

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for feeder mains including the preparation of the pipe bed, supply of bedding materials and placement of all pipe and accessories including fittings, pre-cast air valve and drain chamber, as specified or shown on the Drawings.
- .2 Materials and installation for water mains.

1.2 RELATED SECTIONS

- .1 Section 01 11 00 – Summary of Work
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.3 METHOD MEASUREMENT AND BASIS OF PAYMENT

- .1 Supply and Installation of Feedermain
 - .1 Supply and Installation of Feedermain outside of chambers shall be measured and paid on a length basis. The length to be paid for shall be the total number of lineal metres acceptably installed as to each size, class, type of backfill and method of installation listed at the Contract Unit Price for “Main Line Piping – Supply and Install.” Measurement shall be made horizontally, at grade, above the centreline of the pipe, through all fittings and appurtenances, as computed by measurements made by the Contract Administrator, including all accessories, appurtenances. Measurement will be from the connection points on the existing Feeder mains to 1.0 metres outside all chambers.
 - .2 Supply and Installation of Fittings and Specials shall be made on a unit basis. The units measured and paid shall be the total number of fittings and specials installed, of each size, class and type, at the Contract Unit Price for “Supply and Install Fittings and Specials”, and shall include all couplers .
- .2 Supply and Installation of Owner Supplied Equipment
 - .1 Supply and Installation of all Owner supplied Equipment as listed in Specification 01 11 00 will be measured and paid on a Lump Sum basis. Price paid shall include pickup, delivery and installation, supply of all gaskets, bolts and mounting hardware
- .3 Supply and Installation of Small diameter (150 mm and less) Piping, fittings and Appurtenances
 - .1 Supply and installation of small diameter chamber piping, including building subdrains, pipe drains, blow-offs and building drains will be measured on a lump sum basis, and shall include all pipe, valves, fittings and connectors acceptably installed in accordance to the Drawings and Specifications.
- .4 Connection to Existing Feeder mains
 - .1 Connections to Existing Feeder mains will be measured and paid on a unit basis. The price paid for the connection shall be the total number of connections made,

in accordance with this specification and shall include all excavations, backfill, removal of existing pipes, patching of concrete where required and provision of new pipe gaskets at the Contract Unit Price for "Connect to Existing Feeder mains."

.5 Trench Insulation

- .1 Trench insulation will be measured on a length basis and paid for at the Contract Unit Price for "Trench Insulation." Length to be paid for will be the total length of trench insulation supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- .2 Measurement of trench insulation will be made horizontally at grade along the centreline of the insulation.

.6 Pressure Testing and Disinfection

- .1 Testing and disinfection of Feeder mains will be measured and paid on a unit basis and paid at the Contract Unit Price for "Pressure Test and Disinfection". The price paid shall include all main cleaning, bulkheads, temporary bracing and removal, supply and disposal of water for testing, and testing successfully completed in accordance with this specification.

.7 Demolition, Removal of Existing Feeder main Pipe and Fittings

- .1 Demolition and Removal of pipe shall be measured on a length basis, and paid at the Contract Unit Price for "Removal of Existing Feeder main Pipes". The length to be paid shall be the total number of lineal metres of pipe removed and disposed of off-site or demolished and removed from site in accordance with this Specification, accepted and measured by the Contract Administrator. Exact limits of removal of pipe are unknown at this time and limits will be as directed by the Consultant at a later date.

.8 Abandonment of Existing Feeder main Pipe with Cement Stabilized Flowable Fill

- .1 Abandonment of pipes with cement stabilized flowable fill shall be made on a volume basis, and paid for at the Contract Unit Price for "Abandonment of Pipes with Cement Stabilized Flowable Fill". The volume to be paid shall be the total number of cubic metres of pipe filled in accordance with this Specification, accepted and measured by the Contract Administrator. No measurement will be made for fill placed outside contract limits, blow-out of temporary bulkheads or other waste. Exact limits of abandonment of pipe with flowable fill are unknown at this time and limits will be as directed by the Consultant at a later date.

1.4 REFERENCES

.1 City of Winnipeg Standard Construction Specifications

- .1 CW 1110, General Instructions.
- .2 CW 2030, Excavation Bedding and Backfill.
- .3 CW 2110, Water mains.
- .4 CW 2125, Flushing, Hydrostatic Leakage Testing and Disinfection of Water mains and Water Systems.
- .5 CW 2130, Gravity Sewers

