

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 71 10 – Trenchless Pipe Installation.
- .2 Section 33 31 23 – Sanitary Pressure Sewer.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute/American Water Works Association
ANSI/AWWA.
 - .1 ANSI/AWWA B300-10, Standard for Hypochlorites.
 - .2 ANSI/AWWA B301-10, Standard for Liquid Chlorine.
 - .3 ANSI/AWWA C153/A21.53-11, Standard for Ductile-Iron Compact Fittings.
 - .4 ANSI/AWWA C500-09, Standard for Metal-Seated Gate Valves for Water Supply Services.
 - .5 ANSI/AWWA C651-05, Standard for Disinfecting Water Mains.
 - .6 ANSI/AWWA C800-05, Standard for Underground Service Line Valves and Fittings.
- .2 ASTM International ASTM
 - .1 ASTM F 714-10, Standard Specification for Polyethylene PE Plastic Pipe SDR-PR Based on Outside Diameter.
- .3 Canadian General Standards Board CGSB
 - .1 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids.
- .4 CSA Group CSA
 - .1 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12.
 - .1 CAN/CSA-B137.1-09, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.

1.3 ACTION AND INFORMAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for distribution piping materials and include product characteristic, performance criteria, physical size, finish, and limitations.
 - .2 Pipe certification to be on pipe.
- .3 Shop Drawings:
 - .1 Submit complete drawings and construction schedule for water mains.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 – Closeout Submittals.
- .2 Submit record drawings, including directions for operating valves, list of equipment required to operate valves, details for pipe material, location of air and vacuum release valves, hydrant details.
- .3 Include top of pipe, horizontal location of fittings and type, valves, valve boxes.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect water distribution piping from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 SCHEDULE OF WORK

- .1 Schedule Work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by the Departmental Representative.
- .3 Notify the Departmental Representative minimum of 24 hours in advance of interruption in service.
- .4 Do not interrupt water service for more than 3 hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized.
- .5 Notify fire department of planned or accidental interruption of water supply to hydrants.
- .6 Provide and post "Out of Service" sign on hydrant not in use.
- .7 Advise local authority of anticipated interference with movement of traffic.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

Part 2 PRODUCTS

2.1 PIPE, JOINTS, AND FITTINGS

- .1 Polyethylene pressure pipe:
 - .1 NPS ½ to NPS 6: CAN/CSA-B137.1 type PE 3406, series 160 ASTM F 714, type PE 3408, series DR 11.
 - .2 Polyethylene to polyethylene joints: to be thermal butt fusion joined, to ASTM D 2657 or flanged with ductile iron backing flanges.
 - .3 Cast iron fittings with flanged ends: to ANSI/AWWA C110/A21.10 for pipe size above NPS 4.

- .4 Polyethylene fittings: to CAN/CSA-B137.1, for pipe sizes NPS 4 and less.

2.2 VALVES AND VALVE BOXES

- .1 Gate valves: to ANSI/AWWA C500, standard iron body, brass/bronze mounted wedge valves with non-rising stems, suitable for 1 Pa with mechanical flanged joints.
- .2 Cast iron valve boxes: bituminous coated screw type three piece sliding type adjustable over minimum 450 mm complete with valve operating extension rod, 30 mm minimum diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover.
- .1 Base to be large round type with minimum diameter of 300 mm.
- .2 Top of box to be marked "WATER" / "EAU".

2.3 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material to following requirements:
- .1 Crushed or screened stone, gravel, or sand.
- .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
- .3 Table

Sieve Designation & Passing	Stone Gravel	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	80-100
2.00 mm	-	50-90
0.425 mm	10-25	10-50
0.180 mm	-	-
0.075 mm	0-8	0-10

- .2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 – Cast-in-Place Concrete.

2.4 BACKFILL MATERIAL

- .1 Common backfill within roadway.

2.5 PIPE DISINFECTION

- .1 Liquid chlorine to ANSI/AWWA B300ANSI/AWWA B301ANSI/AWWA B 303 to disinfect water mains.
- .2 Disinfect water mains in accordance with ANSI/AWWA C651.

Part 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
 - .1 Inspect materials for defects to approval of the Departmental Representative.
 - .2 Remove defective materials from site as directed by the Departmental Representative.

