CW 2130 - GRAVITY SEWERS

TABLE OF CONTENTS

CW 2130 - GRAVITY SEWERS

1. DESCRIPTION

1.1 General

.1 This specification covers supply and installation of combined sewers, interceptor sewers, land drainage sewers, storm relief sewers, wastewater sewers, sewer services, sewer repairs, catch basins, manholes and connections to existing catch basins, manholes and sewers including fittings, appurtenances and related work.

1.2 Definitions

.1 Fittings include tees, wyes, bends, reducers, couplings and plugs.

.2 Appurtenances include, flexible rubber compression joint sealers, bushings, catch basin hoods, hooks and pins, fasteners and miscellaneous components required for completion of the Work.

.3 Where used in this specification “sewer services” will include sewer connections as defined in the City of Winnipeg By-Law No. 7070 as well as catch basin leads, roof drains and utility manhole drains.

.4 Sewer service risers consist of that portion of the sewer service from the outside top of the sewer pipe to the top of the sewer service pipe at the 45 degree elbow as shown on SD-014 and SD-015.

.5 Trenchless installation methods are methods of installing pipe inside a hole that has been made between shafts by coring, boring, horizontal directional drilling, jacking, tunnelling and extraction of an existing pipe or similar methods with minimal excavation and surface disruption.

1.3 Referenced Standard Construction Specifications

.1 CW 2030 - Excavation, Bedding and Backfill
.2 CW 2140 – Sewer And Manhole Cleaning
.3 CW 2145 – Sewer and Manhole Inspections
.4 CW 2160 - Concrete Underground Structures and Works
.5 CW 3110 - Sub-Grade, Sub-base and Base Course Construction
.6 CW 3150 – Gravel Surfacing
.7 CW 3210 – Adjustment of Pavement and Boulevard Structures
.8 CW 3230 -Full-Depth Patching of Existing Slabs and Joints
.9 CW 3235 - Renewal of Existing Miscellaneous Concrete Slabs
.10 CW 3240 - Renewal of Existing Curbs
.11 CW 3310 – Portland Cement Concrete Pavement Works
.12 CW 3410 - Asphalt Concrete Pavement Works
.13 CW 3510 - Sodding
.14 CW 3520 - Seeding

1.4 Referenced Standard Details

.1 SD-001 - Standard Pipe Bedding Classes
.2 SD-002 - Standard Trench and Excavation Backfill Classes
.3 SD-009 – Sewer or Sewer Service Connection to Existing 1050 Diameter and Larger Sewer
.4 SD-010 - Standard Pre-cast Concrete Manhole (For up to 525 Millimetre Pipe)
.5 SD-011 - Standard Pre-cast Concrete Pipe Manhole (For 600 to 1500 Diameter Pipe)

.6 SD-014 - Sewer Service With Alternative “A” Riser
.7 SD-015 - Sewer Service With Alternate “B” Riser
.8 SD-020 – Nine Arm Mandrel and Proving Ring for 5.25% Deflection Testing of SDR 35 PVC Pipe
.9 SD-021 – Sewer Service Abandonment Beneath Pavement
.10 SD-022A – Sewer Repair Up to 3.0 Metres Long
.11 SD-022B – Sewer Repair Longer Than 3.0 Metres
.12 SD-023 - Curb and Gutter Inlet With Catch Pit
.13 SD-024 - Catch Basin With Curb and Gutter Inlet
.14 SD-025 - Standard Catch Basin
.15 SD-220B – Manhole Isolation Detail in Existing Pavements
.16 SD-220C – Curb and Gutter Inlet Isolation Detail

1.5 Referenced Approved Product Drawings

.1 AP-004 - Standard Frame for Manhole and Catch Basin
.2 AP-005 - Standard Solid Cover for Standard Frame
.3 AP-006 - Standard Grated Cover for Standard Frame
.4 AP-007 – Lifter Ring for Standard Frame
.5 AP-008 – Barrier Curb and Gutter Inlet Frame and Box
.6 AP-009 – Barrier Curb and Gutter Inlet Cover
.7 AP-011 – Mountable Curb and Gutter Inlet
.8 AP-012 - Catch Basin Hood

2. MATERIALS

2.1 Approved Products

.1 Use only those products listed as Approved Products for Underground Use in the City of Winnipeg found on the City of Winnipeg, Materials Management web site at: http://www.winnipeg.ca/matmgt/spec/

2.2 Sewer and Sewer Service Pipe

.1 Mainline and sewer connection pipe to be in accordance with AT 4.2.1.10 and AT 4.2.2.10 of the Approved Products for Underground Use in the City of Winnipeg.

.2 Mainline cul-de-sac sewer pipe to be in accordance with AT 4.2.1.11.

.3 Open profile ribbed storm sewer pipe in accordance with AT 4.2.1.16 of the Approved Products for Underground Use in the City of Winnipeg.

.4 250 to 600 millimetre non-reinforced concrete bell and spigot pipe in accordance with CAN/CSA A257.1 and ASTM C14, Class 3.

.5 300 millimetre and larger reinforced concrete bell and spigot pipe in accordance with CAN/CSA A257.2 and ASTM C76.

.6 Reinforced concrete bell and spigot straight wall pipe used for jacking in accordance with CAN/CSA A257.2 and ASTM C76. Outside of bell ends to be fitted with a 14 gauge steel band with a width of 1.5 times the length of the bell end groove.

2.3 Drainage Inlet Connection Pipe

.1 250 millimetre diameter gasketed bell and spigot PVC pipe in accordance with CAN/CSA B182.2 and ASTM D 3034, SDR 35.

.2 250 millimetre non-reinforced concrete bell and spigot pipe in accordance with CAN/CSA A257.1 and ASTM C14, Class 3.

2.4 Sewer and Sewer Service Fittings and Connection Saddles

.1 150 millimetre and larger gasketed push-on style PVC injection moulded fittings in accordance with AT 4.2.1.60 of the Approved Products for Underground Use in the City of Winnipeg.

