

**PART 1      GENERAL**

**1.1      Applicable Specifications**

- .1      Manitoba Water Services Board Standard Construction Specifications, Latest Edition.
- .2      Manitoba Infrastructure and Transportation (Highways), Latest Edition

**NOTE:** The MWSB will not be providing financial or technical assistance for this project.

**1.2      Applicable Standards**

AWWA - American Water Works Association  
6666 West Quincy Avenue, Denver, Colorado

CSA International  
178 Rexdale Boulevard,  
Toronto, Ontario M9W 1R3

ASTM - American Society for Testing Materials  
100 Barr Harbor Drive  
West Conshohocken PA 19428-2959 USA

CGSB - Canadian Government Specifications Board  
Ottawa, Ontario, K1A OS5

WCU - Western Canadian Underwriters

The Standards referred to shall be the most recent edition.

**1.3      Applicable Drawings**

Civil

- C01      GENERAL PLAN
- C02      PROFILE #1 TO PROFILE #4
- C03      PROFILE #5 TO PROFILE #10
- C04      WASTEWATER SEWER DETAILS
- C05      WATER DETAILS

## **PART 1 GENERAL**

### **1.1 Items Covered Contract Prices**

- .1 In addition to covering the cost of the various items of work for which the Contract unit prices by and/or Contract Lump Sum Prices are set forth in the Contract, and the Contract Prices so set forth shall be held to cover and shall cover the cost of furnishing all materials, plant, tools, equipment, labour, services, transportation, taxes and incidental's necessary for the doing of all things essential in executing the work required of the Contractor under the term required of the Contractor in the Contract, Plans and Specifications, and the observing, performing and keeping of all the terms, covenants and conditions of the Contract, all of which shall be observed, performed and kept by the Contractor. Any item of work not specifically listed under Contract Unit and/or Lump Sum prices shall be considered incidental to such other items as are listed.

### **1.2 Pressure Pipelines**

- .1 **METHOD OF MEASUREMENT** – Measurement of “watermain” and “water service pipe” shall be on the basis of the number of linear metres of piping installed measured horizontally on the ground along the centre line of the pipe, to the nearest half metre, including the length through appurtenances such as gate valves, and fittings. Payment shall be full compensation for stripping and stockpiling topsoil, locating existing services, trenching, dewatering, bedding sand, backfilling, compacting, marking posts, pipe cutting, flushing, testing, and disinfection, topsoil spreading and replacement, seeding, restoration, and all other work necessary to properly complete this work. Adaptors, gaskets, flanges, nuts, bolts and lubricants as are required to join pipe to appurtenances shall be considered incidental to “watermain” and “water service pipe”, including tees, bends, reducers, and fittings.
- .2 **BASIS OF PAYMENT** – Payment for each class of “watermain” and “water service pipe” shall be at the contract unit price for each class of “watermain” and “water service pipe”, measured as specified herein, which shall be payment in full for those operations described in Section 02511 – Pressure Pipelines.

### **1.3 Wastewater Sewer Lines**

- .1 **MEASUREMENT** – Measurement of “wastewater sewer lines” and “sewer service line” shall be on the basis of the number of linear metres of piping installed measured horizontally on the ground along the centre line of the pipe, to the nearest half metre, including the length through appurtenances such as manholes, fittings, and crossings. Payment shall be full compensation for stripping and stockpiling topsoil, trenching, dewatering, bedding sand, backfilling, compacting, pipe cutting, mandrel testing, televising, locating existing utilities, topsoil spreading and replacement, seeding, restoration, marking posts and all other work

necessary to properly complete this work. Adaptors, gaskets, flanges, nuts, bolts and lubricants as are required to join pipe to appurtenances shall be considered incidental.

- .2 BASIS OF PAYMENT – Payment for each class of “wastewater sewer lines” and “sewer service lines” shall be at the contract unit price for each class of “wastewater sewer lines” and “sewer service lines”, measured as specified herein, which shall be payment in full for those operations described in Section 02530 – Gravity Sewers.

#### **1.4 Gate Valves**

- .1 METHOD OF MEASUREMENT – Measurement for each class of “Gate Valve” as described in Section 02511, Pressure Pipelines, shall be based on the actual number of each class of “Gate Valve” supplied, installed and accepted by the Contract Administrator.
- .2 BASIS OF PAYMENT – Payment for each class of “Gate Valve” shall be at the Contract Unit Price for each class of “Gate Valve” measured as specified herein, which shall be payment in full for those operations described in Section 02511. Where gate valves are installed on existing watermains, payment shall include all work and material required to cut into the existing main and install the new gate valve.

#### **1.5 Connection to Existing Watermain Plugs**

- .1 METHOD OF MEASUREMENT – Measurement for “Connection to Existing Watermain Plugs” as described in Section 02511, Pressure Pipelines, shall be based on the number of connections acceptably made.
- .2 BASIS OF PAYMENT – Payment for “Connections to Existing Watermain Plugs” shall be made at the Contract Unit Price bid, measured as specified herein, which price shall be payment in full for performing all operations and supplying all materials; including excavation, dewatering, bedding sand, backfilling, compaction, pipe cutting, restoration, adaptors, fittings, reducers, flanges, nuts, bolts, lubricants, and any other work or materials required to complete this work. All other items included in this Specification shall be incidental to the work.

#### **1.6 Hydrant Assembly**

- .1 Measurement for “Hydrant Assembly” as described in Section 02511, Pressure Pipelines, and these Specifications shall be based on the actual number of “Hydrant Assembly” acceptably supplied and installed and shall include excavation, dewatering, bedding, bracing, connection to main, reducers, the supply and installation of spindle, stone disc, hydrant, hydrant leads, extension, fittings, tees, gate valve, valve box, flexible marker, thrust blocking, backfilling, cleanup, site restoration and all other materials and work required to complete the hydrant assembly installation as specified herein.

- .2 Payment for “Hydrant Assemblies” shall be at the Contract Unit Price bid for each hydrant assembly installed as specified herein, which shall be payment in full for those operations incidental to the work for which no price or prices or provisions for payment are included in the contract.

## **1.7 Corporation/Curb Stop and Water Service Wye**

- .1 METHOD OF MEASUREMENT – Measurement for each “Corporation/Curb Stop” and “Wye” shall be measured on a unit basis for each size and paid for at the Contract Unit Price for “Corporation/Curb Stop” and “Wye”, which price shall be payment in full for installing all materials including corporation stops curb stops, wyes and all other items incidental to the work included in this Specification.
- .2 BASIS OF PAYMENT – Payment for “Corporation/Curb Stop” and “Wye” shall be made at the Contract Unit Price bid, measured as specified herein, which price shall be payment in full for performing all operations and supplying all materials. Work shall include excavation, dewatering, bedding sand, backfilling, compaction, pipe cutting, restoration, adaptors, fittings, reducers, nuts, bolts, lubricants, and any other work or materials required to complete this work. Work also includes the installation of a steel or poly access box for the curb stops, supplied by the Owner, and as indicated on the Plans. All other items included in this Specification shall be incidental to the work.

## **1.8 Sewer Service Saddle and Sewer Service Wye**

- .1 METHOD OF MEASUREMENT – Measurement for each “Sewer Service Saddle” and “Wye” shall be measured on a unit basis for each size and paid for at the Contract Unit Price for “Sewer Service Saddle” and “Wye”, which price shall be payment in full for installing all materials including sewer service saddles and wyes and all other items incidental to the work included in this Specification.
- .2 BASIS OF PAYMENT – Payment for “Sewer Service Saddle” and “Wye” shall be made at the Contract Unit Price bid, measured as specified herein, which price shall be payment in full for performing all operations and supplying all materials. Work shall include excavation, dewatering, bedding sand, backfilling, compaction, pipe cutting, restoration, adaptors, fittings, reducers, nuts, bolts, lubricants, and any other work or materials required to complete this work. All other items included in this Specification shall be incidental to the work.

## **1.9 Manhole**

- .1 METHOD OF MEASUREMENT - Manhole installation including frames, covers, rungs, risers, base and other accessories and appurtenances shall be measured on a vertical length basis and paid for at the Contract Unit Price per vertical metre for “Manhole”. Manholes installed on existing sewers shall include all work and materials required to remove

the existing sewer pipe, install the new manhole, re-connect existing sewers, and connect new sewers.

- .2 BASIS OF PAYMENT - Measurement of manholes shall be taken from the lowest sewer invert to the top of the finished rim elevation, to the nearest 0.1 metre.

#### **1.10 Connection to Existing Manhole**

- .1 METHOD OF MEASUREMENT – Measurement for “Connection to Existing Manhole” as described in Section 02530, Gravity Sewers, shall be based on the number of connections acceptably made.
- .2 BASIS OF PAYMENT – Payment for “Connections to Existing Manhole” shall be made at the Contract Unit Price bid, measured as specified herein, which price shall be payment in full for performing all operations and supplying all materials. Work shall include excavation, dewatering, bedding sand, backfilling, compaction, pipe cutting, restoration, adaptors, fittings, reducers, flanges, nuts, bolts, lubricants, and any other work or materials required to complete this work. Work also includes breaking into the existing manhole, patching, and benching. All other items included in this Specification shall be incidental to the work.

#### **1.11 Miscellaneous Appurtenances**

- .1 METHOD OF MEASUREMENT – There shall be no measurement for miscellaneous appurtenances such as “plugs”, “tees”, “bends”, “crosses” and “reducers”. These items shall be considered incidental to the pipelines or connections.