- .6 CW 2160, Concrete Underground Structures and Works.
- .7 Division 3 Approved Products for Underground Works
- .8 Division 3 Standard Details – Underground Works
- .2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA B300, Hypochlorites.
 - .2 ANSI/AWWA B301, Liquid Chlorine.
 - .3 ANSI/AWWA B303, Sodium Chlorite.
 - .4 ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - .5 ANSI/AWWA C110/A21.10, Ductile-Iron and Gray Iron Fittings, 3 inch through 48 inch (75 mm through 1200 mm), for Water
 - .6 ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - .7 ANSI/AWWA C200, Steel Water Pipe - 6 in (150 mm) and Larger.
 - .8 ANSI/AWWA C205, Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 Inch (100 mm) and Larger - Shop Applied.
 - .9 ANSI/AWWA C207, Steel Pipe Flanges for Waterworks Service Sizes 4 Inch through 144 Inch (100 mm through 3,600 mm)
 - .10 ANSI/AWWA C208, Dimensions for Fabricated Steel Water Pipe Fittings.
 - .11 ANSI/AWWA C210, Standard for Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
 - .12 ANSI/AWWA C213, AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
 - .13 ANSI/AWWA C301, Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
 - .14 ANSI/AWWA C304, Design of Prestressed Concrete Cylinder Pipe.
 - .15 ANSI/AWWA C651, Disinfecting Water Mains.
 - .16 ANSI/AWWA C905, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 14 Inch through 48 Inch (350 mm – 1,200 mm), for Water Transmission and Distribution.
- .3 National Sanitation Foundation, (NSF)
 - .1 ANSI/NSF 61, Drinking Water System Components – Health Effects
- .4 American Society of Mechanical Engineers (ASME)
 - .1 ASME/ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
 - .2 ASME/ANSI B16.5, Pipe Flanges and Flanged Fittings.
 - .3 ASME/ANSI B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings
- .5 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
 - .2 ASTM A276, Standard Specification for Stainless Steel Bars and Shapes.
 - .3 ASTM B43 Standard Specification for Seamless Red Brass Pipe, Standard Sizes

- .4 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .5 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- .6 ASTM C76, ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- .7 ASTM C117, Standard Test Method for Material Finer Than 75 [MU] m (No. 200) Sieve in Mineral Aggregates by Washing.
- .8 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .9 ASTM C311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
- .10 ASTM C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
- .11 ASTM C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .12 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m³)).
- .13 ASTM D6226, Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
- .6 American Water Works Association (AWWA)/Manual of Practice
 - .1 AWWA M9, Concrete Pressure Pipe.
 - .2 AWWA M11, Steel Pipe - A Guide for Design and Installation.
- .7 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A257 Series, Standards for Concrete Pipe.
 - .2 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).
 - .1 CAN/CSA-A8, Masonry Cement.
 - .3 CSA B137 Series, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
 - .1 CSA B137.3, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
 - .4 CAN/CSA-S6-00, Canadian Highway Bridge Design Code.
- .8 Underwriter' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-97, Standard For Thermal Insulation, Polystyrene, Boards and Pipe Covering
- .9 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .10 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

- .11 Submit complete shop drawings and construction schedule for feeder mains. Include method for installation..
- .12 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 PIPE, JOINTS AND FITTINGS

- .1 Prestressed Concrete Pressure Pipe conforming to AWWA C301
 - .1 Acceptable Manufacturers
 - .1 Hanson Pressure Pipe (Stouffville, Ont. or St. Eustache, PQ Plants)
 - .2 Munro Concrete Products (Utopia, Ont)
 - .2 Materials
 - .1 Cement
 - .1 Portland Cement shall be CSA A3000 Type HS Sulphate Resistant Cement.
 - .2 External mortar coating shall contain 10 percent silica fume by weight of cement.
 - .3 Approval in writing is required if the Contractor proposed to use fly ash or pozzolan as a supplementary cementing material in conformance with AWWA C301, Section 4.4.1.
 - .4 Approval requests should be accompanied by a submission from an independent testing laboratory complete with sampling and testing results of the material conforming to ASTM Standard C311.
 - .2 Bell and Spigot Joint Rings
 - .1 Where indicated on the drawings, restrained joints shall be harnessed clamp joints.
 - .2 Double gasket joints will be used for all new pipe joints. Existing joint 'O' ring size is unknown and to be determined by the Contractor.
 - .3 Fittings
 - .1 Fittings shall be manufactured using minimum steel thicknesses specified in Table 1, Section 4.7 of AWWA C301-99.
 - .2 Flanges for fittings shall be AWWA C207-01 minimum Class D Flanges.
 - .3 Pipe sections passing through chamber walls shall be manufactured with a minimum 12 mm thick by 75 mm wide water stop located at the midpoint of the chamber walls.
 - .3 Closures
 - .1 Buried pipe closures shall be bolted sleeve couplers.
 - .2 The plain steel end of each closure piece shall extend 150 mm longer than the required length of the piece to provide an overlap