.2 450 millimetre and larger gasketed push-on style PVC fabricated fittings in accordance with AT 4.2.1.61 of the Approved Products for Underground Use in the City of Winnipeg.

.3 250 millimetre and larger gasketed bell and spigot concrete pipe fittings in accordance with CAN/CSA A257 Series and ASTM C 14 and C 76.

2.5 Sewer Pipe Gaskets

.1 PVC pipe gaskets, flexible rubber in accordance with ASTM F477

.2 Concrete pipe gaskets, flexible rubber in accordance with ASTM C443.

.3 Where required, elastomeric compounds for oil and gas resistant gaskets to be rated as "excellent".

2.6 Flexible Transition Pipe Couplings

.1 Flexible transition sewer couplings to be in accordance with AT 4.2.1.66 of the Approved Products for Underground Use in the City of Winnipeg.

2.7 Manholes,Catch Basins and Catch Pits

.1 Pre-cast concrete sections as indicated on SD-010, SD-011, SD-023, SD-024 and SD-025: to CSA A257.4 and ASTM Standard C 76 Class II and C 478 (circular sections)

.2 Cast iron frames and covers to be in accordance with AP-004, AP-005, AP-006, AP-007, AP-008, AP-009, AP-010 and AP-011 in accordance with AT 4.2.1.73, AT 4.2.1.75, AT 4.2.1.83B, and AT 4.2.1.83M of the Approved Products for Underground Use in the City of Winnipeg.

.3 Ladder rungs to be in accordance with AT 4.2.1.72 of the Approved Products for Underground Use in the City of Winnipeg.

.4 Pre-cast concrete adjusting rings in accordance with CAN/CSA A257.4 and ASTM C478.

.5 Concrete brick in accordance with CAN3-A165 Series.

.6 Catch basin hood to be in accordance with AP-012 and AT 4.2.1.84 of the Approved Products for Underground Use in the City of Winnipeg.

.7 Manhole and catchbasin joint gaskets to be in accordance with AT 4.2.1.71 of the Approved Products for Underground Use in the City of Winnipeg.

.8 Core and seat boot type flexible rubber connection for PVC pipe in accordance with material requirements of ASTM C923.

2.8 Fasteners

.1 Fasteners, tie rods, clamps, straps, bands, nuts and bolts to be stainless steel in accordance with ASTM A320, ANSI Type 316 marked as such with raised or indented numerals.

2.9 Cast-in-Place Concrete, Grout, Mortar and Cement-Stabilized Fill

.1 Cast-in-place concrete, grout, mortar and cement stabilized fill in accordance with CW 2160.

2.10 Cement Patching Compound

.1 Cement patching compound to be fast hardening, high strength non-shrink mixture suitable for use on vertical surfaces.

2.11 Bedding and Backfill

.1 Bedding and backfill in accordance with CW 2030.

3. CONSTRUCTION METHODS

3.1 Excavation

.1 Remove existing concrete pavement slabs, miscellaneous concrete slabs, curbs and asphalt pavement in accordance with CW 3110, CW3230, CW 3235, CW 3240 and CW 3410.

.2 Excavate in accordance with CW 2030. Excavate and prepare trench a sufficient distance in ahead to not to interfere with installation of the pipe.

3.2 Foundation and Bedding

.1 Place and compact foundation material, where required and bedding material in bottom of trench or excavation in accordance with CW 2030 and SD-001 to grade and elevation shown on the Drawings. Level across full width of trench or excavation and leave ready for pipe installation.

3.3 Installation in a Trench

.1 Install same material, class and type of pipe between adjacent manholes.

.2 Assemble pipe in accordance with manufacturer's instructions so when complete sewer will have a smooth and uniform invert. Lay pipe with bell upgrade. Use longest pipe size manufactured where practicable to reduce total number of joints on sewer.

.3 Place pipe on compacted bedding ensuring uniform support under bell and pipe body throughout its full length. Work and compact bedding material under sides of pipe to provide proper haunching.

.4 Protect exposed pipe ends with an approved stopper to prevent excess amounts of water, earth and debris from entering pipe as work proceeds.

.5 Install pipe to the line and grade shown on the Drawings or as determined by the Contract Administrator on-site in accordance with the limits in Section 3.6 of this specification.

.6 Pipe joint deflections to be within the manufacturer's recommendations.

.7 Remove construction debris and materials from sewers before performing video inspection.

3.4 Installation Using Trenchless Methods

.1 Install sewers using trenchless methods where alignment is under or crosses existing and proposed pavements, existing boulevards, trees, utility poles, structures and at other locations in accordance with the Drawings and Specifications or as directed by the Contract Administrator.

.2 Install same material, class and type of pipe between adjacent manholes.

.3 Excavate shafts and provide shoring in accordance with CW 2030.

.4 Provide the locations and sizes of shafts to the Contract Administrator for review before excavating.

.5 Completely remove existing pipe for on-line sewer renewals.

.6 Join pipe sections together in shafts before inserting into installation hole. Pull or push entire length of pipe into installation hole from end of last pipe with bells facing away from pulling or pushing direction. Installation methods where tension is applied to a pipe section will not be permitted.

.7 Ensure the force applied to the section of pipe being pulled or pushed into the installation hole does not result in spigots being inserted into the bell beyond the manufacturer's recommended insertion depth.

.8 Pull back the entire length of pipe already in the installation hole if a length of pipe is to be withdrawn from the installation hole.

.9 Install pipe to the line and grade shown on the Drawings or as determined by the Contract Administrator on-site in accordance with the limits in Section 3.6 of this specification.

.10 Keep pipe joint deflections within the manufacturer's recommendations.

.11 Remove construction debris and materials from sewers before performing video inspection.

.12 Repair damage to underground and surface structures due to surface subsidence and soil heaving caused by trenchless installation methods.

.13 Where field conditions are such that sewers cannot be installed using trenchless methods install sewers in a trench using the type of backfill specified in CW 2030 for the installation location after receiving written approval from the Contract Administrator.

