ASTM C 117, Standard Test Method for Materials Finer than 75-µm Sieve in Mineral Aggregates by Washing.
.3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
.4 ASTM C 139, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
.5 ASTM C 478M, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.
.6 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
.2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)
.1 CAN/CSA-A23.1/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.1 CSA-A3001, Cementitious Materials for Use in Concrete.
.2 CSA-A3002, Masonry and Mortar Cement.
.3 CAN/CSA-A165 Series, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
.4 CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.
.5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

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

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete:
.1 to Section 03 30 02-Cast-In-Place Concrete.
.2 concrete to be minimum 20 MPa or as specified otherwise on Contract Drawings.

.2 Concrete reinforcement: to Section 03 20 02-Concrete Reinforcing.

.3 Precast manhole sections: to ASTM C 478M, complete with ladder rungs.

.4 Precast "Tee" Sections: precast "Tee" sections constructed as an integral component of mainline pipe will be acceptable where shown on Contract Drawings as an approved alternative.

.5 Manhole lids: to be precast reinforced concrete designed to withstand H20 loading.

.6 Cast iron frame and cover: as shown on Contract Drawings.
.1 Frame and cover must conform to ASTM A48 and be designed to withstand H20 loading.
.2 Frame and cover must bear manufacturer identification on castings.

.7 Ladder rungs to be:
1. As shown on Contract Drawings.
2. To conform to ASTM C-497, C-478 load test
3. 20 mm cold rolled steel, hot dipped after bending to CSA G164, welded to reinforcing bars and cast with manhole sections or epoxy grouted into manhole walls.
4. 20 mm aluminum alloy #6351-T6 (CSA-S157 and NBC 1977), complete with polyethylene anchor insulating sleeves and installed in 25 mm or 26 mm precast or drilled holes in manhole sections.
5. Polypropylene encased steel ladder rungs: polypropylene ASTM-D-4101 steel core to be ½ inch dia grade 60 per ASTM A615M.
6. Distance from top of manhole cover to top rung to be maximum 500 mm where no handhold provided. Maximum distance may be extended to 660 mm where handhold provided.
7. In compliance with all requirements of Workers' Compensation Board.

.8 Safety platform: to be installed as shown on Contract Drawings in all manholes in excess of 6 m deep.

.9 Precast catch basin sections: to ASTM C478M.

.10 Catchbasin leads to be minimum 200 mm diameter and of PVC DR35.

.11 Catchbasin lids: to be precast reinforced concrete designed to withstand H20 loading.

.12 Cast iron catchbasin frame and grate: as shown on Contract Drawings.
1. Frame and grate must conform to ASTM A48 and be designed to withstand H20 loading.
2. Frame and grate must bear manufacturers identification on casting.

.13 Joints: made watertight using rubber rings to ASTM C443 or cement mortar.

.14 Mortar:
.1 Aggregate: to CSA A82.56.
.2 Masonry Cement: to CAN/CSA-A8.

.15 Adjusting rings: to ASTM C 478.

.16 Concrete Brick: to CAN3-A165 Series.

.17 Drop manhole pipe: to be as shown on Contract Drawings.

.18 Lawn drains to be: as shown on Contract Drawings.

.19 Concrete bags to be: Jute, burlap or synthetic bag of suitable size and texture filled to 2/3 capacity with mixture of 1 part Portland cement to 2 parts sand, thoroughly mixed, and weighing approximately 27 kg.

.20 Concrete blocks: to be H type concrete construction blocks conforming to latest ASTM Specifications.

.21 Prebenched manhole bases:
1. Where precast manhole sections are incorporated into precast base by bonding to concrete benching, use precast reinforced concrete manhole sections to ASTM C478 complete with ladder rungs above benching.
2. Where base benching is cast monolithically with manhole walls, reinforce wall and joint sections as specified in ASTM C478.
3. Precast concrete base section minimum thickness to be 120 mm, measured from underside of base to lowest point in concrete channeling.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL .1 Excavating and backfilling in accordance with Section 31 23 33.01-Excavating, Trenching and Backfilling.

3.2 CONCRETE WORK .1 Place concrete reinforcement in accordance with Section 03 20 02-Concrete Reinforcing.

.2 Do concrete work in accordance with Section 03 30 02-Cast-In-Place Concrete.

3.3 MANHOLE INSTALLATION .1 Install manholes as shown on Contract Drawings, concurrently with pipe laying.

.2 Ensure excavation free of water prior to placing concrete.

.3 Place minimum 100mm of 25mm bedding gravel compacted to minimum 95% Modified Proctor density in compliance with ASTM D1557.

.4 Construct base to ensure first precast riser section is set plumb.

.5 Set all inlet and outlet pipes to specified alignments and elevations.

.6 Connect concrete pipe into manhole using spigot or bell precast into manhole wall or, alternatively, grout pipe into pre-formed rough core in manhole wall using fast-setting grout.

.7 Connect PVC pipe into manhole using "manhole adapter ring" or approved equal.

.8 Ensure placement of concrete does not disturb connecting pipes.

