

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for constructing new outfall structures, precast and cast-in-place manholes and catch basins.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 00 – Cleaning and Waste Management.
- .3 Section 31 23 10 – Excavation, Trenching and Backfilling
- .4 Section 03 30 00 – Cast-in-Place Concrete

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A48/A48M-00, Standard Specification for Gray Iron Castings.
 - .2 ASTM C139-99, Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .3 ASTM C478M-97, Specification for Precast Reinforced Concrete Manhole Sections [Metric].
 - .4 ASTM C618-00, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 - .5 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort (12,400 ftlb/ft³ (600 kN-m/m³)).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2MM, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-98 (April 2001), Cementitious Materials Compendium.
Includes:
 - .1 CAN/CSA-A5-98, Portland Cement.
 - .2 CAN/CSA-A8-98, Masonry Cement.
 - .3 CAN/CSA-A23.5-98, Supplementary Cementing Materials.
 - .2 CSA-A23.1/A23.2-00 (June 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .3 CSA-A165 Series-94 (R2000), CSA Standards on Concrete Masonry Units.
 - .4 CAN/CSA-G30.18-M92(R1998), Billet Steel Bars for Concrete Reinforcement.
 - .5 CAN/CSA-G164-M2R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

- .4 Manholes to conform with City of Winnipeg specifications.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 30 – Submittal Procedures.
- .2 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .3 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Contract Administrator.
- .4 Divert unused concrete materials from landfill to local facility as approved by Contract Administrator.
- .5 Divert unused aggregate materials from landfill to facility for reuse as approved by Contract Administrator.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

- .1 Cast-in-place concrete:
 - .1 In accordance with Section 03 30 00 – Cast-in-Place Concrete.
 - .2 Portland cement with 40% Fly ash replacement to CAN/CSA-A5, Type 10.
 - .3 Concrete mix design in accordance with Section 03 30 00.
 - .4 Additives: Fly ash to CAN/CSA-A23.5 ASTM C618.
- .2 Concrete reinforcement: in accordance with drawing.
- .3 Precast manhole units: to ASTM C478M, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation. Monolithic bases to be approved by Contract Administrator and set on concrete slabs cast in place.
 - .1 Acceptable material: in accordance with drawing.
- .4 Precast catch basin sections: to ASTM C139.
 - .1 Acceptable material: in accordance with drawing.

- .5 Joints: to be made watertight using bituminous compound.
- .1 Masonry Cement: to CAN/CSA-A3000-A8.
- .6 Ladder rungs: to CAN/CSA-G30.18, No. 25M billet steel deformed bars, hot dipped galvanized to CAN/CSA-G164. Rungs to be safety pattern drop step type.
- .7 Adjusting rings: to ASTM C478M.
- .8 Concrete Brick: to CAN3-A165 Series.
- .9 Drop manhole pipe: to be same as sewer pipe.
- .10 Galvanized iron sheet: to be approximately 2 mm thick.
- .11 Steel gratings
- .12 Frames, gratings, covers to dimensions as indicated and following requirements:
 - .1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
 - .2 Gray iron castings: to ASTM A48/A48M, strength class 30B.
 - .3 Castings: in accordance with drawing.
 - .4 Manhole frames and covers: in accordance with drawings.
 - .5 Catch basin frames and covers: in accordance with drawings.
 - .6 Manhole frames and covers: in accordance with drawings.
 - .7 Catch basin frames and covers: in accordance with drawings.
 - .8 Manhole frames and covers: in accordance with drawings.
 - .9 Catch basin frames and covers: in accordance with drawings.
 - .10 Size: to drawings.
- .13 Granular bedding and backfill: in accordance the following requirements:
 - .1 Crushed gravel.
 - .2 Gradations to be within limits specified when tested.
 - .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	50-100
2.00 mm	-	30-90
0.425 mm	10-25	10-50
0.180 mm	-	-
0.075 mm	0-8	0-10

- .4 Concrete mixes and materials: in accordance with drawing.
- .14 Unshrinkable fill: in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXCAVATION AND BACKFILL

- .1 Excavate and backfill in accordance with Section 31 23 10 – Excavation, Trenching and Backfilling and as indicated.
- .2 Obtain approval of Contract Administrator before installing manholes or catch basins.

3.2 CONCRETE WORK

- .1 Do concrete work in accordance drawing.
- .2 Place concrete reinforcement in accordance drawing.
- .3 Position metal inserts in accordance with dimensions and details as indicated.

