PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

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

.2 Section 33 05 16 - Maintenance Holes and Catch Basin Structures.

1.2 REFERENCES

.1 ASTM International
.1 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)).

.2 Canada Green Building Council (CaGBC)
.1 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

.3 CSA International
.1 CSA B1800-11, Thermoplastic Non-pressure Pipe Compendium.

.4 Washington State Department of Ecology.
.1 Stormwater Management Manual for Western Washington, Volume II, Construction Pollution Prevention (2015 edition).

.5 Newfoundland and Labrador Department of Municipal Affairs.
.1 Municipal Water, Sewer and Roads Construction Specifications, latest revision.

.6 National Association of Sewer Services Companies (NASSCO) Performance Specification Guidelines.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
.1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.

1.3 ADMINISTRATIVE REQUIREMENTS (Cont'd)

.1 Scheduling: (Cont'd)
.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
.3 Notify Departmental Representative and the local authority having jurisdiction.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.
.2 Indicate on drawings proposed method for installing carrier pipe for undercrossings.

.4 Samples:
.1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
.2 Submit for testing at least 2 weeks prior to beginning Work, samples of materials proposed for use as follows:
.1 Pipe bedding and surround material.

.5 Certificates:
.1 Certification to be marked on pipe.

.6 Test and Evaluation Reports:
.1 Submit manufacturer's test data and certification 2 weeks minimum before beginning Work.

.7 Sustainable Design Submittals:
.1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.
.2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation

1.4 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.7 Sustainable Design Submittals: (Cont'd)

.2 (Cont'd)
control plan in accordance with EPA 832/R-92-2005, authorities having jurisdiction and Section 01 35 21 - LEED Requirements.

.3 Construction Waste Management:

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

.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

.4 Recycled Content:

.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

.2 Submit evidence, when Supplementary Cementing Materials (SCMs) are used, to certify reduction in cement from Base Mix to Actual SCMs Mix, as percentage.

.5 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.3 Storage and Handling Requirements: (Cont'd)
.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

.5 Packaging Waste Management: remove for reuse or return of pallets, crates, padding, banding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 PLASTIC PIPE

.1 Type PSM Polyvinyl Chloride (PVC): to CAN/CSA B1800.
.1 Standard Dimensional Ratio (SDR): 35.
.2 Locked-in gasket and integral bell system.
.3 Nominal lengths: 6 m.

2.2 PIPE BEDDING AND SURROUND MATERIALS

.1 Type 1 bedding in accordance with Section 02223 of the Newfoundland and Labrador Municipal Water, Sewer and Roads Master Construction Specification.

2.3 BACKFILL MATERIAL

.1 Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.4 GROUT

.1 Non-shrink grout to Section 33 05 16 - Maintenance Holes and Catch Basins Structures.

2.5 MARKER TAPE

.1 Detectable underground warning tape with aluminum backing. Yellow in colour and marked "CAUTION BURIED SEWER LINE BELOW".

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 sediment and erosion control drawings.
.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.

3.2 PREPARATION (Cont'd)

.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 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
.1 Do not use blocks when bedding pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D 698.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.5 INSTALLATION

.1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.2 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.

3.5 INSTALLATION (Cont'd)

.3 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.

.4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Joint deflection permitted within limits recommended by pipe manufacturer.

.6 Water to flow through pipe during construction, only as permitted by Departmental Representative.

.7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Install plastic pipe and fittings in accordance with CSA B1800.

.9 Pipe jointing:
.1 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
.2 Align pipes before joining.
.3 Maintain pipe joints free from mud, silt, gravel and foreign material.
.4 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.
.5 Complete each joint before laying next length of pipe.
.6 Minimize joint deflection after joint has been made to avoid joint damage.
.7 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.10 When stoppage of Work occurs, block pipes as directed by Departmental Representative to prevent creep during down time.

3.5 INSTALLATION (Cont'd)

.11 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.

.12 Make watertight connections to manholes.
.1 Use shrinkage compensating grout when suitable gaskets are not available.

.13 Use prefabricated saddles or field connections approved by Departmental Representative, for connecting pipes to existing sewer pipes.
.1 Joints to be structurally sound and watertight.

3.6 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
.1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 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% maximum density to ASTM D 698.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% maximum density to ASTM D 698.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.7 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D 698.
.1 In other areas, compact to at least 90% maximum density to ASTM D 698.

.4 Install marker tape as indicated.

3.8 TESTING

.1 Inspection and testing of pipe bedding, surround and backfill material will be carried out by independent inspection and testing agency designated by Departmental Representative. Costs of these tests will be paid by Contractor in accordance with Section 01 29 83 - Payment Procedures for Testing Laboratory Services and Section 01 45 00- Quality Control.

3.9 FIELD TESTING

.1 Repair or replace pipe, pipe joints or bedding found defective.

.2 Remove foreign material from sewers and related appurtenances by flushing with water.

.3 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete.

.4 Do infiltration and exfiltration testing as specified herein and as directed by Departmental Representative.
.1 Perform tests in presence of Department Representative.
.2 Notify Departmental Representative 24 hours minimum in advance of proposed tests.