3.5 Fitting Installation

.1 Install fittings of same material, type and class as sewer, sewer service or catch pit pipe.

.2 Install watertight plug in the end of sewers where shown on the Drawings to allow for a future connection.

.3 Excavate, bed and install fittings as specified for sewers and sewer services.

3.6 Line and Grade

.1 Allowable variance from specified line to be +/- 100 millimetres. Allowable variance from specified grade to be 25 millimetres above grade and 50 millimetres below grade at any one location. Allowable ponding in pipe due to combined variance above and below grade not to exceed 50 millimetres.

.2 Correct alignment and grade exceeding the allowable variance in a manner acceptable to the Contract Administrator.

3.7 Backfill

.1 Place and compact initial backfill above the pipe in accordance with CW 2030 and SD-001.

.2 Backfill the reminder of the trench or excavation in accordance with CW 2030 and SD-002.

3.8 Manhole, Catch Basin and Catch Pit Installation

.1 Level bedding to ensure manhole base, catch basin and catch pit is uniformly supported and the floor is level.

.2 Construct manholes, catch basins and catch pits in accordance with SD-010, SD-010D, SD-011, SD-023, SD-024 and SD-025 and as shown on the Drawings. Install manhole, drop pipe, catch basin and catch pit sections plumb and level. Variance from line and grade to be in accordance with Section 3.6 of this specification.

.3 Install approved gasket or joint sealer between pre-cast concrete sections including 750 millimetre diameter riser adjusting rings and between frame and pre-cast concrete riser as construction progresses. Alternately install grout between frame and pre-cast concrete risers as approved and directed by Contract Administrator. Ensure grout completely fills space between frame and riser to make joint watertight and finish flush with inside surface of risers.

.4 Connect sewers to manhole bases, catch basins and catch pits at invert elevations shown on the Drawings and grout in place to make a watertight connection. Coat outside of PVC pipe end for a length equal to the manhole, catch basin and catch pit wall thickness plus 150 millimetres with an approved cementing agent to which sand has been added and allow mixture to harden before grouting in place. Alternatively PVC pipe may be connected using an approved pre-treated, gasketed PVC insert or an approved interference fit flexible rubber boot or gasket inserted into a hole cored in the manhole base, catch basin or catch pit wall.

.5 Bench and channel manhole floor with mortar or concrete in accordance with SD-010 and SD-011 and as shown on the Drawings. Curve flow channels smoothly and provide smooth transition between inlet and outlet pipes.

.6 Grout and plug lifting holes, joints and frame with mortar to make watertight. Remove excess mortar from inside surface of manhole.

.7 Compact backfill between manholes, catch basins or catch pits and the sides of the trench or excavation in accordance with CW 2030.

3.9 New Manhole Installation on Existing Sewer

.1 Where a new manhole is to be installed by removing a length of the existing sewer pipe install the manhole in accordance with Section 3.8 of this specification and the following requirements.

.1 Cut fully through the existing sewer pipe leaving neat, square ends and remove the required length or remove existing sewer pipe at a joint within the excavation.

.2 Excavate the required depth below the existing sewer for granular foundation and bedding.

.3 Install required length of new sewer, connect to existing sewer with approved coupling, adapter or bushing and connect to new manhole.

.4 Remove construction debris and materials from manholes and sewers when the Work is complete.

.2 Where a new manhole is to be installed overtop the existing sewer without removing a length of pipe install the manhole in accordance with Section 3.8 of this specification and the following requirements.

.1 Excavate the required depth below the existing sewer for the cast-in-place concrete manhole floor. Fully support the existing sewer during excavation.

.2 Set the saddle or arch type open manhole base over the existing sewer in a manner to not damage the existing sewer.

.3 Place concrete in the bottom of the excavation and embed the manhole base to required elevation. Plumb and level the manhole base as required.

.4 Cut out and remove top portion of existing sewer as required in a manner that will not damage the remaining sewer pipe.

.5 Grout around the sewer pipe and manhole wall opening with mortar to make a watertight joint.

.6 Place mortar or concrete between the existing sewer pipe and the inside of new manhole wall and form smooth flow channel and benching.

.7 Remove construction debris and materials from manholes and sewers when the Work is complete.

3.10 Sewer Service Installation

1. Install sewer services as specified for sewers in accordance with Section 3.3 and 3.4 of this specification.

.2 Variance from specified line not to exceed +/- 100 millimetres. Variance from specified grade not to exceed +/- 25 millimetres.

.3 Connect sewer services to sewers at locations where preformed fittings have been provided. Use an approved adapter, coupling or bushing if required to make a watertight connection. Connect sewer services in accordance with Section 3.16 of this specification if preformed fittings do not exist on the sewer.

.4 Install a sewer service riser pipe in accordance with SD-014 and SD-015 where the connection to the sewer is deeper than 4.25 metres. Terminate sewer service riser 3.35 to 4.25 metres below finished grade.

.5 Use 45 degree or less bends only on sewer services.

.6 Install a watertight removable plug in the end of the sewer service to allow for a future connection.

3.11 Drainage Connection Pipe Installation

1. Install drainage connection pipe between inlet box or catch pit and catch basin in accordance with Section 3.3 and 3.4 of this specification at locations shown on the drawings or as directed by the Contact Administrator.

.2 Variance from specified line not to exceed +/- 100 millimetres. Variance from specified grade not to exceed +/- 25 millimetres.

.3 Connect drainage connecting pipe to existing catch basins in accordance with Section 3.8 of this specification.

3.12 Sewer Repairs

.1 Perform video inspection of sewer to be repaired using video equipment in accordance with CW 2145 and review with Contract Administrator to confirm repair limits. Coding of the video inspection is not required.

.2 Install required length of new sewer pipe in accordance with SD-022A or SD-022B, Section 3.3 or 3.4 of this specification and to the following requirements.

.1 Excavate, expose and remove sewer pipe to be repaired. Cut fully through existing sewer pipe at limits of repair leaving neat square ends or remove existing sewer pipe at a joint location within excavation.