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. Maximum of three units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Contract Administrator and remove soft and foreign materials before placing concrete base.
- .4 Cast bottom slabs directly on undisturbed ground.
- .5 Set precise concrete base in accordance with drawings.
- .6 Precast Units:
 - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with Contract Administrator approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof.
 - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .3 Plug lifting holes with precise concrete plugs set in cement mortar or mastic compound.
- .7 For sewers:

- .1 Place stub outlets and bulkheads at elevations and in positions indicated.
- .2 Bench to provide a smooth U-shaped channel. Side height of channel to be 0.75 times full diameter of sewer. Slope adjacent floor at 1 in 20. Curve channels smoothly. Slope invert to establish sewer grade. For pipes smaller than 200 mm, use standard fittings, breaking out upper half of fitting upon completion of manhole.
- .8 Compact granular backfill to 95% standard maximum dry density to ASTM D698 00 (a).
- .9 Place unshrinkable backfill in accordance with Section 31 23 10 – Excavation, Trenching and Backfill.
- .10 Installing units in existing systems:
 - .1 Where new unit is to be 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 to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .11 Set frame and cover to required elevation on no more than four courses of brick. Make brick joints and join brick to frame with cement mortar. Parge and make smooth and watertight.
- .12 Place frame and cover on top section to elevation as indicated. If adjustment is required, use concrete ring.
- .13 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.
- .14 Install safety platforms in manholes having depth of 5 m or greater, as indicated.

3.4 ADJUSTING TOPS OF EXISTING UNITS

- .1 Remove existing gratings, frames and beams and store for re-use at locations designated by Contract Administrator
- .2 Sectional units:
 - .1 Raise or lower straight walled sectional units by adding or removing precise sections as required.
 - .2 Raise or lower tapered units by removing cone section, adding, removing or substituting riser sections to obtain required elevation, then replace cone section. When amount of raise is less than 600 mm, use standard manhole brick modoloc or grade rings.

3.5 SEALING OVER EXISTING UNITS

- .1 Cut galvanized iron sheet to extend 50 mm beyond opening of existing manhole or catch basin grating. Centre iron sheet over existing grating and spot or switch weld to grating.
- .2 If permissible leakage is exceeded, correct defects. Repeat until approved by Contract Administrator.

- .3 Contract Administrator will issue Test Certificate for each manhole passing test.

3.6 LEAKAGE TEST

- .1 Install watertight plugs or seals on inlets and outlets of each new [sanitary sewer] manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole.
- .2 If permissible leakage is exceeded, correct defects. Repeat until approved by Contract Administrator.
- .3 Contract Administrator will issue Test Certificate for each manhole passing test.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM D3034-88, Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and fittings.
- .2 CSA B181.12-1967, Recommended Practice for the Installation of PVC Drain, Waste and Vent Pipe Fittings.

1.2 MATERIAL CERTIFICATION

- .1 At least 2 weeks prior to commencing work submit manufacturer's test data and certification that pipe materials meet requirements of this section.
- .2 At least 2 weeks prior to commencing work provide sample of bedding materials to be used.

Part 2 Products

2.1 SEWER MAINS - PIPE

- .1 Pipe and Fittings: Meet or exceed all the requirements of ASTM Specification D3034 and CSA Standards B182.1 and B182.2, BNQ 3624-130. DR35 minimum.
- .2 Standard lengths: 4 or 6 metres nominal.
- .3 Pipe: Manufactured from clean, virgin approved class 12454-B compound conforming to ASTM D1784.

2.2 SERVICE CONNECTION

- .1 PVC pipe: to CAN / CSA B182.1, with push-on joints.
- .2 Fittings and accessories manufactured and furnished by the pipe supplier and have bell and/or spigot configurations similar to that of the pipe.
- .3 Service connections to sewer mains: Use a prefabricated PVC tee service saddle and stainless steel clamps.

2.3 PIPE BEDDING AND SURROUND MATERIAL

- .1 Use bedding sand as specified - Excavating, Trenching, and Backfilling

2.4 BACKFILL MATERIAL

- .1 Type 3 in accordance with - Excavation, Trenching, and Backfilling.

Part 3 Execution

3.1 PREPARATION

- .1 Pipes and fittings to be clean and dry before installation.
- .2 Remove defective material from site.
- .3 Prior to installation, obtain Contract Administrator's approval of pipes and fittings.