#### **1.12 Restoration**

- .1 Topsoil replacement, fine grading, seeding, repairs to roadways, walkways, driveways, lawns, and drainage shall be considered incidental to the installation of services under this Contract. No payment shall be made for this associated work.
- .2 Topsoil in landscaped areas shall be carefully bladed to the side prior to the construction, and spread back over the disturbed area upon completion. Road restoration shall include final grading of the compacted ‘C’ base backfill to match existing grade and elevation.

#### **1.13 CCTV Inspection**

- .1 METHOD OF MEASUREMENT- Measurement for “CCTV Inspection” shall be measured on a length basis. The length to be paid for shall be the total number of metres televised in accordance with this Specification, accepted and measured by the Contract Administrator. No measurement shall be made for Sewer Cleaning. Payment for Sewer Cleaning shall be considered incidental to “CCTV Inspection”.

- .2 BASIS OF PAYMENT- Payment for "CCTV Inspection" shall be made at the contract unit price bid, measured as specified herein, which price shall be payment in full for described in these Specifications, Section 02635,.

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**Part 1            GENERAL**

**1.1                Fires**

- .1      Burning is not permitted.

**1.2                Disposal of Waste**

- .1      Do not bury rubbish and waste materials on site.
- .2      Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

**1.3                Drainage**

- .1      Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2      Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3      Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.4                Site Clearing & Plant Protection**

- .1      Protect trees and plants on site and adjacent properties where indicated.
- .2      Restrict tree removal to areas indicated or designated by the Contract Administrator.

**1.5                Pollution Control**

- .1      Maintain temporary erosion and pollution control features installed under this contract.
- .2      Control emission from equipment and plant to local authorities emission requirements.
- .3      Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .4      If open channel trenching is required due to unforeseen geologic conditions, detailed plans regarding methodology, location, scheduling and erosion control methods must be submitted for approval to the Department of Fisheries and Oceans prior to commencement of the crossing. Fish impact assessment along with mitigation plans would have to be done prior to proceeding with the pipeline crossing and mitigation measures stated in the Watercourse Crossings 2nd Edition (CPWCC, 1999) for wet or trenched crossings should be followed.
- .5      As well, if open channel trenching is required Fisheries and Oceans Canada – Coast Guard may have an interest if the waterway is deemed navigable. The Canadian Coast Guard is to be contacted to determine navigability.

## 1.6 Construction Mitigation

- .1 The following standard mitigation measures have been specified for the protection of aquatic habitat and water quality as standard precautions for working near water:
  - .1 All instream and riparian work along waterbodies must be done in accordance with guidelines for the Protection of Fish and Fish Habitat (Fisheries and Oceans, 1996). Mitigation measures and precautions are specified to reduce sediment, hazardous materials, and timing impacts on resident fish and aquatic life;
  - .2 Construction or maintenance activities that may result in the siltation or sediment deposition on or immediately adjacent to waterways are not to occur between April 1 and June 15 of any year;
  - .3 No re-fuelling or servicing of construction equipment within 100 m of any watercourse;
  - .4 Fuel storage areas established for project construction must be located a minimum of 100 metres from any watercourse, and must comply with Manitoba Regulation 97/88R respecting the Storage and Handling of Gasoline and Associated products;
  - .5 Proper collection and disposal of waste hazardous materials, and oil and lubricating products from construction equipment, in accordance with Manitoba regulations;
  - .6 All hazardous materials stored on or near the construction site must be 100 m away from watercourse;
  - .7 contractor must have spill clean-up materials on site with a minimum of 25 kg of suitable commercial sorbent, 30 m<sup>2</sup> of 6 mil polyethylene, and an empty fuel barrel for spill collection and disposal (CPWCC, 1999);
  - .8 Notification of project engineer in the event of any spills of petroleum products or hazardous materials;
  - .9 Construction equipment must be properly maintained to prevent leaks and spills of fuels, lubricants, hydraulic fluids or coolants;
  - .10 Disturbed areas around watercourses and the construction site should be re-vegetated as soon as possible after construction with vegetation that existed prior to construction;
  - .11 Proper collection and disposal of all construction wastes from the development; and
  - .12 Where applicable topsoil should be conserved by removal and stockpiling prior to construction.

## 1.7 Wetland /Wildlife Habitat

- .1 The following mitigation measures are to take place to minimize impact to wildlife:
  - .1 Construction is not to occur before August 1st of any year in areas likely to provide bird habitat;
  - .2 Construction near or through productive wetlands or riparian zones adjacent to rivers shall not occur before August 15th of any year;
  - .3 It is preferred that permanent wetlands be crossed after freeze-up;
  - .4 No alteration to inflows and outflows of wetlands will be permitted so as to protect the integrity and value of the wetland; and



.5 The disturbed areas will be restored with native or pre-existing vegetation.

**Part 1 GENERAL**

**1.1 General**

- .1 The Contractor shall be responsible for the safety of all persons and property on or about the project and for ensuring that the Work is performed in accordance with all applicable safety requirements.
- .2 Without in any way limiting the generality of the foregoing, the Contractor shall comply fully with the following provisions:
  - .1 Observe and enforce construction safety measures of the latest edition of the National Building Code of Canada, the latest edition of the National Building Code, The Worker's Compensation Act, The Workplace Safety and Health Act, The Department of Labour, and any other authorities applicable to this project. The Contractor is responsible for compliance with these standards for all workers engaged in the work of this Contract.
  - .2 In event of conflict between any provision of above authorities, the most stringent provision will apply.
  - .3 Provide at least seventy-two (72) hours written notice to all utility companies and property owners in the immediate vicinity of his operations prior to the commencement of construction and shall, if requested, cooperate with such parties in the protection, removal or relocation of their installations and property.
  - .4 Develop, maintain and supervise for the duration of the work, a comprehensive safety program that will effectively incorporate and implement all required safety precautions. The program shall, as a minimum, respond fully to the requirement of all applicable laws, ordinances, rules, regulations and orders, and general construction practices for the safety of persons or property, including, without limitation, any general safety rules and regulations of Canada, and any Workers' Compensation or Occupational Health and Safety legislation or regulations that may be applicable (eg. WHMIS).
  - .5 If requested, provide a copy of the safety program to the Contract Administrator for delivery to the Owner prior to the commencement of construction.
  - .6 Supply and maintain, at his own expense, at his site office or other well known place at the job site, safety equipment necessary to protect the workers and general public against accident or injury as prescribed by the governing authorities.
  - .7 Arrange regular safety meetings at his expense. Such meetings shall occur no less frequently than once per week. The Contractor shall record the minutes of such meetings and maintain a complete file for review by the appropriate authorities.

- .8 Designate a safety officer who shall be qualified and authorized to supervise and enforce compliance with the safety program.
- .9 Except as otherwise agreed to in the Contract, supply and maintain all articles necessary for giving first-aid to any person who may be injured on the job site and shall establish an emergency procedure for the immediate removal of any injured person to a hospital or a doctor's care in accordance with applicable legislative and regulatory requirements.
- .10 Report in writing to the Owner and the Contract Administrator, all accidents of any sort arising out of, or in connection with, the performance of the Work whether on or adjacent to the job site, giving full details and statements of witnesses. If death or serious injuries or damages are caused, the accident shall be promptly reported by the Contractor to the Owner and the Contract Administrator by telephone or messenger, in addition to any reporting required under provincial laws and regulations.
- .11 If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Owner and the Contract Administrator, giving full details of the claim.
- .12 Night work will only be performed by the Contractor if permission is given beforehand by the appropriate authorities. When work is carried out at night, the Contractor shall supply a sufficient number of electric, or other approved lights to enable the work to be done in a safe and satisfactory manner.
- .13 Perform all work in a fire-safe manner and comply with all applicable governmental legislation and, without limiting the generality of the foregoing, shall supply and maintain at the job site, adequate and proper fire fighting equipment.

## **1.2 Work in Hazardous Areas**

- .1 Before commencing the day's work, and while working in areas which may contain an explosive, toxic or oxygen deficient atmosphere, the Contractor shall test for explosive or toxic gases or oxygen deficiency. If a hazardous condition is found, the Contractor shall make the work area safe before commencing or continuing work.
- .2 Use non-sparking tools in areas where an explosive atmosphere may exist.
- .3 Provide, mount and maintain signs warning all of the hazards and of the proper procedures required for working in the hazardous areas.

