PART 1 GENERAL

1.1 RELATED SECTIONS

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

.2 Section 33 41 00 - Storm Utility Drainage Piping.

1.2 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS)
.1 OPSS 407-November 2007 (R2010), Construction Specification For Maintenance Hole, Catch Basin, Ditch Inlet And Valve Chamber Installation.
.2 OPSS 1351-April 2010, Material Specification for Precast Reinforced Concrete Components for Maintenance Holes, Catch Basins, Ditch Inlets and Valve Chambers.
.3 OPSS 1850-April 2013, Material Specification for Frames, Grates, Covers and Gratings.

.2 Ontario Provincial Standard Drawings.
.1 OPSD 401.010 - November 2007, Cast Iron, Square Frame with Circular Closed or Open Cover for Maintenance Holes.
.2 OPSD 701.010 - November 2009, Precast Concrete Maintenance Hole, 1200 mm diameter.

1.3 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

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.

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Precast manhole units: to OPSS 407.

.2 Joints: made watertight using rubber rings.

.3 Ladder rungs: to OPSS 1351.

.4 Adjusting rings: to OPSS 1351.

.5 Steel gratings, I-beams and fasteners: to OPSS 1351.

.6 Frames, gratings, covers to OPSS 1351 and following requirements:
- .1 Metal gratings and covers to bear evenly on frames.
  - .1 Frame with grating or cover to constitute one unit.
  - .2 Assemble and mark unit components before shipment.
- .2 Manhole frames and covers: cover cast with perforations and complete with two 25 mm square lifting holes to OPSS 1850.

.7 Granular bedding and backfill: In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, Paragraph 2.1.2.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain approval of Departmental Representative before installing manholes or catch basins.

3.3 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.

.3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.

.4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density.

.5 Precast units:
.1 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
.2 Plug lifting holes with concrete plugs set in cement mortar or mastic compound.

.6 For sewers:
.1 Place stub outlets and bulkheads at elevations and in positions indicated.

.7 Compact granular backfill to 95% corrected maximum dry density.

.8 Installing units in existing systems:
.1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
.2 Make joints watertight between new unit and existing pipe.
.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.9 Place frame and cover on top section to elevation as indicated.
.1 If adjustment required use concrete ring.

.10 Clean units of debris and foreign materials.
.1 Remove fins and sharp projections.
.2 Prevent debris from entering system.

3.4 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Common Work Results for Mechanical.

.2 Section 23 05 05 - Installation of Pipework.

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.4 Section 26 05 23 - Heat Tracing for Piping.

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

.6 Section 33 11 16 - Site Water Utility Distribution Piping.

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

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C272/C272M-12, Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions.
.2 ASTM C518-10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
.3 ASTM D638-10, Standard Test Method for Tensile Properties of Plastics.
.4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m3).
.5 ASTM D1000-10, Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.
.6 ASTM D1621-10, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
.7 ASTM D1622-08, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
.8 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
.9 ASTM D3350-12e1, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
.10 ASTM D3574-11, Standard Test Methods for Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams.
.11 ASTM D4883-08, Standard Test Method for Density of Polyethylene by the Ultrasound Technique.
.12 ASTM D6226-10, Standard Test Method for Open Cell Content of Rigid Cellular Plastics.

.2 Ontario Provincial Standard Specifications (OPSS)
.1 OPSS 1010-April 2004, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

1.3 SUBMITTALS

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

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.3 Closeout Submittals:
.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
.2 Record Drawings: provide record drawings on project completion and following requirements:
.1 Give details of pipe material, location of fittings, maintenance and operating instructions.

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.

.2 Storage and Protection:
.1 Unload from trucks or containers by hand or by lifting apparatus with fabric slings. Do not use cables or chains.
.2 Once removed, store on smooth surface.
.1 Lay pipes flat.
.2 Where sleepers are desired use several lengths of wide planks to provide broad bearing surface.
.3 Lift, do not drag, insulated pipes from storage area to job site.

.3 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling.

1.5 SCHEDULING

.1 Schedule work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions for approval by Departmental Representative and adhere to interruption schedule as approved by Departmental Representative.