3.2 TRENCHING

- .1 Do trenching work in accordance with - Section 31 23 10 - Excavation, Trenching and Backfilling.
- .2 Complete units as pipe laying progresses.
- .3 Trench alignment and depth require approval of Contract Administrator prior to placing bedding material and pipe.

3.3 BEDDING

- .1 Place bedding materials in accordance with – Section 31 23 10 - Excavating, Trenching and Backfilling.

3.4 INSTALLATION

- .1 Lay and join pipes in accordance with manufacturer's recommendations.
- .2 Handle pipe using methods approved by Contract Administrator. 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 invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipe during construction, except as may be permitted by Contract Administrator.
- .7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Position and join pipes by methods recommended by manufacturer.
- .9 Install PVC pipe and fittings in accordance with CSA B181.12.
- .10 Pipe jointing:
 - .1 Install gaskets in accordance with manufacturer's recommendations.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

- .3 Align pipes carefully before joining.
- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or gasket contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 At rigid structures, install pipe joints not more than 1.2m from side of structure.
- .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .11 When any stoppage of work occurs, block pipes to prevent creep during down time.
- .12 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner, as recommend by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available.

3.5 BACKFILL

- .1 Place backfill material in accordance with – Section 31 23 10 - Excavation, Trenching and Backfilling.
- .2 For HDPE pipe complete the following backfilling procedures in addition to .1 above:
 - .1 Complete pipe haunching in successive lifts of 150 mm to the spring line of the pipe. Compact to 95% Standard Proctor Density.
 - .2 Initial Backfill from the springline to 300 mm above the crown of pipe to be the same material as the initial haunching and compacted to 95 % Standard Proctor Density.

3.6 LINE AND GRADE

- .1 Install sewer pipe to the line and grade shown on the drawings and as set in the field by the Contract Administrator.
- .2 Ensure vertical variance from grade does not exceed the following limits: invert 50 mm below the design grade nor more than 25 mm above the design grade and there shall be no dips which will allow ponding of water to a depth of more than 50 mm.
- .3 Horizontal variance from line shall not exceed 100 mm.
- .4 Sharp bends will not be permitted even though the sewer pipe remains within these tolerances.
 - .1 For piping following a radius in the road allowance use 4 m pipe lengths and ensure deflection does not exceed 4%.

3.7 TELEVISION INSPECTION

- .1 Complete television inspection by personnel skilled and qualified in the use of television inspection equipment.
- .2 The lighting and equipment used shall be specifically designed for use in sewer mains and shall provide a clear picture of the entire periphery of the pipe.

- .3 The speed shall not exceed 9 m per minute.
- .4 The camera, TV monitor and other components of the system shall be capable of producing picture quality satisfactory to the Contract Administrator.
- .5 Picture shall clearly state the position of the camera and related background data.
- .6 Results of the inspection shall be logged by the Contractor and bound as a report.
- .7 Report shall clearly show all points of significance such as locations of building sewer connections, unusual conditions. Provide minimum 3 copies.
- .8 Take pictures of problem areas and general conditions, minimum of 1 picture between manholes.
- .9 Provide 1 copy of the video recording of the waste water sewer on DVD.
- .10 All televising and videotape equipment shall be of a type approved by Contract Administrator.
- .11 Inspection shall be between manholes or other appropriate locations where the equipment may be installed or removed.
- .12 Rectify any deformation, misalignment, etc. which are deemed unsuitable by the Contract Administrator upon review of the tape.
- .13 Flush and clean sewer before the television inspection is done utilizing high-velocity sewer cleaning equipment capable of removing all dirt, sand, rocks, grease and other solid and semisolid material. All dirt, sand, rocks, grease and other solid and semisolid material shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section will not be permitted.
- .14 Cleaning of the new mains and the lift station is incidental to television inspection.

3.8 MANDREL TESTING

- .1 Complete a mandrel test after installation works are complete.
- .2 The minimum contact length of the mandrel shall be 250 mm. The mandrel shall be cylindrical in shape, constructed of 9 evenly spaced arms.
- .3 Provide and check the mandrel with a go-no-go proving ring sized. The proving ring shall have a diameter equal to the computed deflected diameter ± 0.1 mm. An acceptable ring shall be fabricated from 6 mm thick steel.
- .4 Mandrel and proving ring dimensions for DR 35 flexible sewer pipe are shown in the following table:

Nominal Pipe Size (mm)	Mandrel Arm Radius (mm)	Mandrel Contact Length (mm)	Proving Ring Inside Diameter (mm)
200	92.74	150	185.48
250	115.70	200	231.40