.9 Set remaining precast riser sections plumb with joints consisting of cement mortar or gaskets to ASTM C443.

.10 Where possible, for channeling using half-sections of pipe or suitable fittings. Bench to direct flow parallel to main flow of sewer. From top of benching as high as crown of sewer pipe. Finish concrete to smooth surface using steel trowel.

.12 Brace capped inlets or stubs to withstand testing head.

.13 Set frames by firmly embedding in mortar on minimum of 1, maximum of 3 courses of bricks or precast concrete riser rings, or cast-in-place form system with due regard to maximum distance to first step.

.14 "Butter" inside and outside faces of bricks with mortar to ensure neat even finish. Grout inside, outside and

between courses of bricks or grade rings with mortar to ensure neat even finish. Pre-wet all joints before placing mortar.

.15 Plug lifting holes in pipe.

.16 Install drop structures where required to Contract Drawings.

.17 Paint manhole covers if specified on Contract Drawings.

.18 Ensure frames conform to design contour of pavement or existing surface.

.19 Pre-fabricated Corrugated Steel Pipe Manholes to be installed as shown on the Contract Drawings and to manufacturers specifications.

3.4 CLEANOUT INSTALLATION .1 Install cleanouts as shown on Contract Drawings, to standards and installation procedures described in 3.3.

3.5 CATCHBASIN INSTALLATION .1 Install catchbasins as Shown on Contract Drawings, to general standards and installation procedures described in 3.3.

.2 Place minimum of 100 mm bedding gravel under base, compact to 95% Modified Proctor density.

3.6 ENDWALL INSTALLATION .1 Install reinforced concrete endwalls as shown on Contract Drawings or as shown otherwise on Contract Drawings and in accordance with Section 03 20 02-Concrete Reinforcing and Section 03 30 02-Cast-In-Place Concrete.

.2 Precast concrete endwalls may be installed where shown on Contract Drawings as an approved alternative.

3.7 GRILLAGE TRASH SCREENS .1 Where specified, install grillage trash screens as shown on Contract Drawings.

3.8 ADJUSTING TOPS OF EXISTING UNITS .1 Remove existing gratings, frames and store for re-use at locations specified.

.2 Precut units:
.1 Raise or lower precast units by adding or removing precast sections as required.
.2 When amount of raise is less than 300 mm use standard manhole bricks, precast riser rings or Cast-in place form system.

.3 Cast-in-Place units:

.1 Raise cast-in-place units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.
.2 Lower cast-in-place units with straightwall by removing concrete to elevation indicated for rebuilding.
.3 Install additional manhole ladder rungs in adjusted portion of units as required.
.4 Re-use existing gratings, frames.

.4 Re-set gratings and frames to required elevation on not more than 3 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.

.5 Ensure adjustments conform to requirements regarding distance to first step.

3.9 REMOVE EXISTING UNITS .1 Remove existing structures where shown on Contract Drawings. Backfill in accordance with Section 31 23 10-Excavating, Trenching and Backfilling.

3.10 LEAKAGE TEST .1 Perform leakage testing of sanitary manholes in accordance with Section 33 31 13- Sanitary Utility Sewerage Piping.

----------END OF SECTION----------

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for sanitary sewer.

1.2 RELATED SECTIONS

.1 Section 01 33 00-Submittal Procedures.

.2 Section 03 30 02-Cast-in-Place Concrete.

.3 Section 31 05 16-Aggregate Materials.

.4 Section 31 23 33.01-Excavating, Trenching and Backfilling.

.5 Section 33 05 13-Manholes and Catch Basin Structures.

1.3 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
.1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.2 ASTM International
.1 ASTM C 12-09, Standard Practice for Installing Vitrified Clay Pipe Lines.
.2 ASTM C 14M-07, Standard Specification for Nonreinforced 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 MU m (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 Nonpressure 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/ft^3 (600 kN-m/m^3)).

.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.

.3 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).

.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.
.3 CAN/CGSB-34.9-M94, Pipe, Asbestos Cement, Sewer.

.5 CSA International
.1 CSA A3000-08, Cementitious Materials Compendium.
.2 CSA A257 Series-09, Standards for Concrete Pipe and Manhole Sections.
.3 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings, and Means of Joining.
.4 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.

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

1.4 MATERIAL CERTIFICATION .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Products having CSA certification to be used where

readily available. Certification by Standards Council of Canada approved independent third body that products conform to CSA standards in acceptable in lieu of CSA certification.

.3 At least 2 weeks prior to commencing work, submit manufacturer's recent test data and certification that materials to be incorporated into works are representative and meet requirements of this Section. Include manufacturer's drawings where pertinent.

1.5 SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services. Maintain existing flow during construction.

.2 Submit schedule of expected interruptions to Department Representative for approval and adhere to interruption schedule as approved by Department Representative.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Divert unused concrete materials from landfill to local facility as approved by Department Representative.

.3 Divert unused aggregate materials from landfill to facility for reuse as approved by Department Representative.

.4 Handle and dispose of hazardous materials in accordance with the Regional and Municipal regulations.