.3 Notify Departmental Representative minimum of 24 hours in advance of interruption in service.

PART 2 PRODUCTS

2.1 GENERAL

.1 Pre-insulated piping systems for sanitary and water piping between trailer units shall be supplied by a single source, complete with core pipe, insulation, outer jacketing, pipe joints, fitting insulation kits and freeze prevention components on the water piping.

2.2 CARRIER CORE PIPE

.1 Type L Copper Tubing
.1 20 mm diameter as per Section 33 11 16 - Site Water Utility Distribution Piping.

.2 PVC DR 35 gravity sanitary sewer.
.1 100 mm diameter as per Section 33 31 13 - Public Sanitary Utility Sewerage Piping.

2.3 FACTORY APPLIED INSULATION

.1 Clean pipes of surface dust or dirt and treat to assure positive bond of foam to entire pipe surface.

.2 Material: rigid polyurethane foam factory applied.

.3 Insulation thickness: 50 mm.

.4 Density: to ASTM D1622, 35 to 46 kg/m^3.

.5 Closed cell content: to ASTM D6226, 90% minimum.

.6 Water absorption: to ASTM D2842, maximum 4% by volume.

.7 Compressive strength: to ASTM D1621, up to 552 kPa.

.8 Thermal conductivity: to ASTM C518, 0.020 to 0.026 W/m degrees C.

.9 Service temperature: minus 45°C to plus 120°C.

.10 Centering of pipe within insulation: no more than plus or minus 6 mm off centre.

.11 Protect insulation on both ends of pipe from moisture and sunlight by 3 mm thick continuous concentration of black asphalt mastic compound.

.12 Insulation must completely fill space between pipe and conduit.

2.4 OUTER JACKET

.1 Material: factory applied high density polyethylene jacket, black in colour (UV inhibited).

.2 Density of HDPE jacket: to ASTM D4883, 0.940 gm/cm^3 minimum.

.3 Sealant: synthetic polymers or modified rubber mastic.

.4 Jacket thickness: 1.14 mm minimum.

.5 Elongation: to ASTM D1000, 400% maximum 6 month test.

.6 Service temperature: minus 45°C to plus 120°C maximum.

.7 Tensile strength: 6.8 kg/cm width minimum.

2.5 INSULATED PIPE JOINTS

.1 Material: rigid polyurethane half shells with heat shrink sleeves and mastic sealant to provide moisture-proof seal.

.2 Pre-formed rigid polyurethane halves, as indicated, with properties as described in this Section.

.3 Heat shrink sleeves: adhesive coated cross linked polyethylene sleeve.

.4 Sleeves: to cover entire exposed joint length plus overlap of about 76 mm of pipe coating on either side.

.5 Waterproofing mastic sealant for coating exposed ends of insulation after field cutting or trimming has been carried out: as described in this Section.

2.6 INSULATION KITS FOR FITTINGS

.1 Material: rigid polyisocyanurate or urethane foam insulation with fully bonded FRP glass reinforced polyester or polymer protective coating on exterior surfaces including ends.

.1 Supply kits complete with silicone caulking for seams, stainless steel

attachment straps and clips, and heat shrink sleeves to seal between pipe and insulation cover.

.2 Rigid polyisocyanurate foam insulation.
- .1 Density: to ASTM D1622, 27 kg/m^3 minimum.
- .2 Compressive strength: to ASTM D1621, 131 kPa minimum.
- .3 Closed cell content: 90% minimum.
- .4 Water absorption: to ASTM C272/C272M, 4% by volume
- .5 K Factor: to ASTM C518, 0.027 W/m. degrees C maximum.

.3 FRP coating.
- .1 Glass reinforced polyester fully bonded to insulation.
- .2 Laminating resin black in colour, UV inhibited.
- .3 Thickness: 2.54 mm minimum.
- .4 Exterior surface: resin-rich hot coat of 0.25 mm minimum thickness.