- .5 Mandrel and proving ring dimensions for Polyethylene Land Drainage pipe are shown in the following table:

Nominal Pipe Size (mm)	Mandrel Diameter (mm)
300	269.0
375	336.4
450	403.5
525	470.7
600	538.0

- .6 Pipe larger than 600 mm diameter is to be televised but not mandrel tested.
- .7 If the mandrel does not readily pass through the sewer, repair or replace the defective sewer and repeat the test.
- .8 Mandrel testing is incidental to television inspection.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for storm sewer.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 00 – Cleaning and Waste Management.
- .3 Section 31 23 10 – Excavation, Trenching and Backfilling.
- .4 Section 32 11 23 – Aggregate Base Course
- .5 Section 03 30 01 – Concrete Paving

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C76M-02, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric)
 - .2 ASTM C117-95, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM C443M-02, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - .5 ASTM C506M-02, Standard Specification for reinforced concrete Arch Culvert, Storm Drain and Sewer Pipe.
 - .6 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort [12,400 ft-lbf/ft³(600kN-m³)].
 - .7 ASTM D1056-00, Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.
 - .8 ASTM F794-01, Standard Specification for Polyvinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2M88, Sieves, Testing, Woven Wire, Metric.
 - .2 CAN/CGSB-34.9-94, Asbestos-Cement Sewer Pipe.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A257 Series-M92 (R1998), Standards for Concrete Pipe.
 - .2 CSA B1800-02, Plastic non-Pressure Pipe Compendium – B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11). CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).

- .1 CSA B182.04-02, Profile PVC Sewer Pipe and Fittings.
- .2 CSA B182.11-02, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).

- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.4 DEFINITIONS

- .1 A pipe section is defined as length of pipe between successive catch basins and/or manholes.

1.5 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Inform Contract Administrator at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .4 Submit to Contract Administrator for testing, at least 2 weeks prior to beginning Work, following samples of materials proposed for use: storm sewer pipe, manholes and fittings.
- .5 Certification to be marked on pipe.
- .6 Submit to Contract Administrator 1 copy of manufacturer's installation instructions.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.
- .5 Divert unused metal materials from landfill to metal recycling facility for disposal approved by Contract Administrator.

- .6 Divert unused concrete materials from landfill to local facility as approved by Contract Administrator.
- .7 Divert unused aggregate materials from landfill to facility. Place materials defined as hazardous or toxic in designated containers.
- .8 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations. Dispose of unused asbestos cement pipe in accordance with regulations governing the disposal of hazardous materials.
- .9 Fold up metal banding, flatten and place in designated area for recycling.

1.7 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.

Part 2 Products

2.1 PLASTIC PIPE

- .1 Type PSM Polyvinyl Chloride (PVC) to ASTM D3034 CSA-B182.2.
 - .1 Standard Dimensional Ratio 35.
 - .2 Separate gasket and integral bell system.
 - .3 Nominal lengths 6 m.

2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material in accordance with Section 32 11 23 – Aggregate Base Courses and the following requirements:
 - .1 Crushed or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sized to CAN/CGSB-8.2.
- .2 Table

Sieve Designation (mm)	%Passing Stone/Gravel	% Passing Gravel/Stone
200	-	-
75	-	-
50	-	-
38.1	-	-
25	100	-
19	-	-
12.5	65-90	100
9.5	-	-
4.75	35-55	50-100
2.00	-	30-90

Sieve Designation (mm)	%Passing Stone/Gravel	% Passing Gravel/Stone
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0.425	10-25	10-50
0.180	-	-
0.075	-	0-10

- .3 Concrete mixes and materials for bedding, cradles, encasements, supports; in accordance with Section 03 30 00 – Cast-in-Place Concrete.

2.3 BACKFILL MATERIAL

- .1 Type 3 to Section 31 23 10 – Excavation, Trenching and Backfilling.

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 Contract Administrator.

3.2 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 10 – Excavation, Trenching and Backfilling.
- .2 Do not allow contents of sewer or sewer connection to flow into trench.
- .3 Trench alignment and depth to approval of Contract Administrator prior to placing bedding material and pipe.
- .4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by Contract Administrator.

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. 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% standard maximum dry density to ASTM 698 00(a).
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with lean mix concrete compacted bedding material.

3.4 INSTALLATION

- .1 Lay and join pipes to ASTM C12.
- .2 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Contract Administrator.