.2 Install required length of sewer pipe of the type and class in accordance with the Specifications and Drawings.

.3 Connect new sewer pipe to existing sewer pipe using an approved flexible transition coupling, adapter or bushing to make a watertight connection.

.4 Connect new sewer pipe to existing manhole in accordance with Section 3.8.4 of this specification.

.3 Remove construction debris and materials from sewers when the Work is complete.

3.13 Existing Manhole and Catch Basin Repairs

.1 Saw cut and remove existing pavement in accordance with SD-220B and SD-220C where frames, covers, reducers and risers are required to be replaced.

.2 Prevent construction materials and debris from entering the sewer.

.3 Remove existing pre-cast concrete, cast-in-place concrete or brick reducer and riser sections to depth shown on the Drawings or as directed by the Contract Administrator without damaging

remaining risers. Level top of remaining riser section as necessary with mortar or concrete to accept and make a watertight joint with new pre-cast concrete flat top reducer or riser section. Add or remove excess mortar or concrete from joint as necessary to make new flat top reducer and riser section level and plumb and finish joint flush with inside surface of wall.

.4 Install pre-cast concrete riser sections, flat top reducer, frame and cover in accordance with Section 3.8 of this specification.

.5 Make final adjustment of frames in accordance with Section 3.2 of CW 3210.

.6 Remove loose and unsound material from inside surface of wall area to be repaired. Clean and prepare repair area as required and apply approved concrete patching compound in accordance with manufacturer's instructions. Finish surface smooth and form to shape of wall.

.7 Remove loose and flaking mortar from brickwork and clean repair area as required. Remove and replace cracked and broken bricks as necessary. Apply mortar to replacement brick before fitting into place. Work mortar completely into joints ensuring all gaps are filled. Remove excess mortar and shape joint to match existing.

.8 Cut existing rungs and steps to be replaced flush with inside wall surface. Install approved rungs on alignment indicated on contract drawings and as directed by the Contract Administrator at 300 millimetres vertically on centre.

.9 Cut existing catch basin hood wall hook to be replaced flush with inside wall surface. Attach approved wall hook directly above existing wall hook with adequately sized stainless steel anchor bolt. Replace broken or missing hinge pin with approved hinge pin.

.10 Remove construction debris and materials from bottom of manholes, catch basins and sewers when the Work is complete.

3.14 Removal and Replacement of Existing Manholes, Catch Basins and Catch Pits

.1 Remove and replace existing manholes, catch basins and catch pits where indicated on the Drawings and Specifications as excavation progresses. Install replacement manholes, catch basins and catch pits in accordance with SD-010, SD-010D, SD-011, SD-023, SD-024 and SD-025, Section 3.8 of this specification and the following requirements

.1 Cut fully through existing sewer pipe or catch basin lead pipe leaving neat, square ends before removing the existing catch basin, catch pit or manhole base. Alternately, remove existing sewer pipe or catch basin lead pipe at a joint location within the excavation.

.2 Install new sewer pipe or catch basin lead pipe of specified size and type from new manhole, catch basin or catch pit to existing sewer pipe or catch basin lead pipe.

.3 Connect to existing sewer pipe or catch basin lead pipe with approved coupling, adapter or bushing to make a watertight connection.

.2 Remove construction debris and materials from manholes, catch basins, catch pits and sewers when the Work is complete.

3.15 Connecting New Sewers and Catch Basin Leads to Existing Manholes, Catch Basins and Catch Pits

.1 Connect new sewers and catch basin leads to existing manholes, catch basins and catch pits at locations and elevations shown on the Drawings.

.2 Excavate required depth and make neat hole in manhole, catch basin or catch pit wall a maximum of 25 millimetres larger than outside diameter of the sewer or catch basin lead pipe.

.3 Connect sewers, catch basin leads and drainage connection pipes in accordance with Section 3.8 of this specification.

.4 Connect catch basin leads to existing manholes at a depth of 2.4 to 4.0 metres below finished grade and from 600 millimetres to 900 millimetres above the manhole floor where the manhole floor is between 3.0 and 4.0 metres below finished grade

.5 Install approved catch basin hood in accordance with AP-012, SD-024 and SD-025. Reuse existing catch basin hood if not damaged and approved by Contract Administrator.

.6 Cut existing catch basin lead pipe flush with catch basin or catch pit wall and plug opening with mortar or concrete to make watertight.

.7 Re- bench and re-channel manhole floor as required with mortar or concrete in accordance with SD-010 and SD-011. Curve flow channels for perpendicular connections smoothly into main flow channel.

.8 Remove construction debris and materials from existing manholes, catch basins, catch pits and sewers.

3.16 Connecting New Sewer or Sewer Service to Existing Sewer

.1 Connect to existing sewer fittings where provided with approved coupling, adapter or bushing to make a watertight connection.

.2 Connect to existing vitrified clay pipe sewers where no fitting is provided by removing the required length of sewer pipe and installing an approved tee, required lengths of new sewer pipe and flexible couplings, bushing or adapters in accordance with Section 3.12 of this specification.

.1 Where approved by the Contract Administrator a connection can be made to 300 millimetre and larger vitrified clay sewers with an approved PVC saddle in accordance with clause 3.16.3.2 of this specification.

.3 Connect to other types of existing sewers where no fitting is provided using one of the following methods.

.1 Remove a section of existing sewer pipe and install an approved tee. or

.2 Make a neat circular hole in the existing sewer the same size as the sewer or sewer service to be connected and install an approved PVC saddle in accordance with the manufacturer's instructions using stainless steel straps or 6 millimetre diameter stainless steel bolts.

.1 Maximum connection to an existing sewer using a PVC saddle to be two sizes smaller than the sewer pipe.

.2 Install fastening bolts with head on the inside of the sewer pipe. Use washers if hole has chipped during drilling. Do not over tighten bolts to cause stress or damage to existing sewer pipe.

.3 Limit excavation beneath existing sewer to only what is required to install saddle straps. Fill excavation beneath existing sewer with grout or cement stabilized fill.