.5 Dispose of unused asbestos cement pipe in accordance with regulations governing the disposal of hazardous materials.

.6 Fold up metal banding, flatten and place in designated area for recycling.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 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.

PART 2 - PRODUCTS

2.1 PLASTIC PIPE

.1 Type PSM Polyvinyl Chloride (PVC): to ASTM D 3034 CSA B182.2.
.1 Standard Dimensional Ratio (SDR): 35.
.2 Locked-in gasket and integral bell system.
.3 Nominal lengths: 6 m.

.2 Acrylonitrile - Butadiene - Styrene (ABS): to ASTM D 2680 CSA B182.2.

.3 Corrugated High Density Polyethylene (HDPE): to ASTM D 3350 CSA B182.6.
.1 320 kPa pipe stiffness.
.2 Sewer class.
.3 Mechanical non-gasket coupling system.

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.

2.3 CONCRETE

.1 Concrete mixes and materials required for bedding cradles, encasement, and incidental uses: to Section 03 30 02 - Cast-in-Place Concrete.

.2 Concrete to be minimum 20 MPa.

2.4 PIPE BEDDING AND SURROUND MATERIAL

.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 Designation	% Passing Stone/Gravel	% Passing Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	100	-
19 mm	-	-
12.5 mm	65-90	100
9.5 mm	-	-
4.75 mm	35-55	50-100
2.00 mm	-	30-90
0.425 mm	10-25	10-50
0.180 mm	-	-
0.075 mm	0-8	0-10

.3 Concrete mixes and materials for cradles, encasement, supports: to Section 03 30 02 - Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

.1 As shown on Contract Drawings.

.2 In accordance with Section 31 05 16-Aggregate Materials.

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 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, 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 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

.3 Clean and dry pipes and fittings before installation.

.4 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.3 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.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 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete Work in accordance with Section 03 30 02 - Cast-in-Place Concrete.
.1 Place concrete to details as directed by Departmental Representative.

.2 Position pipe on concrete blocks to facilitate placing of concrete.
.1 When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 hours after placing.

3.5 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding materials in uniform layers not exceeding 300 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% modified proctor density.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.6 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.

3.7 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 mid height of pipe to at least 95% Modified Proctor Density.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 95% Modified Proctor density.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.8 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 95% Modified Proctor density.

.4 Place unshrinkable fill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.9 UNDERCROSSING

.1 Excavate working pit to dimensions indicated, outside right-of-way to be crossed.

.2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pit.

.3 Dewater excavation.

.4 Dewater area of undercrossing.

.5 Place encasing pipe to exact line and grade as indicated.
.1 Encasing pipe: undercross obstruction at 90 degrees.

.6 Install encasing pipe by jacking, boring or tunnelling.

.7 Ensure encasing pipe is not in tension.

.8 Use mechanical or welded type joints for encasing pipe.
.9 Place concrete grout levelling pad in encasing pipe.
.1 Control level of grout during placing.
.10 Provide shop drawings showing proposed method of installation for sanitary sewer in undercrossing.
.11 Insert sanitary sewer pipe into encasement pipe, in end with largest opening after placement of levelling pad.
.12 Use approved blocking method to guide sanitary sewer pipe in true alignment.
.13 Clearance between blocks and encasement pipe: maximum 12 mm when sanitary sewer pipe is in position.
.14 Join sanitary sewer pipe one length at time outside encasement pipe.
.1 Push sanitary sewer pipe into position.
.15 Couplings of sanitary sewer pipe: not to rest on levelling pad when sanitary sewer pipe is in position.
.16 Place 20 MPa concrete cradle around sanitary sewer pipe after it is positioned.
.1 Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.
.17 Pressure grout remaining void with grout consisting of 1 part Portland cement and 2 parts clean washed sand with only sufficient amount of water added to allow placement.
.1 Do not install pressure grout until sanitary sewer pipe is secure against flotation.
.2 Do not use additives.
.18 Do field testing before placing concrete cradle and grouting.

3.10 SERVICE CONNECTIONS

.1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.

.2 Maintain grade for 100 and 125 mm diameter sewers at 1 vertical to 50 horizontal unless directed otherwise by Departmental Representative.

.3 Service connections to main sewer: standard Wye fittings or Departmental Representative approved saddles.
.1 Do not use 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 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.

3.11 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 of 50 mm less than 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 Infiltration and exfiltration: not to exceed following limits in L per hour per 100 m of pipe, including service connections.

Nominal Pipe diameter in mm	Asbestos-Cement or Plastic pipe	Concrete or Vitrified Clay pipe
100	3.88	25.5
125	4.62	30.0
150	5.51	34.0
200	7.45	41.5
250	9.39	49.5
300	11.33	56.5
350	13.27	63.5
400	14.91	70.0
450	16.84	76.0
500	18.78	81.5
550	20.72	87.0
600	22.80	92.5
700	26.53	102.0
800	30.11	110.5
900	33.69	118.0
1000	37.56	124.5
1100	41.29	130.0
1200	45.01	135.0

.11 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.

.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 Payment for inspection services in accordance with Measurement and Payment in PART 1.

3.12 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----------