- in order to compensate for any correction required when installed.
- .3 The Contractor shall be responsible for any interior and/or exterior mortar coating damage.
 - .4 The closure section location will be left to the Contractor, subject to the approval of the Contract Administrator, to best suit proposed installation sequencing.
- .4 Design Requirements
- .1 Pipe Design
 - .1 The Contractor shall submit details of the pipe design for approval of the Contract Administrator prior to manufacture. Where pipe runs contains more than one pipe class, pipe marking system shall clearly indicate different pipe classes.
 - .2 All pipe and fittings shall be designed and constructed to withstand maximum design working pressure of 275 kilopascals, plus the greater of forty percent transient allowance or 275 kPa, a test pressure of 1.25 times working pressure, and all external pressures caused by overburden, traffic or other loads to which the pipe might be subjected, all in accordance with the applicable requirements of AWWA Standard C301 and C304.
 - .3 Trench loadings shall be calculated and based on a Positive Projecting Embankment Loading, a soil weight of 2160 kilograms per cubic metre, AWWA Design Manual R4 90 degree bedding, earth cover as indicated on the drawings (minimum earth cover of 2750 millimetres) and a $K_u = K_u' = 0.165$ (trench condition) in Marston's formula. An additional 0.5 metre berm allowance shall be added to the depth of cover indicated above to allow for future site regrading.
 - .4 Live loading under roadways shall allow for CAN/CSA-S6-00 CL-625 highway loading.
 - .5 The steel cylinder shall be a minimum of 1.6 millimetre thickness (No. 16 gauge)
 - .6 Mortar coating shall be a minimum of 24 millimetres thick measured from the outside of the high tensile wire.
 - .2 Pipe Length
 - .1 Standard pipe lengths shall be used, except where special lengths are required by an approved laying schedule.
 - .2 In addition to the requirements noted in Section 4.5 of AWWA C301-07, the overall length of pipe measured from the end of the spigot to the seat of the bell at any point around the circumference shall not vary more than 3 millimetres +/-.
 - .3 The Contractor shall accurately measure and confirm pipe bell and spigot tolerances, and ensure pipe mating, prior to shipping pipe. The Contractor shall provide a written report of pipe bell and spigot measurements.

- .3 Laying Schedule
 - .1 Where indicated, pipe laying schedule shall incorporate a short pipe length of approximately 1.5 times the diameter, immediately outside of chamber piping.
 - .2 Minor adjustments to pipe design plans to suit standard pipe lengths, may be allowed on approval of the Contract Administrator.
 - .3 Pipe closures shall be field measured prior to fabrication.
 - .4 Laying schedule shall incorporate sufficient person access points to safely facilitate pipe access for joint grouting and inspection.
- .4 Fitting Design
 - .1 Fittings shall be designed to accommodate the horizontal and vertical deflections shown on the Drawings. Where combination horizontal and vertical bends are used, fitting orientation shall be clearly marked on the fitting to aide in installed alignment.
- .5 Pipe Marking
 - .1 Each section of pipe and each fitting shall be plainly marked with a waterproof marking material both inside, on the bell or spigot end, and outside, at the pipe's midspan, the classification, the date of manufacture and marks of identification sufficient to show its proper location in the line by the reference to the laying schedule specified. The point of maximum bevel shall be marked on the end of the spigot on each piece of bevelled pipe. All bends shall be marked on the ends with the angle of deflection. The manufacturer's proposed marking system shall be included with the "Submittals" in 2.1.1.6. Colour coded markings shall be required when there is more than one pipe classification.
- .6 Submittals
 - .1 General
 - .1 Sufficient numbers of copies of all drawings and laying schedules as specified in Specification CW 1110, Clause 1.5, shall show full details of reinforcement, concrete and joint dimensions for the straight pipe, specials and connections and shall be furnished by the Contractor for the review by the Contract Administrator. No pipe shall be manufactured until the drawings have been entirely approved.
 - .2 The data submitted by the Contractor shall include a tabulated laying schedule with reference to the stationing and grade lines shown on the Drawings. This schedule shall show the locations and length of each class of pipe which the Contractor proposes to furnish, and the point of change from one class to the next shall be clearly indicated by station number. The area of steel per linear metre and such other details as are required shall be listed for each of the pipe classes proposed by the Contractor.

- .3 The Contractor shall be responsible for the accurate details, fabrication and fit of the pipe and specials.
 - .4 The Contractor shall submit to the Contract Administrator for review, design calculations for the determination of the details of the pipe reinforcement prior to the manufacture of any pipe. The manufacturer of the pipe shall have sufficient data to verify all design strengths. Design details to be stamped by a Professional Engineer, registered in the Province of Manitoba.
 - .5 The Contractor shall provide complete Record Drawings for the pipe, including revised laying schedules, closure lengths for field trimmed pieces or other modifications required for the pipe installation.
- .7 Quality Control
- .1 Inspection
 - .1 The Contractor shall afford the Contract Administrator every facility to access and inspect all plant to be provided, work to be performed, materials to be supplied and equipment or machinery to be installed in accordance with the provisions of AWWA C301 Section 5.1.
 - .2 Testing of Pipe and Materials
 - .1 The Contractor shall provide access to the Contract Administrator or his appointed representative to conduct plant inspections, in accordance to Section 5.1 of AWWA C301-07. The Contractor shall provide a minimum of 7 calendar days notice of commencement of pipe manufacture, for the purposes of scheduling plant inspections.
 - .2 The Contract Administrator reserves the right to conduct third party quality control testing.
 - .3 The Contractor shall make, conduct, arrange, make available, obtain and provide for all testing as described in Section 5.2 AWWA Standard C301-07. The following reports shall be made available to the Contract Administrator on request:
 - .4 Absorption tests shall be carried out by the Contractor on specimens of the exterior coating of the pipe. These tests shall be carried out in accordance with ASTM Standard C497 Method of Testing Concrete Pipe, Sections or Tile, method A.
 - .1 Notwithstanding AWWA C301-07 4.6.8.3, no individual absorption test may exceed 10%.
 - .2 Notwithstanding AWWA C301-07 4.6.8.3, mortar tests shall be conducted on a daily basis for the entire production run.