.3 Make a neat circular hole in the existing sewer a maximum of 25 millimetres larger than sewer or sewer service pipe to be connected. Insert a short piece of sewer or service pipe into the hole with the bell end resting on the outside of the existing sewer pipe. Grout around and between the sewer or service pipe bell and the existing sewer pipe wall with mortar in accordance with SD-009 or construct a concrete collar in accordance with the Drawings to make a watertight connection.

.4 Make holes in existing sewer pipes using the following methods.

.1 Non-reinforced monolithic concrete sewer and pre-cast reinforced concrete pipe 900 millimetres in diameter and larger: by concrete coring.

.2 Pipes less than 900 millimetres in diameter: by concrete coring or drilling a series of 12 millimetre diameter holes with a masonry drill bit around the circumference of the hole and carefully tapping out the coupon.

.1 Drill holes at 15 millimetres on centre for sewer pipes 375 millimetre diameter and smaller and at 25 millimetres on centre for sewer pipes up to and including 900 millimetre diameter.

.3 PVC pipe: by coring or cutting with hole saw or other tool capable of cutting a circular opening.

.5 Ensure the new sewer or service pipe does not protrude more than 19 millimetres into the existing sewer.

.6 Remove all construction debris and materials from the existing sewer when the Work is complete.

.7 Perform a video inspection of the existing sewer after completion of backfilling and compaction using the video equipment indicated in CW 2145 from the nearest manhole to a minimum of 2 metres past the new connection. Provide the DVD of the inspection to the Contract Administrator for review. The video inspection is to clearly show the distance from the manhole to the connection and the connection. Coding of the video inspection will not be required.

.8 Submit video inspections of existing sewers equal to or smaller than 450 millimetres in size for a new service connection done under a Service Permit within 90 Calendar days of the completion of the new service connection. Video inspection of existing sewers larger than 450 millimetres in size are not required for a new sewer service connection made under a Service Permit.

3.17 Connecting to Existing Sewer and Sewer Service Stubs

.1 Remove the existing plug and connect the new sewer or sewer service pipe to the existing sewer pipe with an approved coupling, adapter or bushing to make a watertight connection.

3.18 Connecting Existing Sewer Service to New Sewer

.1 Locate existing sewer service by dye tracing, electronic tracing, video inspection or other methods approved by the Contract Administrator.

.2 Excavate and connect to the existing sewer service pipe at the location shown on the Drawings or within the limits of excavation for on-line sewer renewals unless otherwise directed by the Contract Administrator.

.3 Cut fully through the existing sewer service pipe leaving a neat square end or remove existing

sewer service pipe at a joint location within the excavation.

.4 Connect the new sewer service pipe to the existing sewer service pipe or joint using an approved flexible transition coupling, adaptor or bushing to make a watertight connection.

.5 Install fittings, riser pipe, required length of new sewer service pipe and connect to the tee on the new sewer in accordance with Section 3.10 of this specification.

3.19 Plugging and Abandoning Existing Sewers and Sewer Services

.1 Abandon existing sewers and sewer services smaller than 300 millimetres in diameter by completely plugging each end at a manhole or where cut off with mortar or concrete a minimum of 300 millimetres thick.

.2 Abandon existing sewers and sewer services 300 millimetres in diameter and larger by plugging one end with mortar or concrete and completely filling the sewer or sewer service with cement-stabilized flowable fill. Confirm all active sewer services have been disconnected from sewer being abandoned and have been reconnected to new sewer before filling the sewer.

.3 Abandon sewer services under pavement by installing a plug within 1.0 metre of the sewer and filling with flowable cement-stabilized fill in accordance with SD-021 except where the existing sewer itself will be abandoned with flowable cement-stabilized fill.

.4 Perform a video inspection of the existing sewer using the equipment indicated in CW 2145 from the nearest manhole to a minimum of 2 metres past the abandoned sewer service and provide the DVD to the Contract Administrator for review. The video inspection is to clearly show the distance from the manhole to the abandoned sewer service. Cleaning of the sewer and coding of the video inspection will not be required.

.5 Video inspection of existing sewers is not required after plugging and abandoning existing sewer services under a Service Permit.

3.20 Abandoning, Relocation and Removal of Existing Manholes, Catch Basins, Catch Pits and Drainage Inlets

.1 Abandon existing manholes, catch basins and catch pits by removing the frame and cover, flat top reducers and riser sections to a minimum of 1.2 metres below existing or proposed finished grade.

.2 Abandon existing drainage inlets and inlet box by removing the inlet frame and inlet box cover and completely demolishing the concrete inlet box.

.3 Relocate existing manholes, catch basins and catch pits by completely removing the structure from the existing location and installing at the location shown on the Drawings.

.4 Remove existing manholes, catch basins and catch pits by completely removing the entire structure from the ground.

.5 Plug sewers and sewer services and drainage inlet pipe connected to abandoned or removed manholes, catch basins, catch pits and drainage inlet boxes in accordance with Section 3.19 of this specification. Backfill the remainder of the manhole, catch basin or excavation with compacted Class of Backfill indicated on the Drawings and Specifications in accordance CW 2030.

.6 Load and deliver salvaged frames and covers as directed by the Contract Administrator to the

Water and Waste Department, Water Services Division Yard located at 552 Plinguet Street. Unload salvaged material as directed by City personnel.

3.21 Maintaining Flow in Existing Sewers

.1 Maintain flow in existing sewers and sewer services during renewal, repair and any other time construction activities may impede or interrupt flow by methods such as diversion through the excavation, redirecting flow or providing by-pass pumping.

.2 Provide details of methods for maintaining flow in existing sewers to the Contract Administrator for review prior to beginning the Work.

.3 Flow control by temporary sewer isolation and by-pass pumping to be in accordance with Section 3.13 of CW 2140.

.4 Provide approved traffic ramps for by-pass pumping discharge hoses where crossing roadways and traffic lanes and locate where directed and approved by the Contract Administrator.