.4 Polymer coating: to ASTM D3574.
- .1 Two component high density polyurethane coating, black in colour.
- .2 Density: 1170 kg/m^3.
- .3 Abrasion: durometer D scale: 60.
- .4 Tensile strength: 11,000 kPa minimum.
- .5 Tear strength: 26.5 N/mm minimum.

2.7 INSULATION FOAMED IN PLACE

.1 Material: two component polyurethane Class I foam, supplied in portable, disposable, pressurized container.

.2 Density: to ASTM D1622, 35 to 46 kg/m^3.

.3 Closed cell content: to ASTM D6226, 90% minimum.

.4 Thermal conductivity: to ASTM C518, 0.020 to 0.026 W/m. degrees C.

.5 Water absorption: to ASTM D2842, 4.25% maximum by volume.

2.8 INSULATION ACCESSORIES

.1 Heat shrink tape for sealing insulation half shells against moisture adaptable to flexible installations.
- .1 Crosslinked polyolefin backing with a hot melt adhesive coating.
- .2 Backing thickness: 0.35 mm minimum.
- .3 Adhesive thickness: 0.51 mm.
- .4 Service temperature: minus 18 to plus 20°C maximum.
- .5 Tensile strength: 16 N/mm.

.2 High density polyethylene tape for minor repair of the outer jacket or completion of straight insulation joints in field where irregular surfaces are not involved.
- .1 Adhesive backed tape: heated to approximately 50°C prior to installation.
- .2 Backing thickness: 0.50 mm average.
- .3 Adhesive thickness: 0.127 mm average.
- .4 Service temperature: minus 34 to plus 82°C.
- .5 Tensile strength: 10 N/mm.
- .6 Colour: black.

.3 Asphalt mastic vapour barrier coating to waterproof exterior surfaces of half shells or sprayed in place foam.
- .1 Colour: black.
- .2 Solids by volume: 62%.
- .3 Drying time to touch: 4 hours maximum.
- .4 Drying time firm: 48 hours maximum.
- .5 Service temperature: minus 29 to plus 93°C.
- .6 Application temperature: 4.4°C minimum.
- .7 Moisture permeability: 3.2 mm wet film at 37.3°C.
- .8 90% relative humidity.
- .9 Shelf life: 12 months.

.4 Silicone caulking for joining faces of rigid urethane insulation.
- .1 Colour: black.
- .2 Specific gravity: 1.07.
- .3 Tensile strength: 25 kg/cm width.
- .4 Tear strength: 8 kg/cm.
- .5 Service temperature: 205°C maximum.

2.9 ELECTRIC HEAT TRACING

.1 Heat tracing conduits:
- .1 Consisting of extruded plastic moulding and applied to pipe prior to application of insulation.
- .2 Fasten securely to pipe and seal to prevent ingress of foam during insulation.
- .3 Check conduit after insulating to ensure they are not plugged.
- .4 Seal ends prior to shipping to prevent foreign material from entering conduit while in transit or during installation.

.2 Electric tracing:
- .1 Refer to Section 26 05 32 - Heat Tracing for Piping.

2.10 PIPE BEDDING AND SURROUND MATERIALS

.1 Granular material to following requirements:
- .1 OPSS 1010 - Granular A.

2.11 ESCUTCHEON PLATES AND PIPE SLEEVES

.1 Provide plates and sleeves at entry points to buildings and exterior pipe enclosure in accordance with Section 21 05 01 - Common Work Results for Mechanical.

2.12 PIPE SUPPORT

.1 Pipe support systems to be in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 REPAIRING DAMAGED PRE-INSULATED PIPE

.1 Repair damage to outer jacket by applying heat shrink sleeve as reviewed by Departmental Representative or cover using heated HDPE UV resistant adhesive backed tape.

3.3 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Excavation to be done by hand below existing office trailer, and is required only to the extent required to make connections to the existing sanitary and water piping.

.3 Trench alignment and depth require Departmental Representative’s approval prior to placing bedding material or pipe.

3.4 GRANULAR BEDDING AND SURROUND

.1 Place bedding and surround material in unfrozen condition.

.2 Place materials in uniform layers not exceeding 150 mm compacted thickness.