- .3 Every effort shall be taken to limit this absorption to 8% as measured in accordance with the ASTM Standard C497. Pipe with an absorption rate in excess of 10% will not be accepted. No pipe shall be shipped until the absorption results related to the particular shipment have been provided to the Contract Administrator, and are satisfactory.
- .3 Testing of Fittings and Special Pipe
 - .1 Fittings and special pipe shall be tested in the same manner as pipe except that fittings and special pipe shall be tested for tightness by the dye penetrant method as specified in Section 4.7.2.22 of AWWA Standard C301-99.
- .4 Quality Control Report
 - .1 The Contractor shall provide a complete quality control report, compiling all project quality control records, including steel tests, concrete compressive tests, mortar absorption tests, cylinder pressure tests, coating thickness tests, bell and spigot ring dimensional records and any other quality control records normally documented during the manufacture process. Where possible, quality records shall cross reference manufacture by date, and/or pipe serial or mark numbers.
- .5 Affidavit of Compliance
 - .1 An affidavit of compliance signed by an officer of the pipe manufacturing company shall be provided stating that the pipe and fittings comply with this Specification, in accordance with Section 6.3 of AWWA C301-99.
- .8 Delivery of Pipe
 - .1 Contractor is required to coordinate manufacture and delivery of the pipe with his sub-contractor (the manufacturer) and to meet project scheduling requirements.
 - .2 Delivery of the pipe shall be in accordance with AWWA M9 Manual – Concrete Pressure Pipe.

2.2

PIPE COUPLERS

- .1 Pipe couplers for pipe connections for AWWA C301 PCCP and AWWA C905 piping shall be to the latest revision of AWWA C219 for Bolted, Sleeve-Type Couplers for Plain-End Pipe. Minimum requirements are:
 - .1 Minimum sleeve length 250 mm
 - .2 Minimum centre sleeve thickness 10 mm
 - .3 Couplings capable of accommodating up to 2 degrees deflection
 - .4 Bolts and nuts to be 316 Stainless Steel
 - .5 Design pressure 150 psi
 - .6 Restrained couplers shall be provided where indicated on the Drawings

- .2 Couplings to be fusion bonded epoxy coated to AWWA C213, and meeting the requirements of ANSI/NSF 61 “Standard for Drinking Water System Components - Health Effects”.
- .3 Buried pipe couplers and flange connections for PVC pipe shall be protected against corrosion by wrapping with Denso Tape system, consisting of Denso Profiling Mastic, Denso Paste and Densyl Tape, or approved equal in accordance with B6 to AWWA C217.
- .4 Buried pipe closures for AWWA C301 pipe shall be encased in a minimum 75 mm thick concrete grout coating.
- .5 Couplings to be supplied with di-electric insulating boots where connecting to metal pipe.

2.3 PAINT

- .1 Paint for exposed metal surfaces shall be in accordance with AWWA C210.
- .2 Interior coatings shall comply with ANSI/NSF 61 “Drinking Water System Components – Health Effects”
- .3 Coating shall be two (2) or more layers (5 mils minimum each coat) Polyamide Epoxy, Amerlock 400, Tnemec Series 140 F Pota-Pox Plus or approved equal.

2.4 PIPE INSULATION

- .1 Rigid Insulation
 - .1 Rigid insulation for below grade applications shall be rigid polystyrene insulation conforming to CAN/ULC S701 Type 4, Styrofoam HI40 by Dow Chemical, Foamular 400 by Owens Corning, or approved equal .
- .2 Spray Applied Polyurethane Foam Insulation
 - .1 Polyurethane foam shall be closed cell, less than 1% open cell content to ASTM D-6226.
 - .2 BASF Wallite CT (Cold temperature grade) or approved equal.

2.5 VALVE CHAMBER PIPING

- .1 Materials
 - .1 Pipe
 - .1 Steel Pipe conforming to AWWA C200
 - .1 Minimum steel yield strength of 307 MPa (30,000 psi)
 - .2 Minimum wall thickness of 9.5 millimetres
 - .3 Paint for exposed steel surfaces shall be in accordance with AWWA C210
 - .4 Interior coatings - cement lining
 - .5 External Coating shall be two (2) or more layers (5 mils minimum each coat) Polyamide Epoxy, Amerlock 400, Tnemec Series 140 F Pota-Pox Plus or approved equal.
 - .2 Ductile Iron Pipe conforming to AWWA C151
 - .1 100 mm Interior drain piping - Class 54
 - .2 Cement Lined as per AWWA C104