3.22 Deflection Testing of SDR 35 PVC Sewers

.1 Perform deflection testing of SDR 35 PVC pipe in the presence of the Contract Administrator by pulling a cylindrical shaped mandrel constructed with 9 evenly spaced arms generally conforming to SD-020 through the sewer after installation of sewer services and no sooner than 24 hours after compaction of backfill.

.2 Position the mandrel a minimum of 4 metres in front of the camera if deflection testing is performed with video inspection.

.3 Allowable deflection to be no greater than 0.15 times the pipe SDR as indicated in Table CW 2130.1. Deflection is expressed as a percent of the base inside diameter of the sewer pipe as defined in the ASTM standard to which the pipe is manufactured.

.4 Mandrel diameter will be checked with a go/no-go proving ring having an inside diameter equal to 2 times the specified Mandrel arm radius. Mandrels passing through the proving ring will not be allowed for deflection testing.

.5 Sewer pipe that does not allow the mandrel to pass will be considered to have failed deflection testing and is to be replaced or re-bedded as directed by the Contract Administrator.

Table CW 2130.1 Mandrel and Proving Ring Dimensions for SDR 35 PVC Pipe

Nominal Pipe Size (millimetres)	Mandrel Arm Radius (millimetres)	Mandrel Contact Length (millimetres)	Proving Ring Inside Diameter (millimetres)
250	115.70	200	231.40
300	137.46	250	274.92
375	168.17	300	336.34
450	205.41	350	410.82
525	242.03	450	484.12
600	272.03	500	544.06

3.23 Reinforced Concrete Pipe Three Edge Bearing Test

.1 The Contract Administrator will randomly select one pipe of each size and class from the pipe supplied for the sewer installation for a three-edge bearing testing in accordance with ASTM C 497. Deliver selected pipe to supplier and perform testing to ultimate failure in presence of

Contract Administrator.

3.24 Sewer Cleaning

.1 Clean sewers in accordance with CW 2140 if required before performing video inspection except for Clause 3.5.7.1, Sections 3.6, 3.7, 3.8 and Clause 3.9.6 and their associated payment clauses which do not apply to new sewer installations.

3.25 Video Inspection

.1 Perform video inspection of sewers in accordance with CW 2145 except for Sections 3.18, 3.19, 3.21 and 3.22 and their associated payment clauses which do not apply to sewer repairs and new sewer installations.

.2 Perform video inspection of catch basin leads longer than 15 metres in length or that extend from a sewer or manhole to a catch basin at a rear lot line, in a public lane, in a park area or in a parking lot.

3.26 Restoration

.1 Replace concrete pavement slabs, miscellaneous concrete slabs, curbs and asphalt pavement or overlays in accordance with CW3230, CW 3235, CW 3240 and CW 3410 as indicated in the Specifications and as directed by the Contract Administrator. Use “early opening” concrete in accordance with the CW 3310 as indicated in the Specifications and as directed by the Contract Administrator.

.2 Restore boulevards and grassed areas by sodding or seeding using imported topsoil in accordance with CW 3510 and CW 3520 as indicated in the Specifications and as directed by the Contract Administrator.

.3 Restore gravel surfaces in accordance with CW 3150 as indicated in the Specifications and as directed by the Contract Administrator.

4. MEASUREMENT AND PAYMENT

4.1 Sewer Installation

.1 Sewer installation will be measured for payment on a length basis for each size, type of pipe material, method of installation, type of bedding, type of backfill and depth and paid for at the Contract Unit Price per metre for the Items of Work listed below. Length to be paid for will be total number of linear metres supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Combined Sewers
Interceptor Sewers
Land Drainage Sewers
Storm Relief Sewers
Wastewater Sewers

.2 Measurement for length of sewer installed in a trench will be made horizontally at grade above the centreline of pipe through fittings from centre to centre of manholes.

.3 Measurement for length of sewer installed using trenchless methods will be made horizontally at grade above the centreline of pipe through shafts from centre to centre of manholes.

.4 Measurement for length of sewer installed using trenchless methods between sewers installed in a trench will be made horizontally at grade above the centreline of pipe from face to face of the trench excavation.

.5 Sewers specified to be installed using trenchless methods but were installed in a trench due to field conditions will be paid for at the Contract Unit Price per metre for trenchless installation.

.6 Depth classification for sewers installed in a trench will be from 0 to 4 metres then in 1.0 metre increments. No further subdivision will be made for depth. Depth will be the average depth between adjacent manholes measured from existing or proposed final grade to the lowest sewer invert. No depth classification will be made for sewers installed by trenchless methods.

.7 Connecting new sewers to new manholes will be included in sewer installation.

.8 Repair of damage to underground and surface structures due to surface subsidence and soil heaving caused by trenchless installation methods will be at own expense.

.9 Correction of alignment and grade exceeding the allowable variance will be at own expense.

.10 Replacement or re-bedding of sewers that do not allow the mandrel to pass will be at own expense.

4.2 Fitting Installation

.1 Supply and installation of sewer fittings and couplings will be included in sewer installation.

4.3 Manholes

.1 Manhole installation including frames, covers, rungs, risers, base and other accessories and appurtenances will be measured for payment on a vertical length basis for each manhole type and base size and paid for at the Contract Unit Price per vertical metre for the Items of Work listed below. Length to be paid for will be the total number of vertical metres of manhole supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:
Manhole
Manhole With Internal Drop Pipe
New Manhole on Existing Sewer
Remove and Replace Existing Manhole

.2 Measurement of manholes will be from the lowest sewer invert to the top of the finished rim elevation.

.3 Pipe, couplings and connections to existing sewer required to install a new manhole on an existing sewer will be included in manhole installation.

.4 Removal of existing manhole will be included with installation of new manhole.

.5 Internal pipe, fittings, couplings, anchors, spacers and fasteners will be included with installation of new manhole with internal drop pipe.