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

.4 Shape transverse depressions in bedding as required to make joints.

.5 Fill authorized excavation or unauthorized over excavation below design elevation of bottom of specified bedding with compacted bedding material.

3.5 PIPE INSTALLATION

.1 On dry ground, assemble shipping lengths of pipe into suitable installation lengths.

.2 Provide trained personnel and equipment approved by pipe manufacturer for jointing of pipe.

.3 Join pipes at flanged ends in accordance with manufacturer's recommendations.

.4 Recheck pipe joints assembled above ground after placement to ensure no movement of joints has taken place.

.5 Complete installation of rigid polyurethane halves on joints after laying pipe and after successful pressure testing of water piping.

.1 Trim half shells to required length with handsaw to provide tight-fit in insulation gap between ends of factory insulation.

.2 Do not allow seam to exceed 3 mm in width at joint.

.1 Match outer surface of shell with outer surface of installation on pipe within tolerance of plus or minus 6 mm.

.2 Shave off any sharp edge with rasp.

.3 Hold half shells in place with masking tape while installing heat shrink sleeve.

.6 Install heat shrink sleeves using large broad flame propane torch to produce 600 mm flame.

.1 Peel back release liner 12 cm from end, centre sleeve over joint and press firmly down.

.1 Wrap sleeve around pipe, removing release liner as it is wrapped.

.2 If corner on underlap is not precut, then cutoff about 25 mm from each corner.

.2 Before completing overlap wrapping, warm underlap area approximately 12 cm until adhesive starts to appear at edge.

.1 Smooth out wrinkles with gloved hand.

.3 Remove remaining release liner and complete wrapping.

.4 Remove release paper from closure seal, prewarm adhesive slightly, centre seal over overlap and press down until well bonded.

.1 Heat closure seal, and press down with gloved hand to remove bubbles and wrinkles.

.5 Shrink sleeve around joint with torch: start at centre of sleeve.

.1 Keep torch moving using broad circumferential strokes to avoid burning.

.2 Continue shrinking sleeve toward one end until about 50 mm is left.

.3 Then aim torch inward towards centre and shrink edges.

.4 Repeat this operation on other end of sleeve.

.5 Finish off by applying long horizontal strokes of torch all around sleeve.

.6 Pay special attention to sleeve overlap area, ensuring no void remains along underlap edge.

.1 Use roller, or gloved hand to firmly and thoroughly press down along underlap edge.

.2 Start in centre and work outwards.

.7 Joint and sleeve cool for at least 30 minutes before lowering pipe into trench.

.8 Lay pipes on prepared bed and saddles, true to line and grade as indicated.

.1 No deviations without written approval of Departmental Representative.

.2 Ensure barrel of each pipe is in contact with shaped bed or support saddles.

.3 Take out and replace defective pipe.

.4 Correct pipe which is not in true alignment or grade, or pipe which shows undue settlement after installation.

.5 Change method or equipment for setting alignment or grade if requested by Departmental Representative.

.9 Do not lay pipe on frozen bedding.

.10 Do not let rocks or other foreign material, which might damage insulation jacket, fall on pipe.

.11 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.

.1 Install removable watertight bulkhead at open end of pipe to prevent entry of foreign materials.

.7 Install pipe within exterior pipe enclosure in accordance with the requirements of Section 21 05 01 - Common Work Results for Mechanical.

.1 Support piping on saddles and hanger system as specified in Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment, providing minimum 1% slope for sanitary piping.

3.6 INSULATION OF FITTINGS

.1 Cut pipes as required to accommodate fittings and fitting insulation kits without damaging pipe insulation or its jacket.

.1 Leave smooth end at right angles to pipe axis.

.2 Cracks larger than 6.4 mm to be filled with insulation foamed-in-place in following manner:

.1 Use strip of thin galvanized sheet metal wide enough to overlap both insulation kit and pipe by at least 8 cm and long enough to wrap around pipe leaving 2.5 cm opening on top.

.2 Hold metal in place with two tension metal or nylon straps, one at either end.