## **1.3 Overloading**

- .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

#### 1.4 General Safety Requirements

- .1 Provide signal worker where signs or barricades do not provide adequate control, and where excavation, cranes or hoisting equipment is in usage, such worker must be qualified to perform the work.
- .2 All openings must be guarded with proper barricades or appropriate covers with warning identification.
- .3 Guy wires erected by the Contractor must be identified with attached warning signs.
- .4 All temporary heaters, lights and power cables, etc., must comply with the requirements of the Canadian Electrical Code and applicable regulations.
- .5 Use proper entrances and routes in proceeding directly to the work under this contract, and avoid passing through other operating locations on the project.
- .6 Wear appropriate protective clothing suitable for the task to cover and protect the body.
- .7 Safety glasses with face shields or other suitable eye protection must be worn when engaged in work where they will be subjected to flying objects, injurious light or heat rays, or any materials liable to injure or irritate to the eyes.
- .8 CSA approved Industrial Headwear/Z94.1 M1977 or latest revision.
- .9 CSA approved Protective Footwear/Z195 M1984 or latest revision.
- .10 Safety harness must be used where work platforms or staging complete with guardrails is impractical.
- .11 Scaffolding, swing stages or other temporary work platforms must be constructed and maintained, and used in compliance with Safety Regulations.
- .12 Approved container used to store drinking water must be clearly marked and must not be used for any other purpose.
- .13 All excavations and trenches must be prepared and maintained in accordance with safety regulations.
- .14 Instruct all workers of the emergency procedures established for the work site and their required response.
- .15 Only authorized workers are permitted to operate, adjust and repair equipment. No equipment should be left running unattended.
- .16 Alcohol and unauthorized drugs are prohibited on the property of the work site. Personnel using a medically prescribed drug may impair performance or judgement and must inform their supervisor in order that tasks may be assigned to ensure worker safety is considered.
- .17 A standby worker must be located immediately outside of a confined space area to render assistance in the event of an unsafe or emergency condition, and all workers inside a confined space must wear a safety lifeline connected to the appropriate

approved extrication device as required by regulations where a harmful atmosphere exists or may develop. An appropriate communication system must also be maintained between the standby workers and the inside worker(s).

- .18 Provide for the use of the Engineer, safety equipment such as ropes, safety belts, combustible/hazardous gas and oxygen depletion meter. Provide casual labour to assist Engineer's staff when entry is required to manholes or other area which may be hazardous. The Engineer is not allowed to enter such areas alone.
- .19 All tools and equipment must comply to standards and regulation having jurisdiction at the work site. The Contractor assumes all risk for the use of same. This applies for the duration of the project.

## **PART 1 GENERAL**

### **1.1 Description of Work**

- .1 The work described herein shall consist of the excavation of trenches (or excavation of tunnels); the supply and placing of bedding and backfill materials; the disposal of all surplus and unsuitable materials; and the restoration of the site.
- .2 All materials and installation shall conform to the relevant Manitoba Water Services Board (MWSB) specifications, most recent edition, with any exceptions being specifically outlined herein.
- .3 The work shall also include shoring and other protective works including cages necessary for and incidental to the safe and proper execution of the work as well as drainage and dewatering of all excavations.

### **1.2 Classification of Work**

- .1 COMMON EXCAVATION, BEDDING AND BACKFILLING - These shall be classified as follows:
  - .1 Common Excavation -Common Excavation shall include all excavation of clay, silt, sand, gravel, hard-pan, earth, roots, rubble, water, ice, snow, shale, cobbles, boulders (less than one cubic metre), asphalt, concrete pavement, existing underground and surface utilities and works, and any other obstacles which may be encountered, excepting bedrock excavation as defined herein. Common excavation shall include all necessary dewatering.
  - .2 Bedding - Pipe shall be bedded on Class "B" bedding.
  - .3 Backfill -There are four classes of backfill for open cut trenches, Common, Compacted Common, Compacted 'C' Base, and Cement Stabilized Backfill. Unless otherwise specified herein or on the construction drawings, the Contractor shall use Compacted 'C' Base Backfill.

### **1.3 Standards**

- .1 The following organizations publish Standards which have been STANDARDS referred to in this Section:

CSA International,  
178 Rexdale Boulevard,  
Toronto, Ontario M9W 1R3

A.S.T.M. -American Society for Testing and Materials,  
100 Barr Harbor Drive  
West Conshohocken PA  
19428-2959 U.S.A.

The Standards referred to shall be the most recent edition.

#### **1.4 Quality Assurance**

- .1 QUALITY ASSURANCE - The Contract Administrator shall carry out such tests on the gradation of bedding sand and backfill materials as he considers necessary in accordance with the current CSA Standard A23.2.2, Test for Sieve Analysis of Fine and Coarse Aggregate.

#### **1.5 Job Conditions**

- .1 CROSSING HIGHWAYS, RAILWAYS AND BODIES OF WATER – Where it is required to construct pipelines through paved roads under the jurisdiction of the Manitoba Department of Highways and under railways, the Contractor shall construct the pipeline in accordance with MWSB Section 02707, “Highway and Railway Crossings”. Where it is required to construct pipelines across bodies of water, the Contractor shall construct the crossing in accordance with MWSB Section 02708, “River Crossings”.
- .2 OBSTRUCTIONS PROHIBITED - Hydrants under pressure, valve boxes, curb stop boxes and other existing utility controls shall be unobstructed and accessible during the construction period.
- .3 DISRUPTIONS OF SERVICES - No valve, switch or other control on existing utility systems shall be operated for any purpose by the Contractor without the approval of the Contract Administrator and the respective Utility. At least 12 hours prior to the disruption, all affected consumers shall be notified by the Contractor in a manner as directed by the Contract Administrator and the Utility, and advised of the probable time when service will be restored.
- .4 EXISTING WORKS - Prior to the commencement of construction, the Contractor shall inspect the site and examine all available records and contact all relevant utilities to determine the location of all existing surface and underground works. The Contractor shall provide temporary support, adequate protection and maintenance of all existing works, such as surface and underground utilities and structures, which may be encountered in the progress of the work. Where the proposed grade, alignment or location of the work covered by this Contract cannot be altered but is obstructed by existing works, the obstruction shall be permanently supported, relocated, removed or reconstructed by the Contractor in cooperation with the owner of such utilities or by the owner of the utility if the owner chooses. Payment for such permanent support, relocation, removal or reconstruction of existing works shall be made to the Contractor as Extra Work in accordance with the General Conditions attached hereto.
- .5 PAVEMENT - Where it is required to install works under existing oiled surface, asphalt or concrete pavement (including roads, driveways and sidewalks) by means of an open cut trench, the Contractor shall saw cut the pavement to ensure that when the trench is excavated, the excavated portion of the pavement breaks cleanly away from the portion of the pavement which is not to be disturbed. When it is

required to install works under gravelled roads or driveways, the gravel shall be removed from the road surface prior to excavation, stockpiled, and replaced subsequent to backfilling. The trench shall be excavated with vertical walls. The Contractor shall not permit the width of the trench to exceed the dimensions specified in Clause 3.2 and 3.3 of this Section. Any damage to pavement beyond the allowed trench width (overbreak) shall be restored to the original condition by the Contractor at his own expense.

The Contractor may, at his option and subject to the approval of the Contract Administrator, use tunnelling methods to reduce the damage (and hence the amount of restoration required) to roads.

- .6 CULVERTS – Where existing culverts must be removed in the course of construction, the Contractor shall salvage the existing culverts and reinstall them in their original location and elevation. Where in the opinion of the Engineer, the existing culvert is not salvageable, the Contractor shall dispose of the culvert, and the Contractor shall be required to install a new culvert in accordance with MWSB Section 02436 “Placing Pipe Culverts and Pipe Arches” in place of the original, the supply of which shall be by the Owner.
- .7 GRADING-The Contractor shall grade all areas affected by the construction to original grade and elevation.
- .8 SETTLEMENT -The Contractor shall assume responsibility to correct settlement of trenches for a period of one year from the date of Substantial Performance.

## **1.6 Review**

- .1 Reviews of the work described in this Section shall be performed by the Contract Administrator. Reviews shall be required before any pipe is placed in the bottom of the trench.

## **PART 2 PRODUCTS**

### **2.1 Bedding Sand**

- .1 Bedding sand for Class "B" Bedding installation shall be dry, unfrozen, fine granular material all of which passes through a 9.5mm sieve, and not more than 8% of which passes through a 75 µm sieve.

### **2.2 Backfill**

- .1 COMMON BACKFILL – Common backfill shall consist of unfrozen material excavated from the trench with no lumps or stones exceeding 150 mm in diameter. Backfill must be free of all organic material.



- .2 COMPACTED COMMON BACKFILL -Compacted common backfill shall consist of unfrozen material excavated from the trench with no lumps or stones exceeding 150 mm in diameter.
- .3 COMPACTED 'C' BASE BACKFILL -Compacted 'C' Base backfill shall consist of a dry, uniform granular material conforming to the requirements of Manitoba Infrastructure and Transportation for 'C' base course material.

### **PART 3 EXECUTION**

#### **3.1 Alignment**

- .1 The trench or tunnel centre line shall follow the line and grades staked out by the Contract Administrator. The trench or tunnel centre line shall not deviate from the required alignment by more than 300 mm. Where a profile of the proposed pipeline is provided, and where elevations are given on the stakes, the pipe shall be installed within 100 mm of the required elevations. When the pipe installation is a gravity sewermain the pipe shall be installed within 12 mm of the required elevation. In cases where no profile of the proposed pipe is provided, the plans or specifications shall specify a minimum depth of cover for the pipe. In cases where the pipe crosses a road or driveway, the pipe shall be laid at a uniform gradient between the elevations of the pipe on either side of the road or driveway.

#### **3.2 Trench Excavation**

- .1 The excavation of trenches shall be carried out in accordance with the plans and specifications and as staked out on the ground by the Contract Administrator. Where in the opinion of the Contract Administrator, the subgrade is found to be unstable, unsuitable material shall be removed and replaced with approved materials. Trench walls shall be kept vertical from the bottom to 300 mm above the top of the pipe. The trench width in this section shall be not less than twice the outside diameter of the pipe and not greater than 900 mm (or, in the case of PVC "Series" Pipe, twice the outside diameter) plus the outside diameter of the pipe. The minimum clear width shall be available between any shoring or bracing that is required. The trench shall not be open more than 30 m ahead of or behind the pipe-laying operations, unless otherwise directed by the Contract Administrator.