- .3 Threaded flange fittings
- .3 Prestressed Concrete Cylinder Pipe conforming to AWWA C301
- .4 Air Release Piping
 - .1 50 mm Polyethylene pipe and fittings, DR11 PE 4710
 - .2 Curb Stop and Box as per City of Winnipeg Approved Products except;
 - .1 Compression fittings c/w serrated retaining clamp
 - .2 Stainless Steel inserts to be used on all compression connections.
- .2 Chamber Fittings
 - .1 Prestressed Concrete Cylinder Pipe conforming to AWWA C301
- .3 Bolts
 - .1 Bolts shall be ASTM A307 grade B. Bolt size, type and diameter shall be in accordance to AWWA C207. Bolt length shall be sufficient to accommodate flanges, gaskets and insulators.
 - .2 Flange insulator kits shall be Advance Products and Systems or approved equal, including full faced gasket, hole sleeves and washers.
- .4 Flange Gaskets
 - .1 Flange gaskets shall be 3 millimetre in thickness, full faced SBR rubber gaskets or neoprene in accordance with AWWA C207. Gaskets shall be one piece construction where possible. Segmented gaskets shall be constructed of a minimum number of segments and joints be of dovetailed construction or other jointing methods approved by the Contract Administrator.
- .5 Blind Flanges
 - .1 Steel flanges shall be AWWA C207 Class D.
 - .2 Cast and ductile flanges shall be ASME/ANSI B16.1 Class 125.
- .6 Small Diameter Valves
 - .1 Small diameter threaded ball valves (75mm diameter and less) shall be all cast bronze two-piece type with chromium plated ball complete with lever handle rated for minimum 1.0 MPa non-shock cold water service. Bronze material shall conform to ASTM B62. Acceptable product; Apollo, Red-White, Kitz or approved equal
 - .2 Ball valves 100 mm and larger shall be cast iron ball valves complete with Stainless Steel ball, ASME B16.1 CLASS 125 flanges and stem, Kitz #90 or Approved Equal in accordance with B6.
- .7 Butterfly Valves (150 mm and less)
 - .1 Ductile Iron butterfly AWWA C504, Class 150B, resilient seat, complete with 316 Stainless Steel disc, shaft and hardware.
 - .2 Quarter turn handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel. Latch plate and mounting hardware: cadmium plated carbon steel.
 - .3 Paint as per Clause 2.3.

- .8 Threaded Piping, Fittings and Flanges
 - .1 Small diameter brass threaded piping, fittings and flanges (75 millimetre diameter or less) shall be cast red brass conforming to ASTM B43 or cast bronze conforming to ASTM B62. Flange dimension and drilling shall be in accordance with ASME/ANSI B16.24 – 150#.
 - .2 Small diameter steel threaded fittings and flanges (75 millimetre diameter or less) shall be in accordance with ASME/ANSI B16.5 – Class 150.
 - .3 Small diameter steel pipe nipples shall be Schedule 80 steel.
- .9 Pipe Supports and Hangers
 - .1 Provide 316 stainless steel pipe hangers and supports for small diameter piping.
- .2 Design
 - .1 All pipe and fittings shall be designed for an operating pressure of 700 kPa (100 psi) and a test pressure of 1000 kPa (150 psi).
- .3 Submittals
 - .1 Submit shop drawings and data sheets for all valves and pipe specials.
 - .2 Submit layout drawings for all chamber pipe.

2.6 INTERNAL COMPRESSION SEALS

- .1 Acceptable Manufacturers
 - .1 WEKO SEAL as manufactured by Miller Pipeline Corp. of Indianapolis, Indiana.
- .2 Certification
 - .1 The WEKO SEAL and all components therein shall be certified ANSI/NSF Standard 61 "Drinking Water System Components - Health Effects".
- .3 Materials
 - .1 EPDM Rubber Material
 - .1 EPDM Rubber Derivative Membrane for use as joint liner material shall be manufactured in compliance with ASTM-D3900, D3568 and shall have designation M4AA710A13B13C12Z1Z2Z3 in accordance with ASTM-D2000.
 - .2 The EPDM rubber material shall be 366mm in width for all seals.
 - .3 The EPDM Rubber Membrane shall be individually sealed in plastic bags and packaged in a manner that will not damage or deform them in transit or storage.
 - .2 Stainless Steel Bands, Shims, and Set Screws
 - .1 Stainless steel bands, spacers, shims, and set screws for securing rubber membrane across piping joints shall be Type 303, 304, 316 or Maunell as manufactured in accordance with ASTM-A240-83.

Part 3 Execution

3.1 EXCAVATION

- .1 Excavation shall be in accordance with Specification CW 2030, "Excavation, Bedding and Backfill." Over-excavated material shall be replaced with compacted, well-graded crushed limestone having a maximum aggregate size of 20 mm, conforming to CW 2030 Type 2 granular material.