.3 Spray foam through opening on top into cavity.

.4 Spray until cavity is almost half-filled on both sides of pipe.

.1 Foam will rise to complete filling.

.5 Allow to cure for 10 to 15 min.
.6 Trim top and apply waterproofing sealant asphalt mastic, HDPE tape or heat shrink tape.

3.7 ELECTRIC TRACING

.1 Seal heat trace channel at fittings and flanged joints, with silicone caulking.

.2 Install tracer cable conduit prior to installation of half shell joints, terminal seal kits, power connector kits, thermostatic controllers, in accordance with system supplier's instructions and as indicated.

3.8 PIPE BACKFILLING

.1 Do backfilling work at junction between new and old pipes in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

.2 Protect pipe from freezing if temperatures lower than minus 5°C.

3.9 FIELD QUALITY CONTROL

.1 Site tests, and inspections:
.1 Pressure test, flush and disinfect piping in accordance with Section 21 05 01 - Common Work Results for Mechanical.
.2 Protect piping from freezing if testing at temperatures lower than minus 5°C.

3.10 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Common Work Results for Mechanical.

.2 Section 22 11 16 - Domestic Water Piping.

.3 Section 23 05 05 - Installation of Pipework.

.4 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

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

.6 Section 33 07 16 - Factory Pre-Insulated Piping Systems for Utility Applications.

1.2 REFERENCES

.1 ASTM International
.1 ASTM B88M-05(2011), Standard Specification for Seamless Copper Water Tube Metric.

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 distribution piping materials and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Pipe certification to be on pipe, and to conform with City of Ottawa approved products listing.

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 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.

1.5 SCHEDULING OF WORK

.1 Schedule Work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.

.3 Notify Departmental Representative minimum of 24 hours in advance of interruption in service.

.4 Do not interrupt water service for more than 3 hours and confine this period between 13:00 and 18:00 hours local time unless otherwise authorized.

PART 2 PRODUCTS

2.1 SERVICE CONNECTIONS

.1 Copper tubing in accordance with Section 22 11 16 - Domestic Water Piping.

.2 Insulation system in accordance with Section 33 07 16 - Factory Pre-Insulated Piping Systems for Utility Applications.

.3 Hangers and support systems in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

2.2 PIPE DISINFECTION

.1 Flushing, cleaning and disinfecting products in accordance with Section 21 05 01 - Common Work Results for Mechanical.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions are acceptable for distribution piping installation in accordance with manufacturer's written instructions.
.1 Visually inspect installation location 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 Materials to be installed must be in clean condition as supplied by the manufacturer.
.1 Inspect materials for defects to approval of Departmental Representative.
.2 Remove defective materials from site to approval of Departmental Representative.

3.3 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.4 GRANULAR BEDDING

.1 Place granular bedding material in compacted uniform layer to depth of 50 mm below bottom of pipe where pipe is below or on ground surface.

.2 Do not place material in frozen condition.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.

.4 Shape transverse depressions in bedding as required to suit joints.

3.5 PIPE INSTALLATION

.1 Coordinate installation with mechanical requirements for building plumbing.

.2 Install pipes below trailers and within utility enclosure between trailers using saddles and connections as indicated in Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

3.6 SERVICE CONNECTIONS

.1 Terminate building water service below floor of new trailer being installed.
.1 Install coupling necessary for connection to building plumbing.
.2 If plumbing is already installed, make connection, otherwise cap or seal end of pipe and place temporary marker to locate pipe end.

3.7 FLUSHING AND DISINFECTION

.1 Flush, clean and disinfect water service in accordance with Section 21 05 01 - Common Work Requirements for Mechanical.

3.8 CLEANING

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

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

END

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Common Work Results for Mechanical.

.2 Section 22 13 18 - Drainage Waste and Vent Piping - Plastic.

.3 Section 23 05 05 - Installation of Pipework.

.4 Section 26 05 23 - Heat Tracing for Piping.

.5 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

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

.7 Section 33 07 16 - Factory Pre-Insulated Piping Systems for Utility Applications.