Where excavation is made in bedrock, or where excavation is made in a material which cannot provide an even, uniform and smooth surface, or where large boulders are encountered in the trench, such material shall be removed to provide a clear distance between any part or projection of such material and the surface of all pipe and fittings of not less than 150 mm for 600 mm O.D. pipe or less and 225 mm for pipe having an O.D. greater than 600 mm. The trench bottom shall be brought to proper elevation (to receive bedding material) by backfilling

with compacted granular backfill material or as approved by the Contract Administrator.

### **3.3 Trench Walls**

- .1 Trench walls located 300 mm above the top of the pipe shall be excavated with "veed" side slopes consistent with the stability of the soil and consistent with the current Regulations of the Department of Labour. Where excavation of "veed" side slopes is not possible due to limitations on available right-of-way, existing utilities, structures, roads, pavements or other works, then the trench shall be excavated with walls as nearly vertical as possible, and with shoring or bracing, where required to prevent falling, slipping or caving in of the trenches. Bracing and shoring shall be constructed at the Contractor's expense and in accordance with the current Regulations of the Manitoba Department of Labour. Placing and removal of shoring, bracing, sheet piling or cages shall be undertaken in a manner that permits proper backfilling.

### **3.4 Dewatering**

- .1 The bottom of the excavation shall be maintained in a condition to permit the proper installation of the pipe. The installed pipe shall not be used as a drain. The Contractor shall provide, at his own expense, all portable dewatering equipment (including power, pumps and discharge hose) to drain the excavation.

### **3.5 Pipe Bedding**

- .1 The pipe bedding shall be smooth and even to provide full support for the pipe barrel, with cavities provided for flanges, couplings, sleeves or bells.
  - .1 CLASS "B" - Bedding sand shall be placed and thoroughly compacted in the trench such that the pipe is supported along its entire length (and under bells and flanges) by a layer of sand, the thickness of which shall be no less than 100 mm. Additional bedding sand shall be placed and compacted around the pipe and 200 mm above the top of the pipe for the entire width of the trench.

### **3.6 Backfill**

- .1 COMMON BACKFILL – The trench shall be backfilled with common backfill material to the top of the trench. The backfill material shall be consolidated with the wheels or tracks of excavating or grading equipment. The backfilled trench shall be left in a slightly mounded condition to minimize the effects of settlement.
- .2 COMPACTED COMMON BACKFILL -Compacted common backfill shall be placed in layers no greater than 300 mm thick. Each layer

shall be compacted by mechanical means to a density equivalent to that of the surrounding in-situ material.

- .3 COMPACTED 'C' BASE BACKFILL -Where this class of backfill is specified, the trench shall be backfilled entirely with select granular backfill material placed in layers no greater than 150 mm thick and compacted to 100% of maximum Standard Proctor Dry Density (ASTM 0698).
- .4 CEMENT STABILIZED FILL – Where cement stabilized backfill is specified, the top 1.0 of the trench shall be backfilled entirely with unshrinkable backfill material, placed in layers no greater than 150 mm thick, and compacted to 100% of maximum Standard Proctor Dry Density (ASTM D698).

### **3.7 Tunnelling (Coring, Pushing, or Directional Boring)**

- .1 If specified in Section 01001, Supplementary Conditions, the Contractor shall install pipe by pushing, coring or by tunnelling instead of by means of open cut trenching. At each end of the proposed tunnel, the Contractor shall excavate pits such that adequate space is allowed around the proposed tunnel openings for the equipment to construct the tunnel at the required elevation and grade. Tunnels shall be straight. The method of tunnelling shall be subject to the prior approval of the Contract Administrator. The excavated pits shall be backfilled in the same manner as required for open trench pipe backfill installation. Where the pit bottom at subgrade is found to be unstable, the unstable material shall be removed and replaced with compacted granular backfill or as required by the Contract Administrator.

### **3.8 Removal of Bracing**

- .1 In the event that the trench is braced or shored, the Contractor shall remove all bracing or shoring slowly and uniformly, keeping pace with backfilling so that the trench wall does not collapse.

### **3.9 Disposal of Surplus and Unsuitable Materials**

- .1 Surplus excavated material and material which is unsuitable for backfill shall be hauled to, stockpiled or spread at locations approved by the Contract Administrator. Such locations shall not be greater than five kilometres away from the point of excavation. In the event that such material is required to be hauled more than ten kilometres, the Contractor shall be compensated for the overhaul on the basis of Extra Work.

## **PART 1 GENERAL**

### **1.1 Description of Work**

- .1 The work described herein shall consist of the construction of pressure pipelines including forcemains, including the supply and installation of pipe, appurtenances (crosses, tees, elbows, reducers, caps), as well as accessories such as couplings, service saddles, corporation stops, curb stops, thrust blocks, lubricant and including gate valves, the connection of the pipe to the source of supply or to the point of discharge, as may be applicable; and the flushing and hydrostatic testing of the pipe.
- .2 The work performed and materials supplied under this section shall conform to the Manitoba Water Services Board Specifications (MWSB), current edition (all sections), except as amended in these Specifications.

### **1.2 Classification of Work**

- .1 PIPE - shall be classified on the following basis:
  - .1 Nominal inside diameter (nom. i.d.). Under no circumstances shall the actual inside diameter be less than 95% of the nom. i.d. specified on the Plans and/or Tender documents.
  - .2 Insulated or uninsulated. If not specified, pipe shall be uninsulated.
  - .3 Category of pressure pipeline based on use:
    - (a) Watermain – to distribute potable water including water for fire protection as part of an urban watermain distribution.
  - .4 Class of trench backfill (in accordance with Clauses 2.2 and 3.6 of Section 02510, "Pipeline Excavation, Bedding and Backfill"):
    - (a) Common Backfill
    - (b) Compacted Common Backfill
    - (c) Compacted 'C' Base Backfill
    - (d) Unshrinkable Backfill
- .2 APPURTENANCES - Appurtenances shall be classified on the same basis as Pipe and on the basis of the type of appurtenances:
  - .1 Crosses
  - .2 Tees
  - .3 Elbows
  - .4 Reducers
  - .5 Caps
- .3 ACCESSORIES - Accessories shall be defined as items required to complete the installation of watermains and shall include such items as:
  - .1 Couplings and Pipe Restraints
  - .2 Adaptors
  - .3 Service Saddles

- .4 Curb Stops/Box and Corporation Stops
- .5 Thrust Blocks
- .7 Pipe lubricant and pipe gaskets
- .7 Nuts, bolts and washers
  
- .4 GATE VALVES – Gate valves shall be as specified in part 2.40 of this Section and compatible with the type of pipe installed.
  
- .5 CONNECTIONS -shall be classified either:
  - .1 Connection to water supply (for watermains or water pipelines), which may be subclassified as one of the following:
    - (a) Connection to existing capped line
    - (b) Construction of tee or cross on existing line
    - (c) Connection to source of water supply

### **1.3 Standards**

- .1 The following organizations publish Standards which have been referred to in this Section:

AWWA -American Water Works Association  
6666 West Quincy Avenue, Denver, Colorado

CSA International -  
178 Rexdale Boulevard,  
Toronto, Ontario M9W 1R3

ASTM-American Society for Testing Materials  
100 Barr Harbor Drive  
West Conshohocken PA 19428-2959 USA

CGSB -Canadian Government Specifications Board  
Ottawa, Ontario, K1A OSS

WCU -Western Canadian Underwriters

The Standards referred to shall be the most recent edition.

### **1.4 Quality Assurance**

- .1 CONCRETE - The Contract Administrator shall carry out such tests on concrete (used in thrust blocks) as he considers necessary in accordance with the current CSA Standard A23.2, Methods of Test for Concrete. Such tests shall be at the expense of the Owner except that the Contractor shall furnish any and all test samples free of charge. Water used for mixing concrete shall be clean and free of oil and alkali, organic matter or other deleterious substances. Water shall be equal to potable water (drinking water) in physical and chemical properties.
  
- .2 PRESSURE TEST - The Contractor shall pressure test the pipeline under the direct observation of the Contract Administrator.

- .3 BACTERIOLOGICAL TESTS – Upon completion of pipelines and watermains intended to convey potable water, the Contractor shall take water samples and conduct bacteriological tests as the Contract Administrator considers necessary at the Contractor's expense.

## 1.5 Storage and Handling

- .1 Pipe and other materials associated with the construction of pipelines, watermains, forcemains, and low pressure sewer mains, shall be stored and handled in accordance with the recommendations of the respective manufacturers and to the satisfaction of the Contract Administrator.

## 1.6 Review

- .1 Review of the work described in this Section shall be performed by the Contract Administrator.

## PART 2 PRODUCTS

### 2.1 PVC Pipe – The pipe shall be manufactured of Type 1 Grade 1 polyvinyl chloride 1120 in accordance with the following:

- .1 Polyvinyl Chloride Class 150 conforming to American Waterworks Association Standard C900, CSA B137.3, ASTM Specification D-1784 shall be Bell & Spigot with gaskets conforming to ASTM Specification F477-76.

Each length of pipe shall have an integral bell end with a rubber gasket as supplied by the pipe manufacturer. Pipe lengths shall not exceed six metres.