3.2 PIPE INSTALLATION – AWWA C301 Pipe

- .1 Installation of Pipe in a Trench
 - .1 The pipe shall be laid and fitted together so that when complete, the pipe will have a smooth and uniform invert. The trench shall be free of water while the pipe is being installed. The excavation of the trench shall be fully compacted a sufficient distance in advance so as not to interfere with the laying of the pipe.
 - .2 All pipe shall be installed on a 150 millimetre thick bed of sand placed in the bottom of the trench prior to the installation of the pipe in accordance with AWWA M9 Manual, Type R5 Bedding. The sand bedding shall be levelled such that it forms a continuous solid bedding for the full length of the pipe except at the midpoint of each pipe to facilitate the removal of the sling after the pipe has been laid. Another groove shall be provided at each joint to facilitate placing of a "diaper" band around the joint. Both grooves shall be filled with compacted sand after the removal of the sling and after placing of the diaper band.
 - .3 Compacted sand backfill shall be placed above the pipe to a depth of 200 millimetres above the top of the pipe, for the full trench width. Backfill shall be compacted to 90% SPMDD. The Contractor shall ensure that disturbance of the pipe or damage to the pipe coating does not occur during sand bedding and backfilling operations.
 - .4 The exposed end of the pipe shall be fully protected with an approved stopper to prevent foreign matter from entering the pipe. The interior of the pipe shall be kept free of all dirt, concrete or superfluous material as the Work proceeds.
 - .5 Pipe shall be installed utilizing trench methods except where coring is required as shown on the Drawings.
- .2 Jointing
 - .1 Immediately prior to connecting two lengths of pipe, the spigot end of the pipe shall be thoroughly cleaned. Prior to insertion of the rubber gasket in the spigot groove, the spigot groove shall be lubricated with vegetable soap. The gasket shall then be thoroughly cleaned and then lubricated with a vegetable soap approved by the pipe manufacturer, the consistency of which shall be approximately that of soft No. 2 cup grease. In stretching the gasket, care shall be exercised to maintain a uniform tension or volume of rubber around the whole circumference of the spigot. The bell of the pipe already in place shall be carefully cleaned and lubricated with vegetable soap.
 - .2 The spigot shall then be pushed into the bell and against steel inserts placed between the top of the spigot and the shoulder of the bell to provide a space for inserting the feeler gauge. The entire circumference of the joint shall be gauged to determine that the rubber gasket is in its proper position. If the gasket cannot be felt all around the pipe, the pipe shall be withdrawn and the gasket examined

for cuts. If the gasket is undamaged it may be reused, but only after the bell ring and gasket have been lubricated with soap again, as previously specified, before the pipe is re-laid. When it has been determined that the gasket is in its proper position, the steel inserts shall be removed and the pipe pushed completely "home."

- .3 Diaper bands to hold grout in place shall be used according to the manufacturer's instructions. Immediately before pouring cement grout, the entire joint shall be thoroughly wetted. A cement grout of one part Sulphate-Resistant cement to two parts sand shall be poured between the diaper and the pipe, to ensure a thorough sealing of the joint around the portion of the pipe covered by the band. Silt, slush, water or polluted mortar grout shall be carefully forced out by the pouring and removed. The upper portion of the joint shall then be filled with mortar and a bead made around the outside of the top half of the pipe joint with a sufficient amount of additional mortar. The completed joints shall immediately be protected from the air, sun or cold with proper coverings and shall be kept protected for such a period as necessary to secure satisfactory curing of the mortar. No backfilling around joints shall be done until the joints have been fully inspected and approved.
- .4 The inside joint recess of the concrete pipe, sizes 600 millimetres and larger, shall be completely filled with mortar made from one part cement and one part sand so as to provide a smooth continuous flush surface across the joint. The Contractor shall comply with all requirements and regulations of the Workplace, Safety and Health Division concerning air supply for workers performing operations inside the pipe and any associated costs shall be considered incidental to the installation.
- .5 Delay grouting and diapering of short pipe joints immediately outside of chambers, until completion of construction and partial backfill of chamber, to allow maximum differential deflection and settlement prior to final backfill.
- .6 For joints to be pushed into position by trenchless methods substitute diaper band by filling the joint with Flex-Protex prior to pushing the pipes together. When the pipes are pushed completely "home" Flex-Protex shall completely fill the gap between the joints.

.3 Steel Split Ring Closures

- .1 Buried pipe closures shall be accurately measured, cut and installed. Welded Split Sleeve closures shall be installed as recommended by the manufacturer.
- .2 Completed field welds shall be inspected by a certified welding inspector, using magna-flux methods or other methods approved by the Contract Administrator. A detailed inspection report including test data shall be submitted to the Contract Administrator within 5 Business Days of completion of testing. Pipe closures shall be encased in a minimum of 75mm thick grout coating. Ensure encasement of all pipe and coupler components.

.4 Connections to Chamber Piping

- .1 For AWWA C301 pipe connection to dissimilar chamber piping, connections shall be made by means of a steel sleeve type coupling. Pipe coupling to be protected from corrosion by Denso tape system and be supplied with two dielectric insulating boots.

3.3 TRENCH INSULATION

- .1 Insulate trenches to City of Winnipeg Standard Detail SD-018 where noted on the Drawings.

3.4 FROST CONDITIONS

- .1 No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Contract Administrator shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation. Every precaution must be taken to prevent frost from penetrating the ground to depths below the foundations during construction. Any pipe which, in the opinion of the Contract Administrator, shall have been injured through neglect of this provision of the specifications, shall be removed and made good by the Contractor and at the Contractor's expense.
- .2 Heating of the pipe, sand, mortar and gaskets shall commence when the ambient temperature falls below -5 C. The pipe shall be heated throughout with a low heat immediately prior to installation (warm to the touch).
- .3 All mortar for joints shall be heated, and heated sand shall be placed around the pipe for the full height of the specified bedding and initial backfill and to at least 600 millimetres on either side of the joint, all to the satisfaction of the Contract Administrator.