3.3 TRENCHING

- .1 Ensure trench depth allows coverage over pipe of 1.5 m minimum from finished grade as indicated.
- .2 Trench alignment and depth require the Departmental Representative's approval prior to placing bedding material and pipe.

3.4 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .2 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .3 Shape transverse depressions in bedding as required to suit joints.
- .4 Compact each layer full width of bed to 95% maximum density to ASTM C 698.
- .5 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding with compacted bedding materials.

3.5 PIPE INSTALLATION

- .1 Lay pieces to ANSI/AWWA C600 and manufacturer's standard instructions and specifications.
 - .1 Do not use blocks except as specified.
- .2 Join pipes in accordance with ANSI/AWWA C600ANSI/AWWA C602ANSI/AWWA C206 and manufacturer's recommendations.

- .3 Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length
 - .2 Take up and replace defective pipe.
 - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .5 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .6 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
 - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .7 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .8 Align pipes before jointing.
- .9 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by the Departmental Representative.
- .10 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .11 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .12 Do not lay pipe on frozen bedding.
- .13 Do hydrostatic and leakage test and have results approved by the Departmental Representative before surrounding and covering joints and fittings with granular materials.

3.6 UNDERCROSSING

- .1 Excavate working pit to allow for pipe installation.
- .2 Excavate working pit to not less than 0.6 m below lowest invert of encasing pipe.
- .3 Dewater excavation.
- .4 Dewater area of undercrossing.
- .5 Install heavy timber or steel frame backstop.
- .6 Place encasing pipe to exact line and grade indicated.
- .7 Install encasing pipe by jacking, boring or tunnelling.
- .8 Ensure encasing pipe is not in tension.
- .9 Joints for encasing pipe: welded type.
- .10 Place concrete grout levelling pad in encasing pipe. Control level of grout during placing.

- .11 Insert water main into encasing pipe, in end with largest open area, after placement of levelling pad.
- .12 Use approved blocking method to guide water main in true alignment.
- .13 Clearance between blocks and encasing pipe: maximum 15 mm when water main is in position.
- .14 Couplings of water main shall not rest on levelling pad when water main is in position.

3.7 THRUST BLOCKS AND RESTRAINED JOINTS

- .1 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by the Departmental Representative.
- .2 Keep joints and couplings free of concrete.
- .3 Do not backfill over concrete within 24 hours after placing.
- .4 For restrained joints: only use restrained joints approved by the Departmental Representative.

3.8 HDROSTATIC AND LEAKAGE TESTING

- .1 Do tests in accordance with ANSI/AWWA C600.
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify consultant at least 24 hours in advance of proposed tests.
 - .1 Perform tests in presence of the Departmental Representative.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by the Departmental Representative.
- .6 Upon completion of pipe laying and after the Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated as directed by Consultant.
- .7 Leave valves, joints and fittings exposed.
- .8 When testing is done during freezing weather, protect, valves, joints and fittings from freezing.
- .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .10 Open valves.
- .11 Expel air from main by slowly filling main with potable water.
 - .1 Install corporation stops at high points in main.
 - .2 Remove stops after satisfactory completion of test and seal holes with plugs.

- .12 Thoroughly examine exposed parts and correct for leakage as necessary.
- .13 Apply hydrostatic test pressure of 700 kPa minimum based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.
- .14 Examine exposed pipe, joints, fittings, and appurtenances while system is under pressure.
- .15 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .16 Repeat hydrostatic test until defects have been corrected.
- .17 Apply leakage test pressure of 700 kPa minimum after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 hours.
- .18 Do not exceed allowable leakage of 0 L/mm of pipe.
- .19 Located and repair defects if leakage is greater than amount specified.
- .20 Repeat test until leakage is within specified allowance for full length of water main.

3.9 PIPE SURROUND

- .1 Upon completion of pipe laying and after the Departmental Representative has inspected work in place, surround and cover pipes as indicated.
- .2 Place layers uniformly and simultaneously on each side of pipe.
- .3 Do not place material in frozen condition.
- .4 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D 698.

3.10 BACKFILL

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D 698.
- .4 In other areas, compact to at least 90% corrected maximum dry density 90% maximum density to ASTM D 698.