### 2.2 Appurtenances

- .1 Unless otherwise specified in Section 01001, Supplementary Conditions, appurtenances shall be one of the following:

- .1 PVC APPURTENANCES – PVC appurtenances shall be used only in conjunction with PVC pipe. The appurtenances shall be manufactured in accordance with the same specifications as the PVC series or class pipe, and shall be of the same, or better, series or class as the pipe with which the fittings are used. PVC appurtenances shall be injection moulded for watermains 300mm diameter or less.

- .2 CAST IRON APPURTENANCES -Cast iron appurtenances shall be manufactured in accordance with the current AWWA Standard C110, Standard for Gray Iron and Ductile Iron Fittings. The appurtenances shall be suitable for 1,000 kPa service.

The joints shall be as follows:

- (a) Bell and spigot push-on type with appropriate rubber gasket when used with PVC.
- (b) Bell and spigot mechanical joint type with cast iron gland, all stainless steel nuts, bolts and washers, and the appropriate rubber gasket when used with PVC.
- (c) Flanged with appropriate full face rubber gasket epoxy coated ductile iron back-up ring and all stainless steel nuts and bolts when used with polyethylene pipe.
- (d) Thermal butt fusion, socket fusion in accordance with the pipe manufacturer's recommendations and using equipment approved by the manufacturer for joining polyethylene pipe.

### **2.3 Gaskets and Lubricants**

- .1 Gaskets and lubricant used to join pipes and to join pipes and appurtenances shall be of a type compatible with the particular pipe or appurtenance being used. Oil and gasoline resistant gaskets are generally not required but if, during construction, the Contract Administrator determines that the soil has been contaminated by petroleum and petroleum by-products, oil and gasoline resistant gaskets shall be used on all pipe installed within, and extending 100 metres beyond the outermost limit of, the contamination zone.

### **2.4 Gate Valves**

- .1 Gate valves shall conform to the current AWWA C509 Standard for Resilient Seated Gate Valves and shall be suitable for 1,000 kPa service. The valves shall have an epoxy coated cast iron body with Buna-N encapsulated rubber disc trim. Gate valve stem seals shall be O-Ring type. The valve shall be complete with a counter-clockwise opening non-rising spindle. The joints shall be of the same type as the pipe to which the valve is joined (see Clause 2.2.2). Each gate valve shall be complete with a valve box, including an extension spindle with a 50 mm square operating nut, stone disc, and metal valve box cover. The box and extension spindle shall be adjustable to suit the depth of bury specified for the pipe, plus or minus 0.3 metres.

### **2.5 Hydrants**

- .1 HYDRANTS – (MWSB Sec. 02706) AWWA C502, ULC listed and FM approved 1000 kPa service). Hydrant drain holes shall be open. Depth shall be as indicated on the Plans. Acceptable models shall be McAvity M67 (style to match hydrants installed in previous phases in this area).

### **2.6 Accessories**

- .1 Accessories (ie; adaptcrs and couplings) required to join two different types of pipe shall be of type compatible with the pipes being used and

installed in accordance with the manufacturer's recommendations, and shall be subject to the approval of the Contract Administrator.

## **2.7 Repair Clamps (Wrap Around)**

- .1 Repair clamps used to make transition connections (or repairs, as directed by the Contract Administrator) shall be wrap around "O" style suitable for 1000 kPa service.

All metal parts and welds shall be type 304 stainless steel which has been fully passivated. Bolt shanks shall be forged flat to resist bending. Bolt threads shall be rolled-type, lubricated by an anti-galling compound. Nuts, bolts and washers shall be all stainless steel and shall be connected to turn independently without separating.

The rubber gasket shall have tapered ends, a gridded surface and stainless steel armors. Gaskets shall be made of a synthetic equivalent to natural rubber.

Clamps for all pipe with a nom. i.d. of 250 mm and less shall have a minimum of one row of no less than three bolts. Clamps for 300 mm and 350 mm nom. i.d. pipe shall have a minimum of two rows of no less than three bolts. Clamps for 400 mm nom. i.d. pipe and larger shall have three rows of no less than four bolts. Clamp lengths shall be no less than two times the nominal inside diameter of the pipe on which the clamp is to be installed.

## **2.8 Metal Body Couplings (Compression)**

- .1 Metal body-type couplings used to make transition connections shall be suitable for 1000 kPa service.

The centre ring and end plates shall be fabricated of cast ductile iron (ASTM type A536) and shall be epoxy or nylon coated.

Gaskets shall be fabricated of virgin rubber (ASTM type 02000, SBR) compounded for cold water service.

Nuts, bolts and washers shall be all stainless steel with plastic thread protector caps.

The couplings shall be supplied complete with threaded zinc anode bolt caps for corrosion protection.

## **2.9 Concrete**

- .1 Concrete used for thrust blocks and grouting shall have a 28 day compressive strength of no less than 15 MPa. Cement used in concrete shall be sulphate resistant, meeting the current CSA Standard A5, Type 50 Portland Cement. Water used for concrete shall be clean and free from oil, acid, alkali, organic matter or other deleterious substances and



shall be equal to potable (drinking) water in physical and chemical properties.

## **2.10 Wood Blocks**

- .1 Wood blocks used to support gate valve installations shall be cut from hemlock or spruce timber. All surfaces shall be pressure treated with wood preservative.

## **PART 3 EXECUTION**

### **3.1 Depth of Burial**

- .1 WATERMAINS – The pipe shall be laid to the grade and alignment as indicated on Plans. If no specific grades are given or shown on the Plans, the pipe shall be laid at such a depth below the finished design ground surface that the pipe is provided with an earth cover of no less than 900mm above the top of the pipe for pipe installed.

### **3.2 Excavation Bedding and Backfill**

- .1 This portion of the work shall be undertaken in accordance with, Section 02510, "Pipeline Excavation, Bedding and Backfill".
- .2 Bedding sand shall be required for all watermains and appurtenances.

### **3.3 Cleaning**

- .1 Prior to installation, the interior and joining surfaces of all pipes, accessories, and appurtenances shall be cleaned of dirt and foreign material and wiped dry.

### **3.4 Push-On Joints**

- .1 Pipe with push-on type bell and spigot joints (PVC) shall be laid with the bell end toward the direction of laying unless otherwise directed by the Contract Administrator. The lubricant recommended by the pipe manufacturer shall be applied to the spigot end only. The spigot end shall be inserted into the bell end of the previously laid pipe to the stop mark on the pipe, such that a secure joint is obtained.

### **3.5 Tunnelling**

- .1 Where the pipe is to be installed by means of tunnelling rather than by open cut trenching, the tunnel shall be of a diameter large enough to enable the pipes to be pushed through (except in the case of polyethylene, which may be pulled through) without interference or obstruction. For PVC pipe, the pits at either end of any tunnel shall be of adequate length to allow each pipe length to be lowered in parallel to the tunnel and joined to the pipe previously installed; the bell, coupling or

flange of the previously installed pipe shall extend clear of the tunnel opening and be completely exposed to facilitate joining. The pipe lengths shall be securely joined in accordance with Clauses 3.4 of this Section.

### 3.6 Cutting of Pipe

- .1 Where required, lengths of pipe shall be cut to the required size to facilitate joining pipe and appurtenances. Pipe shall be cut square with a fine toothed hand saw, power saw, or hack saw, but not with a chain saw. Cut ends of PVC pipe shall be bevelled to the appropriate outside diameter with a fine file to duplicate the factory bevel on the spigot end of the pipe. Cut ends of polyethylene pipe shall be smoothed to ensure that the face is at a right angle (90 degrees) to the axis of the pipe.

### 3.7 Pipe to Appurtenances

- .1 Pipe shall be joined to appurtenances in a manner approved for the type of pipe being installed (ie; push-on bell and spigot, coupler, mechanical, restraint, flanged) and in accordance with Clause 3.4 of this Section.

### 3.8 Thrust Blocks

- .1 Concrete thrust blocks shall be installed at crosses, tees, elbows, reducers, caps and hydrants. Thrust blocks shall be required for fittings on both PVC and HDPE pipe. The minimum bearing areas (upon undisturbed trench soil) for thrust blocks shall be as outlined in Table 3.1.

**TABLE 3.1**

**MINIMUM BEARING AREAS  
 (on undisturbed trench soil)  
 FOR THRUST BLOCKS**

<b>PIPE DIAMETER (mm)</b>	<b>TEES &amp; PLUG &amp; THRUST (m<sup>2</sup>)</b>	<b>90° BEND (m<sup>2</sup>)</b>	<b>45° BEND (m<sup>2</sup>)</b>	<b>22 1/2° BEND (m<sup>2</sup>)</b>
50	0.2	0.3	0.2	0.1
75	0.2	0.3	0.2	0.1
100	0.2	0.3	0.2	0.1
150	0.4	0.5	0.3	0.2
200	0.6	0.9	0.5	0.3
250	1.0	1.5	0.8	0.4
300	1.5	2.0	1.2	0.6
350	2.0	2.7	1.5	0.8
400	2.6	4.0	2.0	1.0
450	3.2	4.5	2.5	1.3

### **3.9 Gate Valves and Fittings**

- .1 Gate valves shall be installed at the locations shown on the Construction Drawings.
- .2 Where shorts are used at valves and fittings (including couplers), the shorts shall be of sufficient length to ensure that there is a minimum 600 mm (face to face) between fittings.