.5 Carry out tests on each section of sewer between successive manholes.

3.9 FIELD TESTING (Cont'd)

.6 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.

.7 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 begin.
.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.

.8 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.

.9 Infiltration and exfiltration: not to exceed following limits in L per hour per 100 m of pipe, including service connections.

3.9 FIELD TESTING (Cont'd)

.9 Infiltration and exfiltration: (Cont'd)

Nominal Pipe diameter in mm	Plastic pipe	Concrete 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

.10 Leakage: not to exceed following limits in litres per hour per mm of diameter per 100 m of sewer:
.1 Exfiltration, based on 600 mm head: 0.175 L.
.2 Infiltration: 0.150 L.

.11 Repair and retest sewer line as required, until test results are within limits specified.

.12 Repair visible leaks regardless of test results.

3.10 DEFLECTION TESTING

.1 Measure deflection of each plastic pipe, by pulling a deflection gauge through each pipe from manhole to manhole after backfilling.

.2 Provide deflection gauges to measure a 5% and 7 1/2% deflection. Gauges to be a "Go-No-Go" mandrel device. The device shall meet the requirements of the pipe manufacturer and shall be subject to the approval of the Departmental Representative.

3.10 DEFLECTION TESTING (Cont'd)

.3 Within thirty days after installation, pull a deflection gauge measuring 5% deflection through the installed section of pipeline. If this test fails, proceed with 7 1/2% deflection test. If 7 1/2% deflection test fails, locate defect and repair. Retest using same methodology.

.4 Provide deflection test report.

3.11 CLOSED CIRCUIT TELEVISION INSPECTION

.1 Conduct closed circuit television inspection procedures to meet National Association of Sewer Services Companies (NASSCO) Performance Specification Guidelines.

.2 Equipment:

.1 Provide equipment meeting the following requirements:

.1 Self-contained, self-leveling monitoring unit and pan-tilt camera with remotely controlled lighting system capable of varying the illumination.

.2 Picture quality shall produce continuous 600-line resolution picture, showing entire periphery of pipe.

.3 A meter device with readings above ground or marking on cable to clearly identify exact location of camera.

.3 Inspection:

.1 Perform inspection of pipe from manhole to manhole by passing TV camera through sewer in direction of flow.

.2 Classify results in accordance with National Association of Sewer Service Companies (NASSCO) Performance Specification Guidelines.

.4 Records:

.1 Maintain inspection record in log form, during television inspection.

.2 Log to include location of each fault and service lateral distance measured from centreline of reference manhole and position referenced to axis of pipe.

.3 Photograph fault from the television screen. All photographs to be clear and precise with distinct definition of fault.

3.11 CLOSED CIRCUIT TELEVISION INSPECTION (Cont'd)

.4 Records: (Cont'd)
.4 Include detailed technical description with photographs as supporting data for each fault.
.5 Provide minimum of two (2) photographs for each sewer main section televised, detailing typical joint, and typical building service lateral.
.6 All photos and videos to be in colour.

.5 Reports:
.1 Provide a composite report of TV inspection. Enclose report in binder on letter-size paper. Include following pages and information:
.1 Title page identifying project, camera operator and dates of inspection.
.2 Index page identifying section from manhole to manhole, page number or numbers where information for section is contained.
.2 Organize inspection records in sequence from upstream; manhole to downstream manhole.
.3 Report on each sewer main section to contain:
.1 Heading:
.1 Manhole numbers applicable to section.
.2 Reference drawing number, if applicable.
.3 Weather on the day of inspection.
.4 Statement of soil condition in area of inspection, i.e. dry. damp, wet, frozen.
.4 Key Plan, showing corresponding manhole numbers, magnetic north, horizontal distance, pipe and material between manholes, and direction of flow.
.5 Inspection findings for each sewer main section to include:
.1 Location of all faults.
.2 Photographs of all faults.
.3 Location of all service laterals.
.4 One photograph each of typical joint and typical service lateral when faults are not found.
.6 Mount photographs on left-hand page and place corresponding description on right-hand page. Number all photographs in order. Number

3.11 CLOSED CIRCUIT TELEVISION INSPECTION (Cont'd)

.5 Reports: (Cont'd)
.6 (Cont'd)
beside photograph to correspond with description number.
.7 Enclose all pages of report in transparent sheet protector.

.6 Accuracy:
.1 Maximum permissible error in accuracy to be within following limits of fault location:
.1 Up to 375 mm pipe: ± 75 mm per 100 m of length.
.2 450 mm - 600 mm pipe: ± 150 mm per 100 m of length.
.3 750 mm - 900 mm pipe: ± 225 mm per 100 m of length.

.7 Video Record:
.1 Supply a complete record of all inspections in digital format.
.2 Index all files, listing sections of inspections.
.3 Submit DVD with written reports to Departmental Representative.

.8 Repeat Inspection:
.1 Prior to repairs, the methods are to be approved by the Departmental Representative. Repair faults detected during television inspection. Repeat television inspection at no cost to Owner.

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.

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

3.12 CLEANING (Cont'd)

.3 Waste Management:(Cont'd)
Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END