3.5 CONNECTION TO EXISTING PIPES

- .1 Connections to existing pipes shall be made at the locations shown on the Drawings.
- .2 Connections between the existing prestressed concrete cylinder pipe and new prestressed concrete cylinder pipe shall be made by means of bell and spigot joints. The Contractor shall provide new pipe gaskets for these connections.
- .3 Connections between existing reinforced concrete pressure pipe shall be made by means of a concrete collar as indicated on the drawings.
- .4 Neatly cut existing reinforced concrete pressure pipes square and true. Coat exposed reinforcing steel with potable epoxy bonding agent.
- .5 All pipe joints included in connection sections shall be exposed after recommissioning to inspect for leakage.

3.6 INSTALLATION OF INTERNAL COMPRESSION SEALS

- .1 Pipeline Preparation
 - .1 Remove deleterious deposits from the pipe walls by hand brushing. Power tools may be required to remove deposits and stubborn or hard scale lamination in the joint area. Whatever method is adopted, the pipe must be as clean as reasonably possible to provide a reasonable working environment for the operators.
- .2 Joint Filling
 - .1 During pipe cleaning operations the gaps between the joints must be cleared of dust and debris leaving a clean area for "joint filling". The joints are filled to the

full depth of the gap and rendered flush with the internal surface of the pipe. The filling material is a quick-setting cement mortar which is mixed as required in the pipe. All surplus material spillage should be removed from the joint area prior to the surface preparation of the seal area.

.3 Surface Preparation of Joint Area

- .1 The area of pipe either side of the joint where the actual "lip seals" make contact with the pipe must be prepared to a finish which will allow the "lip seals" to interface consistently, and to provide a permanent seal.
- .2 All high/low surface imperfections running axially through or part way through the sealing surface must be removed by scraping or grinding. Deep imperfections that grinding will not remove must be properly filled with approved quick setting cement mortar. This material must be rendered smooth and ground if necessary to suit the prepared surface of the joint area.
- .3 The pipe must be premarked with grease chalk to allow the preparation areas and seal position to be clearly defined.
- .4 If required, apply a coat of approved epoxy to the preparation area where the seal will be placed. This epoxy will control pipe porosity and irregularities and provide for an effective bubble test on the completed seal.
- .5 Immediately prior to fitting the seal, the area must be cleaned with a dry brush and coated with liquid joint lubricant, compatible with the composition of the compression seal. The lubricant is hand applied (using a brush) over the prepared area. Care must be taken not to pick up dust deposits from the unprepared surface. The lubricant is purely an aid to fitting the seal, and in no way contributes to its sealing capabilities.

.4 Installation

- .1 Install seal as per manufacturers written instructions.

.5 Testing

.1 Test 1

.1 The test is applied after each section has been completed and not before 30 minutes have elapsed after final fitting of the seal. A restraining device called a "test band" is fitted over the seal. This is to prevent excessive ballooning that would otherwise occur during the test. The compression seal is pressured to 10 psig through the test valve and maintained with a regulated air supply, while a soap and water solution is applied to the outer edge of the seal to detect any leak.

.2 Testing the Seal - Test 2

.1 In the second test, (5 psig) is introduced through the "valve" in the compression seal. This pressure is sustained while a soap and water test is applied to the outer edge and entire body of the seal.

.3 Test "Valve" Assembly

.1 After the final test of 5 psig, the test "valve" of the compression seal is sealed with a counter sunk hex head completion plug using a non-toxic thread sealing compound on the threads.

3.7 ACCESS AND INSPECTION MANHOLES

- .1 Upon completion of construction, all access and inspection ports shall be secured closed.
 - .1 For AWWA C301 pipe, buried access manholes shall be blind flanged closed using stainless steel bolts, nuts and hardware. Once closed, a protective coating of 50 millimetres of sulphate resistant grout shall be placed over the flange and bolts.

3.8 INSTALLATION OF OWNER SUPPLIED EQUIPMENT

- .1 Install owner supplied equipment as recommended by the Supply Contractor. Do not commence with installation of Owner Supplied Equipment until Form 201 Certificate of Instruction has been completed.

3.9 INSTALLATION OF SMALL DIAMETER PIPE AND FITTINGS

- .1 Threaded Valves and Fittings
 - .1 Install threaded nipples and flanges where indicated. Wrap all threads with a minimum of two wraps of Teflon tape or “pipe dope” containing Teflon. Isolate dissimilar metal flanges with gaskets, insulating bolt sleeves and non metallic washers.
- .2 Valve Chamber Sump Drains
 - .1 Install subdrains, sump drains, traps and cleanouts as indicated on the drawings.
- .3 PE Air Bleed Piping
 - .1 Install PE air bleed piping.
 - .2 Use internal stainless steel inserts on PE compression fittings
 - .3 Adequately support curb stop valving to prevent differential settlement.
 - .4 Install PE pipe to grade shown of Drawings. Provide “gooseneck” in PE piping outside of chamber.
 - .5 Ensure adequate compaction of fill under piping.