### **3.10 Hydrants**

- .1 Hydrants shall be installed at the locations shown on the Construction Drawings. Depth of bury shall be to suit the watermain profile and the hydrant shall be placed so that the pumper nozzle faces the street. The hydrant shall be installed plumb. The finished flange elevation shall be between 50 mm and 150 mm above proposed finished grade. No extra payment will be made for any extensions or adjustments required to meet this grade. Hydrant drain holes shall be unplugged to allow the hydrant to drain into the sump.

### **3.11 Accessories**

- .1 Accessories ie; adaptors, couplings etc. shall be installed by a method compatible with the pipe used and as approved by the Contract Administrator.

### **3.12 Temporary Plugs**

- .1 During prolonged pauses in pipe laying, and always overnight, any open ends of the pipe shall be properly plugged with a cap compatible with the type of pipe being installed so as to prevent entry of foreign material into the pipe.

### **3.13 Prohibition of Use as a Drain**

- .1 Under no circumstances shall the trench or the pipeline be used as a drain.

### **3.14 Connections**

- .1 The Contractor shall make connections at prearranged times and prearranged durations subject to approval by the Contract Administrator. Such time and duration shall be kept to minimize disruption of existing services.
  - .1 CONNECTION TO EXISTING CAPPED PIPE - The Contractor shall close existing gate valves as required to take the existing pipe out of service. The Contractor shall excavate carefully to the end of the existing pipe so as not to damage it. The Contractor shall be responsible for repairing, at his own expense, any damage caused by him to the existing pipe. When the capped end is exposed and cleaned, the Contractor shall remove the thrust block and the cap or plug on the existing pipe. The new pipe shall

be connected to the existing pipe in the manner specified herein or as approved by the Contract Administrator.

- .2 CONNECTION TO EXISTING PIPE WITH NEW TEE OR CROSS  
- The Contractor shall close existing gate valves as required to take the existing pipe out of service. The Contractor shall excavate carefully to the point on the existing pipe into which the new tee is to be installed. The Contractor shall be responsible for repairing, at his own expense, any damage caused by him to the existing pipe. The Contractor shall, when the pipe is exposed and cleaned, make two cuts by the method specified in Clause 3.6 of this Section. The cut section of the existing pipe shall be removed such that the appropriate appurtenance may be installed. After the ends of the existing pipe are trimmed (either bevelled or squared as required), these ends may be joined to the appurtenance in accordance with Clause 3.7 of this Section. Stainless steel repair clamps, metal body couplers, PVC slip couplers, or thermal butt fusion for HDPE pipe shall be employed as required to reconnect the pipe to the new appurtenance. The new appurtenance shall be bedded, secured with a concrete thrust block and backfilled in accordance with Clause 3.8 of this Section and Section 02510 "Pipeline Excavation, Bedding and Backfill".

### 3.15 Hydrostatic Testing

- .1 The Contractor shall perform hydrostatic tests on all portions of the completed pipe under the direct observation of the Contract Administrator. The length of pipe to be tested shall not exceed the distance between neighbouring valves, except where neighbouring valves are less than 150 m apart or where approved otherwise by Contract Administrator.

All equipment and labour necessary to perform the hydrostatic testing, including water for testing, shall be supplied by the Contractor at his own expense. The equipment shall include all required hoses, pumps, water, make-up tanks and gauges. The Contract Administrator shall have the right to use his own gauge and to calibrate the Contractor's equipment.

Hydrostatic testing shall not commence until at least 72 hours after the installation of the last thrust block on the line to be tested.

Prior to hydrostatic testing, the line(s) shall be filled slowly with water (which shall be potable in the case of watermains and water pipelines) and all air shall be expelled from the line. If permanent air vents, flushouts or hydrants are not located at all high points, the Contractor shall install main (corporation) stops at such points in order to allow the air to be expelled as the pipe fills with water.

(For PVC Pipe Only)

The line shall be tested for pressure and for leakage. Unless otherwise specified in Section 01001, Supplementary Conditions, the test pressure for both types of tests shall be 700 kPa except in the case of watermains,

which shall be tested at 1000 kPa. The tests shall not commence until a minimum of 24 hours has passed since the pipe was filled with water.

- .1 PRESSURE TEST -The duration of each test shall be no less than two hours. At the end of the first hour, the pressure shall be boosted to its initial value. At the end of the second hour, the pressure shall be checked. The drop in pressure shall not exceed 2%. If the pressure drop is in excess of this, the Contractor shall find the leak, correct it, and repeat the test until the line can show a pressure drop of less than 2% in one hour.

As an alternative to the above, a pressure drop of no more than 15% over a 12 hour period shall be acceptable.

- .2 LEAKAGE TEST -The test shall be of a duration of not less than two hours. The leakage shall not exceed the following limits:

**TABLE 3.2**

<b>TYPE OF PIPE</b>	<b>LENGTH OF PIPE SECTION (METRES)</b>	<b>LEAKAGE – mL PER HOUR/km OF PIPELINE PER mm OF NOM.I.D.</b>
PVC	3.0	162
PVC	3.9	125
PVC	6.0	81

If the rate of leakage exceeds the allowable limit, the Contractor shall find the leak, correct it, and repeat the test until the leakage falls within the limit.

### **3.16 Repairs**

- .1 Defective or broken products shall be removed and replaced with new products. Repair clamps shall only be employed to make repairs with the Contract Administrator's approval.

### **3.17 Disinfection**

Water pipelines intended to convey potable water and all watermains shall be disinfected as follows:

- .1 PRELIMINARY FLUSHING -Prior to disinfection, watermains shall be flushed (or swabbed with an appropriate swab approved by the Engineer) with potable water at a velocity of not less than 0.75 m/sec. All water pipelines shall be swabbed and flushed prior to or in conjunction with disinfection and hydrostatic testing.

A velocity of 0.75 m/sec will be achieved by using the flow rates given in Table 3.4.

**TABLE 3.4**

<b>Flow Rates to Achieve Flow Velocity of 0.75m/sec</b>	
<b>Nominal Pipe Size (mm)</b>	<b>Flow (litres/second)</b>
50	1.6
75	3.8
100	6.3
150	14
200	25
250	38
300	55
350	76
400	98
450	125

- .2 **FORM OF CHLORINE** -Acceptable forms of chlorine which may be used to prepare disinfecting solutions include calcium hypochlorite granules (powder), calcium hypochlorite tablets, and sodium hypochlorite solutions (liquid).
- .3 **CONCENTRATION** -A chlorine solution shall be prepared to produce a 50 mg/L concentration in the pipe. The amount of chlorine required to effect this per 100 metres of pipe is as shown in Table 3.5.

**TABLE 3.5**

<b>PIPE SIZE (mm)</b>	<b>CALCIUM HYPOCHLORITE (grams)</b>	<b>12% SODIUM HYPOCHLORITE SOLUTION (litres)</b>
50	10	0.10
75	23	0.20
100	40	0.37
150	90	0.83
200	159	1.46
250	250	2.29
300	353	3.30
350	480	4.50
400	628	5.90
450	794	7.40

- .4      **APPLICATION** -The chlorine solution shall be pumped into the water pipe with a chemical feed pump designed to feed chlorine solutions and with such lines and fittings as required to make the necessary connections to the pipe. Water from the source water supply shall be made to flow at a constant, measured rate into the newly laid pipe. The water shall receive a dose of chlorine solution fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine dosage is maintained at a minimum of 50 mg/L. The Engineer shall take such samples as he deems necessary in order to determine the chlorine concentration.
- During the application of chlorine, gate valves on adjacent sections of the distribution system shall be closed to prevent the treatment dosage from flowing into any existing lines or back into the source water supply. Chlorine application shall continue until the entire newly constructed pipe is filled with chlorine solution. The chlorinated water shall be retained in the pipe for 24 hours. During this time, all valves on the lines shall be operated to allow penetration of the chlorine solution into the interior parts of each valve. At the end of the 24 hour period, the chlorine residual as measured by the Engineer shall not be less than 15 mg/L.
- .5      **FINAL FLUSHING** -After the 24 hour retention period, the heavily chlorinated water shall be flushed from the pipe until the chlorine concentration in the flushed water does not exceed that of the water from the source supply. The Engineer shall take samples to determine the free chlorine residual.
- .6      **BACTERIOLOGICAL TESTS** - After final flushing, the The Contractor shall submit water samples for HPC and Coliform counts (i.e. bacteriological testing). Acceptable coliform counts shall be less than 1, acceptable HPC counts shall be less than 500. The costs of acceptable tests shall be borne by Owner. The costs of unacceptable tests shall be borne by the Contractor. These costs shall be laboratory invoice costs plus 10%. After final flushing and before the new watermain is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main.
- .7      **REPETITION OF PROCEDURE** -If initial disinfection fails to produce satisfactory samples, the disinfection process shall be repeated until satisfactory samples are obtained.
- .8      **DISPOSAL OF FLUSHING WATER** -The water used for flushing and disinfection shall be discharged to a site and/or by a method approved by the Engineer and in accordance with Manitoba Conservation Guidelines. Water shall not be discharged into a body of water until the chlorine concentration is less than 0.1 mg/L.

**3.18 Joint Restraints**

- .1 Joint restraints and Denso corrosion protection shall be installed as per manufacturer's recommendations, to ensure a pressure tight, securely restrained joint which is totally protected from corrosion.
- .2 Joint restraints shall be required where thrust blocks cannot be placed securely against undisturbed competent in-situ soil, or as directed by the Contract Administrator.