3.11 FLUSHING AND DISINFECTING

- .1 Flushing and disinfecting operations: witnessed by the Departmental Representative carried out by specialist contractor.
 - .1 Notify Consultant at least 4 days in advance of proposed date when disinfecting operations will begin.
- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clean.
- .3 Flushing flows as follows:

Pipe Size NPS	Flow L/s Minimum
6 and below	38
8	75
10	115
12	150

- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants, and service connections to ensure thorough flushing.
- .6 When flushing has been completed to the Departmental Representative approval, introduce strong solution of chlorine as approved by Consultant into water main and ensure that it is distributed throughout entire system.
- .7 Disinfect water mains to the requirements of local authority.
- .8 Rate of chlorine application to be proportional to rate of water entering pipe.
- .9 Chlorine application to be close to point of filling water main and to occur at same time.
- .10 Operate valves while main contains chlorine solution.
- .11 Flush line to remove chlorine solution after 24 hours.
- .12 Measure chlorine residuals at extreme end of pipe-line being tested.
- .13 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
 - .1 Take samples daily for minimum of 2 days.
 - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.
 - .3 Specialist contractor to submit certified copy of test results.
- .14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.
- .15 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 hours.
 - .1 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

3.12 SURFACE RESTORATION

- .1 After installing and backfilling over water mains, restore surface to original condition as directed by the Departmental Representative.

3.13 CLEANING

- .1 Final cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 71 10 - Trenchless Pipe Installation
- .2 Section 33 14 16 - Watermain

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM D 698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m³).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
 - .2 CGSB 41-GP-25M-77, Pipe, Polyethylene, for the Transport of Liquids.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule Work to minimize interruptions to existing services.
 - .2 Submit schedule of expected interruptions and adhere to schedule approved by Departmental Representative.
 - .3 Notify the Departmental Representative a minimum of 24 hours in advance of interruption in service.

1.4 ACTION AND INFORMAL SUBMITTALS

- .1 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.
- .2 Shop Drawings:
 - .1 Submit shop drawings showing proposed method of installation for pressure sewer in undercrossing.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials 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 MATERIALS

- .1 Polyethylene pressure pipes: to CSA B137 **CGSB 41-GP-25M**:
 - .1 Type: DR 11.
 - .2 Series: 160
 - .3 Joints: to **ANSI/AWWA C207**, thermal butt fusion or flanged with steel backing flanges.
 - .4 Polyethylene fittings: to CSA B137, for pipe sizes 4" and less.

2.2 PIPE BEDDING AND SURROUND MATERIALS

- .1 Granular material to following requirements:
 - .1 Crushed or screened stone, gravel or sand.
 - .2 Graduations within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1CAN/CGSB-8.2.
- .2 Table:

Sieve Designation % Passing	Stone/Gravel	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	80-100
2.00 mm	-	50-90
0.425 mm	10-25	10-50
0.180 mm	-	-
0.075 mm	0-8	0-10

- .3 Concrete mixes and materials for cradles for undercrossing and thrust blocks to Section 03 30 00 – Cast-in-Place Concrete.

2.3 BACKFILL MATERIAL

- .1 Common backfill within woodway.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the 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 the 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, according to sediment and erosion control drawings or sediment and erosion control plan, specific to site.
 - .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 Pipes and fittings to be clean and dry.

3.3 TRENCHING

- .1 Trench alignment and depth require approval from the Departmental Representative prior to placing bedding material or pipe.

3.4 GRANULAR BEDDING

- .1 Place granular bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 150mm compacted thickness.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for 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 design elevation of bottom of specified bedding with compacted bedding material.

3.5 INSTALLATION

- .1 Maintain grade and alignment of pipes
 - .1 Align pipes carefully before jointing.
 - .2 Joint deflection permitted within limits in accordance with pipe manufacturer's written recommendations.
 - .3 Support pipe firmly over entire length, except for clearance necessary at couplings.
 - .1 Do not use blocks to support pipe.
 - .4 Keep pipe and pipe joints free from foreign material.