- .3 Handle pipe using methods approved by Contract Administrator.
 - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade with pipe 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 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipes during construction except as may be permitted by Contract Administrator.
- .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 When any stoppage of Work occurs, restrain pipes as directed by Contract Administrator , to prevent “creep” during down time.
- .10 Plug lifting holes with Contract Administrator approved prefabricated plugs, set in shrinkage compensating grout.
- .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 and catch basins.
 - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .13 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
 - .1 Joint to be structurally sound and watertight.
- .14 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 Contract Administrator 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 1.0 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% standard maximum dry density in accordance with ASTM 298 00(a).
- .6 Compact each layer from mid-height of pipe to underside of backfill to at least 90% standard maximum dry density in accordance with ASTM 698 00 (a).
- .7 When field test results are acceptable to Contract Administrator, place surround material at pipe joints.

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 standard dry density ASTM 698 00. In other areas, compact backfill to at least 90% standard dry density [ASTM 698(a)].

3.7 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Contract Administrator, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Television and photographic inspections:
 - .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means approved by Contract Administrator.
 - .2 Provide means of access to permit Contract Administrator to do inspections.
 - .3 Payment for inspection services to be borne by Contractor.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for foundation and underslab drainage.

1.2 RELATED SECTIONS

- .1 Section 03 10 00 – Concrete Forming and Accessories.
- .2 Section 31 11 23 - Aggregate Base Courses.
- .3 Section 31 23 10 - Excavation, Trenching and Backfilling.

1.3 REFERENCES

- .1 Canadian General Standards (CSA International).
 - .1 CSA –A23.1/A23., Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CSA B1800, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
 - .1 CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))

1.4 SITE CONDITIONS

- .1 Examine sub-surface investigation report.
- .2 Known underground utility lines and buried objects are as indicated on site plans.

1.5 Submittals

- .1 Submit manufacturer's test data and certification at least 2 weeks prior to commencing work.
 - .1 Certification to be marked on pipe.
- .2 Submit manufacturer's information data sheets and instructions.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

Part 2 Products

2.1 BEDDING AND SURROUND MATERIALS

- .1 Coarse filter aggregate: to CSA-A23.1/A23.2, Group 1 20-5 mm.
- .2 Fine filter aggregate: to CSA-A23.1/A23.2.
- .3 Rigid plastic pipe and fittings: to CSA-B182.1, perforated size 150mm, complete with fittings.

2.2 BACKFILL MATERIAL

- .1 Type 2, in accordance with Section 31 23 10 - Excavation, Trenching and Backfilling.
- .2 Excavated or graded material existing on site may be suitable to use if approved by Contract Administrator.

Part 3 Execution

3.1 EXAMINATION

- .1 Ensure graded base conforms with required drainage pattern before placing bedding material.
- .2 Ensure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of Contract Administrator.
- .3 Ensure foundation wall and dampproofing have been installed and approved by Contract Administrator before placing bedding material.

3.2 BEDDING PREPARATION

- .1 Cut trenches in base and place bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .2 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
- .3 Shape transverse depressions, as required, to suit joints.
- .4 Compact each layer full width of bed to at least 95% of corrected maximum dry density.
- .5 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material or lean mix concrete.

3.3 PIPE OR TUBING INSTALLATION

- .1 Ensure pipe interior and coupling surfaces are clean before laying.
- .2 Lay perforated pipe tubing level minimum to slope of 1:100. Face perforations and coupling slots downward.

- .3 Lay non-perforated pipe to slope of 1:50 from perforated pipe to disposal area. Make joints watertight.
- .4 Grade bedding to establish pipe slope.
- .5 Install end plugs at ends of collector drains to protect pipe tubing ends from damage and ingress of foreign material.
- .6 Connect non-perforated pipe storm sewer by appropriate adapters manufactured for this purpose.
- .7 Provide cleanouts on non-perforated pipe at changes of pipe direction and in runs greater than 15 m.
- .8 Provide flush cleanouts where directed by Contract Administrator.
- .9 Connect drainage system to building storm sewers, as indicated.
- .10 Provide certificate of quality compliance upon satisfactory completion of installation.

3.4 PIPE OR TUBING SURROUND MATERIAL

- .1 Upon completion of pipe tubing laying and after Contract Administrator has inspected Work in place, surround and cover pipe as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness, as indicated.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Compact each layer from pipe invert to mid-height of pipe to at least 95% of corrected maximum dry density.
- .5 Compact each layer from mid-height of pipe to underside of backfill to at least 90% of corrected maximum dry density.

3.5 BACKFILL MATERIAL

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

END OF SECTION