**3.19 Completion**

- .1 When the watermains have been flushed, tested, and disinfected to the satisfaction of the Contract Administrator, the Contractor shall place the watermain into service by opening all gate valves as required.



## **PART 1 GENERAL**

### **1.1 Description of Work**

- .1 The work described herein shall consist of the construction of pressure water service connections including the supply and installation of saddles, clamps, man (corporation) stops, couplers, curb stops complete with wood base and box, service connection pipe, and wood markers.
- .2 The work performed and materials supplied under this section shall conform to the Manitoba Water Services Board Specifications (MWSB), current edition (all sections), except as amended in these Specifications.

### **1.2 Classification of Work**

- .1 Water service connections and pipe shall be classified on the basis of the nominal inside diameter of the pipe and fittings (saddle, clamp, main stop, curb stop, couplers), and on the basis of the type of backfill, and on whether the pipe and connection is insulated or not (if not specified, they shall be uninsulated).

### **1.3 Standards**

- .1 The following organizations publish Standards which have been referred to in this Section:

AWWA -American Water Works Association  
6666 West Quincy Avenue, Denver, Colorado

CSA International -  
178 Rexdale Boulevard,  
Toronto, Ontario M9W 1R3

ASTM-American Society for Testing Materials  
100 Barr Harbor Drive  
West Conshohocken PA 19428-2959 USA

CGSB -Canadian Government Specifications Board  
Ottawa, Ontario, K1A 0S5

The Standards referred to shall be the most recent edition.

### **1.4 Storage and Handling**

- .1 Pipe and other materials associated with the construction of water service connections shall be stored and handled in accordance with the recommendations of the respective manufacturers and to the satisfaction of the Contract Administrator.

## **1.5 Review**

- .1 Review of the work described in this Section shall be performed by the Contract Administrator.

## **PART 2 MATERIALS**

### **2.1 Pipe**

- .1 The water service connection pipe for 19 mm and 25 mm shall be cross-linked polyethylene ("Municipex"), to ASTM F 876 and ASTM F 877. Pipe shall be SDR9 (CTS). Service lines shall be continuous (no joints).

### **2.2 Corporation Stops and Fittings**

- .1 The corporation stop, (main stop for watermains), the couplings, wyes, and curb stop shall be waterworks brass suitable for in-ground application. The corporation stop, all couplings, wyes, and curb stop connections for watermains shall be compression type. All fittings shall be Mueller.

### **2.3 Curb Stops**

- .1 The Contractor shall supply and install curb stops at the locations shown on the plans or at the locations directed by the Contract Administrator.
- .2 The curb stop shall be draining, Mueller Oriseal.
- .3 Curb stop boxes shall not be required for this project.

### **2.4 Wood**

- .1 The wood base supporting the curb stop shall be 38mm x 191 x 300 spruce lumber, all surfaces of which shall be pressure treated with wood preservative. The wood marker shall be pressure treated fir lumber 38mm by 38mm and 2 m long, with the upper half painted red.

### **2.5 Drain**

- .1 Curb stop drain sumps shall be filled with a minimum of 0.06 cubic metres of crushed rock or coarse gravel.

## **PART 3 EXECUTION**

### 3.1 Grade and Alignment

- .1 The water service pipe shall be installed at the location as indicated on the Plans. Curb stop shall be installed at a higher elevation than the main to allow the service line to drain.

### 3.1 Excavation, Bedding and Backfill

- .1 This portion of the work shall be undertaken in accordance with Section 02310, Excavation, Bedding and Backfill.
- .2 Bedding sand shall be required for all water service lines.

### 3.2 Pipeline Service Connection

#### .1 Wet Tapping PVC

The water pipe shall be completely exposed by careful excavation in the location at which the water service connection is to be installed. The main shall be cleaned around its entire circumference in the zone within 250mm on either side of the location at which the saddle is to be installed. The service saddle shall be placed on the main and shall be secured to ensure a tight fit around the watermain or water pipeline but shall not be so tight that pipe deformation is caused. The main stop threads shall be wrapped with Teflon tape and shall be threaded into the saddle prior to wet tapping the main. A wet tapping tool, compatible with the type of pipe and approved by the Contract Administrator, shall be used to drill and tap a hole (through the saddle and corporation stop) into the wall of the watermain or pipeline. The tapping tool complete with pipe wall coupon shall be removed, and the water service line pipe shall be connected to the main stop. Compression fittings shall be used. A service saddle is not required when wet tapping PVC AWWA C900 pipe (for 25mm and smaller services, but larger services will require a saddle).

#### .2 Dry Tapping PVC

The water pipe shall be completely exposed by careful excavation in the location at which the water service connection is to be installed. The main shall be cleaned around its entire circumference in the zone within 250mm on either side of the location at which the saddle is to be installed. The service saddle shall be placed on the main and shall be secured to ensure a tight fit around the watermain or water pipeline but shall not be so tight that pipe deformation is caused. The main stop threads shall be wrapped with Teflon tape and shall be threaded into the saddle. A tapping tool, compatible with the type of pipe and approved by the Contract Administrator, shall be used to drill and tap a hole (through the saddle and corporation stop) into the wall of the watermain or pipeline. The tapping tool complete with pipe wall coupon shall be removed, and the water service line pipe shall be connected to the main stop. Compression fittings shall be used.

- .3 A wood marker shall be driven into the ground beside the curb stop. The completed connection shall be flushed and pressure tested in conjunction with pressure testing for watermain or pipeline at a minimum 1000 kPa for two hours. If any leakage is observed, the cause shall be located and corrected and the procedure repeated until the connection passes the test.

### **3.3 Installation**

- .1 Water services shall be installed 2.44 metres into each property and securely plugged.
- .2 Where indicated by the Contract Administrator, and where practical, a single service line for two lots will be connected to the main, and the line split near the front of the lot with a wye fitting to provide an individual service line to the two individual lots.
- .3 All curb stops shall be installed in a steel or poly box, provided by the Owner, as indicated on the plans.

## **PART 1 GENERAL**

### **1.1 Description of Work**

- .1 The work described herein shall consist of the construction of gravity sewers, including the supply and installation of pipe, saddles, tees, elbows, plugs, manholes, the connection of the sewer to the point of discharge, and mandrel testing, as shown on the Construction Drawings.
- .2 'Tunnelling' shall mean augering, boring, pushing, directional drilling, or coring beneath the ground surface.
- .3 The work performed and materials supplied under this section shall conform to the Manitoba Water Services Board Specifications (MWSB), current edition (all sections), except as amended in these Specifications.

### **1.2 Classification of Work**

- .1 SEWERS – Sewer mains shall be classified on the basis of size expressed as the nominal inside diameter, (nom. i.d.), and on the basis of the class of trench backfill (in accordance with Clauses 2.2 and 3.6 of Section 02510, Pipe Excavation, Bedding, and Backfill):
  - (a) Common Backfill
  - (b) Compacted Common Backfill
  - (c) Compacted 'C' Base Backfill
  - (d) Unshrinkable Backfill
- .2 SEWER SERVICE CONNECTIONS – Sewer service connections shall be classified on the basis of size expressed as the inside diameter of the sewer service pipe.
- .3 FITTINGS – Fittings (saddles, sewer service, tees, elbows, and plugs) shall be classified on the basis of size expressed as the inside diameter.
- .4 MANHOLES – Manholes shall be classified as 900mm diameter precast concrete manholes, complete with 900x750x300 flat top reducer, 750 dia. adjusting rings, and solid frame and cover. Manhole plugs must be provided.
- .5 CONNECTION TO POINT OF DISCHARGE – The connection of the furthest downstream portion of the sewer to a point of discharge shall be classified as either a connection to an existing plugged sewer, or to a manhole.

### **1.3 Standards**

- .1 The following organizations publish Standards which have been referred to in this Section:

CSA International -  
178 Rexdale Boulevard,  
Toronto, Ontario M9W 1R3

ASTM-American Society for Testing Materials  
100 Barr Harbor Drive  
West Conshohocken PA 19428-2959 USA

The Standards referred to shall be the most recent edition.

#### **1.4 Quality Assurance**

- .1 CONCRETE - The Contract Administrator shall carry out such tests on concrete (used in thrust blocks) as he considers necessary in accordance with the current CSA Standard A23.2, Methods of Test for Concrete. Such tests shall be at the expense of the Owner except that the Contractor shall furnish any and all test samples free of charge.

#### **1.5 Storage and Handling**

- .1 Pipe, fittings, and other materials associated with the construction of sewers shall be stored and handled in accordance with the recommendations of the respective manufacturers and to the satisfaction of the Contract Administrator.

#### **1.6 Review**

- .1 Review of the work described in this Section shall be performed by the Contract Administrator.

### **PART 2 PRODUCTS**

#### **2.1 Wastewater Sewers and Sewer Service Pipe**

- .1 Wastewater Sewers and Sewer Service Pipe shall be PVC SDR 35, conforming to CSA B182.2, ASTM D3034 and F679. All sewer service pipe shall be 100mm diameter. Each length of pipe shall have a bell end with a rubber gasket as supplied by the pipe manufacturer. Pipe lengths shall not exceed 6 metres.