- .5 Avoid bumping gasket and knocking it out of position or contaminating with dirt or other foreign material. Remove disturbed gaskets clean, lubricate and replace before jointing is attempted.
- .6 Support pipes using hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .7 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.
- .8 Apply restraint to pipe to ensure that joints when completed are held in place, by tamping fill material under and alongside pipe, or otherwise as approved by the Departmental Representative.
- .9 When stoppage of Work occurs, block pipe as directed by the Departmental Representative to prevent creep during downtime.

3.6 THRUST BLOCKS

- .1 Restrain bends, tees and fittings using concrete thrust blocks as indicated.
- .2 Keep pipe couplings free of concrete.
- .3 Bearing area of thrust blocks to be as indicated.

3.7 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after the Departmental Representative has inspected pipe joints, surround and cover pipes as indicated. Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding 150 mm compacted thickness as indicated.
 - .1 Do not dump material within 1.0m of pipe.
- .4 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density maximum density to ASTM D 698.
- .5 Compact each layer from mid height of pipe to underside of backfill to at least 90% maximum density to ASTM D 698.
- .6 When field test results are acceptable to the 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 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 95% corrected maximum dry density to ASTM D 698. In other areas, compact to at least 90% corrected maximum dry density to ASTM D 698.

3.9 FIELD TESTING OF PRESSURE SEWAGE

- .1 Testing of pressure sewer to be carried out under supervision in presence of the Departmental Representative.
 - .1 Strut and brace caps, bends, and tees, to prevent movement when test pressure is applied.
 - .2 Expel air from force main, by slowly filling main with water.
 - .1 Drill and tap high points and install suitable cocks to vent air and to be shut when pressure is applied.
 - .2 Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.
 - .3 Apply hydrostatic test pressure of 700 kPa based on elevation of
 - .4 lowest point in line and corrected to elevation of test gauge for hydrostatic test and 700 kPa for leakage test.
 - .5 Apply pressure for 1 hour for pressure test and 2 hours for leakage test.
 - .6 Remove defective joints, pipe and fittings and replace with new sound material.
 - .7 Define leakage as amount of water supplied from water storage tank meter in order to maintain test pressure for 2 hours.
 - .8 Do not exceed allowable leakage as defined in ANSI/AWWA C600 of 0 litres.
 - .9 Locate and repair defects if leakage is greater than amount specified.
 - .10 Repeat test until leakage is within specified allowance for full length of force main.
 - .11 Complete backfill.
 - .12 Repeat test after completing backfill. Locate and repair defects and backfill. Repeat tests, repairs, and backfills as needed until leakage is less than amount specified.

3.10 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 31 05 16 – Aggregate Materials
- .4 Section 31 23 33.01 – Excavating, Trenching and Backfilling

1.2 REFERENCES

- .1 CSA International
 - .1 CSA B182.6-11, Profile Polyethylene (PE) Sewer Pipe and Fittings for Leak-Proof Sewer Applications
 - .2 CSA B182.8-11, Profile Polyethylene (PE) Storm Sewer Pipe and Drainage Pipe and Fittings
 - .3 CSA-G401, Corrugated Steel Pipe Products
 - .4 CSA-GA257.2, Standards for Concrete Pipe

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit list of all pipe, indicating location, type, diameter, length and invert elevations for Departmental Representative review, at least 4 weeks prior to ordering of pipe.
- .3 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.
- .4 Samples:
 - .1 Inform Departmental Representative at least 4 weeks before beginning Work, of proposed source of bedding materials and provide access for sampling.
- .5 Certification: to be marked on pipe.
- .6 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Store materials in accordance with manufacturer's recommendations.
- .2 Store and protect pipes from damage.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- .1 High Density Polyethylene Pipe: double walled, with a smooth interior surface, conforming to CSA-B182.8. HPDE shall have a minimum stiffness of 320 Kpa.
- .2 Joints: Bell and spigot with integrated gasket.

2.2 CORRUGATED STEEL PIPE

- .1 Corrugated steel pipe: to CSA-G401, aluminized or double zinc corrugated steel pipe, couplers, nuts and bolts. Diameter as noted with 68 x 13 corrugations, or to match pipe to be extended.
- .2 Couplers to be annular corrugated with minimum width of 600 mm and extend 360 degrees around the pipe and fastened with bolts.