4.4 Catch Basins and Catch Pits

.1 Catch basin and catch pit installation including hoods, fittings, frame and cover and other accessories and appurtenances will be measured for payment on a unit basis for each type and paid for at the Contract Unit Price for the Items of Work listed below. Number of units to be paid for will be the total number of catch basins and catch pits supplied, installed and removed where required in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Catch Basin
Catch Pit
Remove and Replace Existing Catch Basin
Remove and Replace Existing Catch Pit

.2 Reconnection of up to 1.0 metre of catch basin lead measured from the outside of the catch basin, including lead pipe and couplings will be included in catch basin and catch pit installation.

4.5 Sewer Service Installation

.1 Sewer service installation will be measured for payment on a length basis for each size, type of backfill and method of installation and paid for at the Contract Unit Price per metre for “Sewer Services”. Length to be paid for will be the total number of linear metres of sewer service supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Measurement for length of sewer service installed in a trench will be made horizontally at grade, above the centreline of the sewer service through fittings from sewer centreline to termination point of sewer service.

.3 Measurement for length of sewer service installed using trenchless methods will be made horizontally at grade above the centreline of the sewer service through shafts from sewer centreline to termination point of the sewer service.

.4 Fittings for sewer services will be included in sewer service installation.

.5 Connection to saddle, tee or wye provided on sewer will be included in sewer service installation.

4.6 Drainage Connection Pipe Installation

.1 Drainage connection pipe installation will be measured for payment on a length basis and paid for at the Contract Unit Price per metre for “Drainage Connection Pipe”. Length to be paid for will be the total number of linear metres of drainage connection pipe supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Measurement for length of drainage connection pipe installed in a trench will be made horizontally at grade, above the centreline of the drainage connection pipe through fittings from the centreline of the inlet box or catch pit to the centreline of the catch basin.

.3 Fittings for drainage connection pipe will be included in drainage connection pipe installation.

4.7 Sewer Service Risers

.1 Sewer service riser installation will be measured for payment on a vertical length basis for each

type and size and paid for at the Contract Unit Price per metre for "Sewer Service Risers". Length to be paid for will be the total number of vertical metres of sewer service risers supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Measurement for vertical length of sewer service risers will be from the top of the sewer to the top of the sewer service pipe in accordance with SD-014 and SD-015.

.3 Fittings for sewer service risers will be included in sewer service riser installation.

4.8 Sewer Repairs

.1 Sewer repairs made by replacing up to 3.0 continuous metres in length will be measured for payment on a unit basis for each size and type of backfill and paid for at the Contract Unit Price for “Sewer Repair – Up to 3.0 Metres Long”. Number of units to be paid for will be the total number of sewer repairs up to 3.0 metres long supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Sewer repairs made by replacing additional pipe continuous to the first 3.0 metres of pipe will be measured for payment on a length basis for each size and type of backfill and paid for at the Contract Unit Price for “Sewer Repair – In Addition to First 3.0 metres”. Length to be paid for will be the total number of linear metres of sewer repair additional to the first 3.0 metre repair supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.3 Measurement will be made horizontally at grade above the centreline of pipe through fittings from connection to connection to existing sewer.

.4 Supply and installation of couplings and connections to existing sewer pipe will be included in sewer repairs.

.5 Repairs completed beyond limits confirmed with Contract Administrator will not be measured for payment.

.6 Video inspection required to confirm limits of sewer repair will be included in sewer repairs.

4.9 Existing Manhole and Catch Basin Repairs

.1 Replacing existing manhole and catch basin frames and covers will be measured for payment on a unit basis for each type and paid for at the Contract Unit Price for the Items of Work listed below. Number of units to be paid for will be the total number of manhole and catch basin frames and covers supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Replacing Standard Frames and Covers

i) AP-004 - Standard Frame for Manhole and Catch Basin
ii) AP-005 - Standard Solid Cover for Standard Frame
iii) AP-006 - Standard Grated Cover for Standard Frame
iv) AP-008 – Barrier Curb and Gutter Inlet Frame and Box
v) AP-009 – Barrier Curb and Gutter Inlet Cover
vi) AP-011 – Mountable Curb and Gutter Inlet

.2 Installing new or replacing existing flat top reducers will be measured for payment on a unit basis for each size and paid for at the Contract Unit Price for “Installing New Flat Top Reducer” or “Replacing Existing Flat Top Reducer”. Amount to be paid for will be the total number of flat top

reducers supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.3 Replacing existing manhole risers will be measured for payment on a vertical metre basis for each size and paid for at the Contract Unit Price for the Items of Work listed below. Length to be paid for will be the total number of vertical metres of risers supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Replacing Existing Risers

i) Pre-cast concrete risers
ii) Brick risers
iii) Cast-in-place concrete

.4 Patching the interior of existing manholes will be measured for payment on a vertical metre basis and paid for at the Contract Unit Price for "Patching Existing Manholes". Length to be paid for will be the total number of vertical metres patched in accordance with this specification, accepted and measured by the Contract Administrator.

.5 Re-pointing and replacing existing manhole brickwork will be measured for payment on a vertical metre basis and paid for at the Contract Unit Price for "Re-pointing Brickwork". Length to be paid for will be the total number of vertical metres of brickwork re-pointed in accordance with this specification, accepted and measured by the Contract Administrator.

.6 Replacing existing manhole rungs will be measured for payment on a unit basis and paid for at Contract Unit Price for "Replacing Existing Manhole or Catch Basin Rungs". Number of units to be paid for will be total number of manhole rungs supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.7 Replacing existing catch basin hood, pin or wall hook will be measured for payment on a unit basis and paid for at Contract Unit Price for "Replacing Existing Catch Basin Hoods, Pins or Wall Hooks". Number of units to be paid for will be total number of catch basin hoods, pins or wall hooks supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

4.10 Connecting New Sewers and Sewer Services to Existing Manholes, Catch Basins and Catch Pits

.1 Connecting new sewers and sewer services to existing manholes, catch basins and catch pits will be measured for payment on a unit basis for each size and type of connection and paid for at the Contract Unit Price for the Items of Work listed below. Number of units to be paid for will be the total number of connections supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work

Connecting to Existing Manhole
Connecting to Existing Catch Basin
Connecting to Existing Catch Pit
Connecting to Existing Inlet Box

4.11 Connecting New Sewer or Sewer Service to Existing Sewer

.1 Connecting new sewers and sewer services to existing sewers where no stub or fitting exists will be measured for payment on a unit basis for each size and type of new sewer or sewer service and each size and type of existing sewer and paid for at the Contract Unit Price for "Connecting to Existing Sewer". Number of units to be paid for will be total number of connections supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Supply and installation of sewer pipe, couplings, tees and saddles will be included with the sewer connection.