1.2 REFERENCES

.1 ASTM International
.1 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 CSA International
.1 CSA B1800-11, Thermoplastic Non-pressure Pipe Compendium.
.1 CSA B182.1-11, Plastic Drain and Sewer Pipe and Pipe Fittings.
.2 CSA B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.
.3 CSA B182.11-11, Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

.3 Ontario Provincial Standard Specifications (OPSS)
.1 OPSS 1010-April 2004, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
.1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
.3 Notify Departmental Representative 24 hours minimum in advance of any interruption in service.

.4 Service interruptions are permitted for no longer than 3 hours, and must take place between the hours of 1300 and 1800.

1.4 SUBMITTALS

.1 Product Data:
.1 Pipe certification to be indicated on exterior pipe wall.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:
.1 Store and protect pipes from damage.
.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 PLASTIC PIPE

.1 Type PSM Polyvinyl Chloride (PVC): to CSA B182.2.
.1 Standard Dimensional Ratio (SDR): 35.

2.2 PIPE BEDDING AND SURROUND MATERIALS

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, Paragraph 2.1.2.

2.3 BACKFILL MATERIAL

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, Paragraph 2.1.1.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions previously installed under other Sections are acceptable for sewer pipe installation in accordance with manufacturer's written instructions.
.1 Visually inspect pipe installation location 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 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

.2 Clean and dry pipes and fittings before installation.

.3 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.3 TRENCHING

.1 Do trenching Work in accordance with Section 31 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 layer not exceeding 150 mm compacted thickness.

.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.

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 Lay pipes on prepared bed or support system, 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 or supports.

.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 B182.11.

.9 Pipe jointing:
.1 Install gaskets in accordance with manufacturer's written recommendations.
.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 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 to the approval of Departmental Representative to prevent creep during down time.

.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 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, insulate, surround and cover pipes as indicated.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.4 Place layers uniformly and simultaneously on each side of pipe.

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 surface grade.

3.8 FIELD TESTING

.1 Test sanitary piping in accordance with the requirements indicated in Section 21 05 01 - Common Work Results for Mechanical.

3.9 CLEANING

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

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

END

PART 1 GENERAL

1.1 RELATED SECTIONS

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

.2 Section 32 12 16.01 - Asphalt Paving - Short Form.

.3 Section 33 05 13 - Manholes and Catch Basin Structures.

1.2 REFERENCES

.1 ASTM International
.1 ASTM D698-12, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 CSA International
.1 CAN/CSA-A3000-08, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2009), Update No. 2 (2010), Update No. 3 (2011).
.2 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 B182.11-11, Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

.3 Ontario Provincial Standard Specifications (OPSS)
.1 OPSS 1010-April 2004, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

1.3 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.4 SUBMITTALS

.1 Certification to be marked on pipe.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations.
- .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 Poly Vinyl Chloride (PVC): to CAN/CSA-B1800.
- .1 Standard Dimensional Ratio (SDR): 35.
- .2 Locked-in gasket and integral bell system.
- .3 Nominal lengths: 4 m.

2.2 PIPE BEDDING AND SURROUND MATERIAL

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, Paragraph 2.1.2.

2.3 BACKFILL MATERIAL

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, Paragraph 2.1.1.

2.4 JOINT MORTAR

.1 Portland cement: to CAN/CSA-A3000, normal type 10.

.2 Mortar: one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

PART 3 EXECUTION

3.1 PREPARATION

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layer not exceeding 150 mm compacted thickness.

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

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% corrected maximum dry density.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted OPSS 1010 Granular B Type II material.

3.4 INSTALLATION

.1 Lay and join pipe 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 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.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 pipes 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 CAN/CSA-B1800.

.9 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.

.10 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.

.11 Make watertight connections to manholes and catch basins.
.1 Use shrinkage compensating grout when suitable gaskets are not available.

.12 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
.1 Joint to be structurally sound and watertight.

.13 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
.1 Do not dump material within 2 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 95% corrected maximum dry density.

3.6 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.

3.7 FIELD TESTS AND INSPECTIONS

.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.

3.8 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

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