2.3 CONCRETE PIPE

- .1 Reinforced concrete pipe: to CSA A257.2 diameter as indicated, strength classification 65-D.
- .2 Rubber gaskets for joints: to CSA A257.
- .3 Cement mortar joint filler:
 - .1 Portland cement: to CSA A3000 type 10.
 - .2 Sand: to ASTM C144.
 - .3 Mortar: one part by volume of cement to two parts of clean, sharp sand mixed dry. Add sufficient water after mixing to give optimum consistency for hand application.

2.4 GRANULAR BEDDING AND BACKFILL

- .1 Granular bedding and backfill material to Section 32 11 23 - Aggregate Base Courses.

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 pipe culvert 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 plan, specific to site, that complies with requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .2 Obtain Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.

3.4 BEDDING

- .1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
- .2 Place 200 mm minimum thickness of approved granular material on bottom of excavation and compact to 95% minimum of corrected maximum dry density.
- .3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Departmental Representative, free from sags or high points.
- .4 Place bedding in unfrozen condition.

3.5 LAYING HDPE PIPE CULVERTS

- .1 Begin placing pipe at downstream end of culvert with flanged end of first pipe section facing upstream.
- .2 Ensure bottom of each pipe is in contact with shaped bed throughout its length.
- .3 Do not allow water to flow through pipes or excavation during construction except as permitted by Departmental Representative.
 - .1 Water control proposed by the Contractor is subject to review and approval by the Departmental Representative.

3.6 JOINTS: HDPE PIPE CULVERTS

- .1 Joints to be Type 2 silt-tight gasket joints which shall not leak when tested in accordance with ASTM D3212.

3.7 LAYING CORRUGATED STEEL PIPE CULVERTS

- .1 Begin placing pipe at downstream end.
- .2 Ensure bottom of each pipe is in contact with shaped bed throughout its length.
- .3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.
- .4 Do not allow water to flow through pipes or excavation during construction except as permitted by Departmental Representative.
 - .1 Water control proposed by the Contractor is subject to review and approval by the Departmental Representative.

3.8 JOINTS: CORRUGATED STEEL CULVERTS

- .1 Corrugated steel pipe: joints / couplings shall be non-corroding, steel culverts aluminized Type II to manufacturer's standards.
- .2 Match corrugations or indentations of coupler with pipe sections before tightening.
 - .1 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.
 - .2 Insert and tighten bolts.

3.9 LAYING CONCRETE PIPE CULVERTS

- .1 Begin at downstream end of culvert with flanged end of first pipe section facing upstream.
- .2 Ensure barrel of each pipe is in contact with shaped bed throughout its length.
- .3 Do not allow water to flow through pipes or excavation during construction except as permitted by Departmental Representative.
 - .1 Water control proposed by the Contractor is subject to review and approval by the Departmental Representative.
- .4 End sections of pipe to be bevel cut at 1.5 to 1 slope to blend into roadway slope.

3.10 JOINTS: CONCRETE PIPE CULVERTS

- .1 Joints may be made with rubber gaskets, bituminous jointing compound or Portland cement mortar.
 - .1 Rubber gasket joints:
 - .1 Install in accordance with manufacturer's written recommendations.
 - .2 Ensure that tapered ends are fully entered into flanged ends.
 - .2 Bituminous filled joint:
 - .1 Make joint with excess of filler to form continuous bead around outside of pipe and finish smooth on inside.
 - .3 Mortar joints:
 - .1 Prepare mortar as specified herein.
 - .2 Clean pipe ends and wet with water before joint is made.

- .3 Place mortar in lower half of flanged end of pipe section in place.
- .4 Apply mortar to upper half of tapered end of pipe section being installed.
- .5 Join pipe ends and force joint up tight, taking care to ensure inner surfaces of abutting pipe sections are flush and even.
- .6 Clean inside of pipe and annular space between ends of pipes after each joint is made.
- .7 Fill joint with mortar and finish smooth and even.
- .8 For pipes 800 mm or less diameter, fill joints before mortar in joints has set.
- .9 For pipes over 800 mm diameter, postpone filling joint until backfilling has been completed. Re-clean joints before applying mortar.

3.11 BACKFILLING

- .1 Place and compact granular material for bedding and backfilling in accordance with Section 31 23 33.01 – Excavating Trenching and Backfilling.

END OF SECTION