4.12 Connecting to Existing Sewer or Sewer Service Stubs

.1 Connecting to existing sewer or sewer service stubs will be included with the sewer or sewer service installation.

4.13 Connecting Existing Sewer Service to New Sewer

.1 Connecting existing sewer services to new sewers will be measured for payment on a unit basis for each size and paid for at the Contract Unit Price for "Connecting Existing Sewer Service to New Sewer". Number of units to be paid for will be the total number of connections supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Supply and installation of fittings will be included in the sewer service connection.

.3 Supply and installation of sewer service risers will be measured and paid for in accordance with Section 4.7.

.4 Supply and installation of sewer service pipe will be measured and paid for in accordance with Section 4.5.

.5 Supply and installation of up to 1.0 metre of new sewer service pipe measured horizontally at grade above the centreline of the sewer service pipe from the outside of the new sewer main will be included with the connection of existing sewer services to a new sewer renewed on-line.

4.14 Plugging and Abandoning Existing Sewers and Sewer Services

.1 Cutting off and plugging existing sewers and sewer services smaller than 300 millimetres in diameter will be measured for payment on a unit basis for each size and paid for at the Contract Unit Price for "Plugging Existing Sewers and Sewer Services Smaller Than 300 Millimetres". Number of units to be paid for will be the total number of sewers and sewer services plugged in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Abandoning existing sewers larger than 300 millimetres in diameter with cement-stabilized flowable fill will be measured for payment on a volume basis and paid for at the Contract Unit Price for "Abandoning Existing Sewers With Cement-Stabilized Flowable Fill". Volume to be paid for will be the total number of cubic metres of sewer abandoned in accordance with this specification, accepted and measured by the Contract Administrator.

.3 Volume of cement-stabilized flowable fill used will be calculated based on the inside diameter and length of the sewer abandoned.

.4 Abandoning existing sewer services under pavement with flowable fill will be measured for payment on a unit basis for each size and paid for at Contract Unit Price for "Abandoning Existing Sewer Services Under Pavement". Number of units to be paid for will be the total number of sewer services abandoned in accordance with this specification, accepted and measured by the Contract Administrator.

4.15 Abandoning, Relocation and Removal of Existing Manholes, Catch Basins, Catch Pits and Drainage Inlets

.1 Abandoning of existing manholes, catch basins and catch pits will be measured for payment on a unit basis and paid for at the Contract Unit Price for "Abandoning Existing Manholes, Catch Basins and Catch Pits". Number of units to be paid for will be the total number of manholes, catch basins and catch pits abandoned in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Abandoning of existing drainage inlets and inlet boxes will be measured for payment on a unit basis and paid for at the Contract Unit Price for "Abandoning Existing Drainage Inlets", Number of units to be paid for will be the total number of drainage inlets abandoned in accordance with this specification, accepted and measured by the Contract Administrator.

.3 Removal of existing manholes, catch basins and catch pits that will not be replaced at the same location will be measured for payment on a unit basis and paid for at the Contract Unit Price for "Removal of Existing Manholes, Catch Basins or Catch Pits". Number of units to be paid for will be the total number of manholes, catch basins and catch pits removed in accordance with this specification, accepted and measured by the Contract Administrator.

.4 Removal of existing manholes, catch basins, catch pits and curb inlets that will be replaced by a new manhole, catch basin or catch pit at the same location will be included with manhole, catch basin or catch pit installation.

.5 Relocation of existing manholes, catch basins and catch pits will be measured for payment on a unit basis for each size and type and paid for at Contract Unit Price for "Relocation of Existing Manholes, Catch Basins and Catch Pits". Number of units to be paid for will be the total number of manholes, catch basins and catch pits relocated in accordance with this specification, accepted and measured by the Contract Administrator.

4.16 Maintaining Existing Sewer Flow

.1 Maintaining existing sewer flow and will be included with type of sewer work being done.

4.17 Sewer Cleaning

.1 Cleaning of new sewers will be included with sewer installation.

4.18 Video Inspection

.1 Video inspection will be measured and paid for in accordance with CW 2145 except Section 4.6 and 4.7 will not apply to new sewer installations.

4.19 Deflection Testing of SDR 35 PVC Sewers

.1 Deflection testing of SDR 35 PVC sewers will be included with sewer installation.

4.20 Concrete Pipe Three Edge Bearing Test

.1 Concrete pipe three edge bearing test will be measured for payment on a unit basis for each size and type of pipe and paid for at the Contract Unit Price for "Concrete Pipe Three-Edge Bearing Test". Number of units to be paid for will be the total number of pipes tested in accordance with this specification, accepted and measured by the Contract Administrator.

4.21 Pavement Restoration

.1 Renewal of existing concrete pavement slabs will be measured on a surface area basis per square metre in accordance with CW 3230. No separate measurement or payment will be made for Drilled Dowels or Tie Bars, the cost for which shall be included in the prices bid for the renewal of the concrete pavement.

.2 Removal and replacement of existing miscellaneous concrete slabs, curbs and asphalt pavement or overlays will be measured for payment in accordance with CW 3235, CW 3240 and CW 3410.

4.22 Boulevard Restoration

.1 Restoration of boulevards and grassed areas disturbed by construction activities will be included with the sewer work being done.

.2 Restoration of boulevard and grassed areas beyond the limits of construction as directed by the Contract Administrator will be measured for payment in accordance with CW 3510 and CW 3520.