3.10 PAINT

- .1 All exposed metal surfaces including valves, fittings, anchor bolts, flange bolts, etc. where not specified to be copper, brass or galvanized, and all galvanized surfaces exposed by welding connections shall be painted.
- .2 Metal surfaces shall be cleaned thoroughly by wire brushing or abrasive blasting.
- .3 Paint exposed surfaces in accordance to AWWA C210.

3.11 CHANGE IN LAYING SCHEDULE

- .1 If the Contractor requests changes in the laying schedule, that is relocation of items such as offtakes, closures, valve chambers or any other alteration of the laying schedule, all costs associated with these changes shall be paid for by the Contractor.

3.12 DEMOLITION, REMOVAL AND ABANDONMENT OF EXISTING PIPE

- .1 Where indicated on the Drawings and directed by the Contract Administrator, remove designated portions of pipe. Removal methods shall be employed that preclude damage to adjacent pipes and joints that are to remain in place.
- .2 Salvage a minimum of one (1) complete length of pipe and return to designated City facility for examination and testing purposes.
- .3 Piping required to be cut and/or demolished to facilitate removal of adjacent pipe shall be a minimum of one complete pipe length away from proposed connection points.
- .4 All gaskets from existing pipes shall be carefully salvaged, cleaned and inspected. Due to changes in gasket design, existing gaskets may require re-use when connecting to existing pipe spigots.
- .5 Where indicated on the Drawings, existing pipelines shall be abandoned by filling with flowable fill in accordance with CW2130. At exposed pipe ends, a bulkhead suitable to restrain fill shall be constructed. A port shall be left open at the top of the bulkhead for verification that the pipe is completely filled.

3.13 QUALITY CONTROL

- .1 Inspection
 - .1 The Contractor shall afford the Contract Administrator every facility to access and inspect all plant to be provided, work to be performed, materials to be supplied and equipment or machinery to be installed.

3.14 LINE AND GRADE

- .1 The pipe shall be installed to the line and grade shown on the Drawings and as set in the field by the Contract Administrator. Vertical variance from grade shall not exceed 25 millimetres and horizontal variance from line shall not exceed 100 millimetres. Sharp bends will not be permitted even though the pipe remains within these tolerances. Alignment corrections allowed in main line piping but not a closures. Tees and bends shall be installed to the grades and at the locations shown on the Drawings or where required to connect to existing pipelines.

3.15 HYDROSTATIC AND LEAKAGE TESTING

- .1 Further to CW 2125, hydrostatic leakage test will not be required. Further to CW 2125, hydrostatic leakage testing will not be required.
- .2 Testing shall be completed by means of double 'O' ring testable joints. Joint Testing shall be conducted with compresses air, at a test pressure of 1.5 times the maximum operating pressure for the line.
- .3 Test Procedure
 - .1 All testing to be conducted in the presence of the Contract Administrator

- .2 Initial testing shall be conducted as pipe is laid, after initial haunching is placed. If initial test fails, the Contractor shall disassemble the joint, inspect bell, spigot and 'O' rings, and reassemble joint.
 - .3 Final testing shall be conducted after pipe is backfilled.
 - .4 Remove steel plug and 'O' Ring
 - .5 Connect air supply and slowly pressurize joint cavity to specified test pressure (Maximum 380 KPa). Close off air supply.
 - .6 Hold test for five (5) minutes. Maximum loss in pressure is thirty five (35) KPa.
 - .7 On successful pressure test, remove test assembly, reinsert steel plug and 'O' ring. Grout joint and test plug.
- .4 Closure Joints
- .1 All joints assembled during pipe closure shall remain exposed and visually inspected for leakage after filling of mains.

3.16 DISINFECTION OF WATERMAINS

- .1 Disinfection of watermains and feeder mains shall be completed in accordance with CW 2125 except initial flushing will not be required. Further to CW 2125, disinfection of segments of Feeder mains shall be completed by swabbing as outline in Section 3.3.16 of CW 2125.
- .2 In accordance with Section 4.3 of AWWA Standard 651, the Contractor shall take all preventative and corrective measures during construction to prevent debris from entering the pipeline. Further, the Contractor shall flush the pipeline with sanitized pipeline cleaning equipment prior to the commencement of disinfection operations.
- .3 Upon completion of disinfection, chlorinated water shall be pumped from the pipeline at the lowest point in the system, or continually flushed until chlorine residuals reach levels indicated in CW 2125. Chlorinated water shall not be directly discharged to the environment. Chlorinated water shall be treated by one of the following methods, as recommended in AWWARF – Guidance Manual for the Disposal of Chlorinated Water:
 - .1 Discharged into a waste water sewer;
 - .2 Be de-chlorinated using sodium ascorbate, Vita-D-Chlor™ by Integra Chemical, or approved equal;
 - .3 Contained on Site until chlorine has dissipated to acceptable limits.
- .4 The pipeline shall be refilled with potable water and water samples for health tests taken in accordance to CW 2125.

END OF SECTION