#### **2.2 Fittings**

- .1 Wastewater sewer and sewer service fittings, including wyes, shall be PVC Fabricated Fittings in accordance with ASTM D3034, SDR 35.
- .2 Services shall connect to new sewer mains using saddles.

## **2.3 Manholes**

- .1 Manholes shall be fabricated of precast reinforced concrete in accordance with the current ASTM C76, Standard for Reinforced Concrete Pipe, Class II. Joints shall be complete with a "Ram-nek" flexible bituminous gasket. Cement used in concrete shall be sulphate resistant meeting the current CSA Standard A5, Portland Cement. Aluminum ladder rungs shall be cast into the manhole.
- .2 Manholes shall be 900mm diameter precast concrete with 900 mm nominal inside diameter from manhole bottom to 900mm x 750mm diameter flat reducers on top, with solid frame and cover unit. long with factory reinforced 750 mm diameter risers.
- 3 Manholes shall be manufactured with a factory firtight gasket precast into the base section.
- .4 Contractor will be required to submit shop drawings for all manholes. Manholes shall not be installed without shop drawing approval from the Contract Administrator.

## **2.7 Manhole Frame and Cover Units**

- .1 Frame and cover units shall be cast iron. Castings shall be true to the required pattern and shall be free from cracks, gas holes, flaws and excessive shrinkage. Casting surfaces shall be free from burnt-on sand and shall be reasonably smooth. Runners, risers, fins and other cast-on pieces shall be removed. Adjustment riser rings shall be used for adjusting the elevation of cover units.

## **2.8 Concrete**

- .1 Concrete used for grout and for forming benching channels in manholes shall have a 28 day compressive strength of not less than 15 MPa. Cement used in concrete shall be sulphate resistant meeting the current CSA Standard A5, Portland Cement. Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances. It shall be equal to potable (suitable for drinking) water in both physical and chemical properties.

## **. 2.9 Gaskets and Lubricants**

- .1 Gaskets and lubricant used to join pipes and fittings shall be of a type compatible with the particular pipe or fitting being used.

## **PART 3 EXECUTION**

### **3.1 Excavation, Bedding and Backfill**

- .1 This portion of the work shall be undertaken in accordance with Section 02510 "Pipe Excavation, Bedding and Backfilling".
- .2 Bedding sand shall be required for all sewer mains and sewer service lines.

### **3.2 Grade and Alignment**

- .1 Sewer pipe shall be installed to the line and grade shown on the Plans.. Prior to installation, the Contractor shall expose existing wastewater sewers at connection points to determine existing inverts.
- .2 The Consultant or Owner shall modify design grades as required. Excavation and backfilling operations as required to expose existing wastewater sewers to determine existing inverts shall be incidental to the contract.
- .3 Vertical Variance from grade shall not exceed the following limits; the invert of the pipe shall not be more than 12 millimetres below the design grade nor more than 12 millimetres above the design grade and there shall be no dips which allow ponding of water to a depth of more than 25 millimetres. Horizontal variance from line shall not exceed 100 millimetres. Sharp bends will not be permitted even though the sewer pipe remains within these tolerances.
- .4 Manholes, tees, wyes, reducers and bends shall be installed to the grades and at the locations shown on the Drawings. The allowable tolerance from the line and grade shall not exceed those specified for sewer pipe.

### **3.3 Cleaning**

- .1 Prior to installation, all interior and joining surfaces of all pipes and fittings shall be cleaned of dirt and foreign material and wiped dry.

### **3.4 Joining PVC Pipe**

- .1 Pipe with push-on type bell and spigot joints (PVC) shall be laid with the bell end facing upstream unless otherwise directed by the Contract Administrator. An integral rubber gasket shall be supplied in the bell end of the pipe. The lubricant recommended by the pipe manufacturer shall be applied to the bevelled spigot end only. The spigot end shall be inserted into the bell end of the previously laid pipe to the stop mark on the pipe, such that a secure joint is obtained.



### 3.5 General Joining Procedure

- .1 Spigot or tongue ends of pipe may be inserted into the bell, coupling or groove ends of previously laid pipe by hand, or if additional force is required to effect complete insertion, the following may be used:
  - .1 BAR AND BLOCK – If a bar is used for leverage, a wooden block shall be placed between the bar and the end of the pipe is being pushed.
  - .2 LEVER-TYPE OR FRICTION PULLERS – When pullers are used, the chains shall be employed in a manner which does not cause damage to the pipe.

### 3.6 Tunnelling

- .1 Where the sewer is to be installed by means of augering, coring, pushing, or directional boring rather than by open cut trenching, the tunnel shall be of a diameter large enough to enable the pipes to be pushed through without interference or obstruction. The pits at either end of the tunnel shall be of adequate length to allow each pipe length to be lowered in parallel to the tunnel and joined to the length of pipe installed previously. The bell, coupling or grooved end of the previously installed pipe shall extend clear of the tunnel opening and be completely exposed to facilitate joining. The pipe lengths shall be securely joined in accordance with Clause 3.4 and 3.5 of this Section.

### 3.7 Cutting Pipe

- .1 If it is necessary to shorten a length of sewer pipe, the pipe shall be cut with a fine toothed hand saw, power saw (quicky saw) or hack saw, but not with a chain saw. Cut ends of PVC pipe shall be bevelled to the correct outside diameter with a fine file to duplicate the factory bevel on the spigot end of the pipe.

### 3.8 Manholes

- .1 Manholes shall be constructed in accordance with the typical manhole details indicated on the Plans.
- .2 “Ram-nek” flexible bituminous gaskets shall be installed on each manhole section prior to lowering the section into the trench. Sections shall be lowered with care and properly aligned to ensure that all ladder rungs line up vertically.
- .3 A flat top ring shall be installed on the riser just prior to the frame and cover unit.

- .4 Subsequent to the installation of the precast concrete sections and frame and cover unit, all joints and holes for lifting lugs shall be sealed on the inside with grout.
- .5 The sewer line shall be laid through the manhole. The line shall be cut lengthwise in the bottom of the manhole such that an outside semi-circular space shall be filled with concrete to the level of the middle of the semi-circular pipe. The concrete floor shall be graded at 10:1 slope toward the channel formed by the pipe. When the contractor installs PVC sewer pipe through cast-in-place manhole or precast concrete walls he shall ensure a water tight connection by using a firtight gasket, or approved equal.

### **3.9 Connection to Point of Discharge**

- .1 EXISTING PLUGGED SEWER – The plug shall be removed from the existing sewer. A new gasket shall be installed to join the existing pipe with the new pipe. Where the two pipes consist of different materials, a secure joint shall be made by placing sulphate resistant concrete around the joint between the two pipes or by installing an approved coupler or adaptor connecting the new to the existing pipe.
- .2 EXISTING MANHOLE – The wall of the existing manhole shall be exposed by excavation. A jackhammer or sledge hammer shall be used to create an opening in the wall at the point where the new pipe invert is to be located. Care shall be taken to ensure that the opening in the manhole is restricted to the immediate vicinity of the proposed pipe entry. The reinforcing steel in the area of the opening shall be cut. All rubble resulting from these operations is unsuitable material and shall be disposed of by removing it from the manhole. If a semi-circular channel does not already exist in the bottom of the manhole, one shall be formed. Existing formed channel works shall be reformed (by jack hammering and placing concrete) if required. The new pipe shall be installed such that it forms a continuous channel in the manhole. The pipe shall be cut, concrete placed and all holes grouted. When the Contractor installs PVC sewer pipe through a cast-in-place manhole or precast concrete walls he shall ensure a water tight connection by coating PVC pipe with an approved cementing agent to which sand has been added prior to grouting the PVC sewer pipe in place, otherwise the Contractor shall install a “manhole adaptor” grouted into place to ensure a water tight connection or utilize a link seal complete with link seal sleeve.

### **3.10 Sewer Services**

- .1 Service lines shall be connected to the sewer mains by means of a saddle. All saddles except PVC saddles shall be installed on the main and grouted in place using sulphate resistant cement for concrete. Appropriate cutting tools shall be employed to cut a hole in the main for the service line prior to the installation of the saddle. PVC saddles shall be installed by means of the solvent-weld cement (in the case of solvent weld saddles) complete with two all stainless steel clamps. Saddles

utilizing a gasket only, shall be installed in accordance with manufacturer's recommendations and two all stainless steel clamps.

- .2 Elbows shall be used as required to connect service line pipe to the saddle on the sewermain. Riser pipe shall be used as required to join sewer service lines to deep sewer mains.
- .3 Sewer services shall be installed 2.44 metres into each property and sealed with an appropriate plug and a marker post installed at the ground surface.
- .4 Where indicated by the Contract Administrator, and where practical, a single service line for two lots will be connected to the main, and the line split near the front of the lot with a wye fitting to provide an individual service line to the two individual lots.

### **3.11 Temporary Plugs**

- .1 During prolonged pauses in the construction, such as meal breaks and overnight, the sewer lines shall be temporarily plugged with an approved plug to prevent the entry of foreign matter.

### **3.12 Mandrel**

- .1 The contractor shall subject all PVC sewer mains to a mandrel test with a rigid device sized to pass 5% or less deflection (deformation) after backfilling of the trench over the pipe. The Contractor may decide to test for pipe deflection following the consolidation of the trench backfill to be determined by the Contract Administrator. The deflection following trench consolidation shall not be greater than 7.5%. The mandrel shall be supplied by the Contractor and approved by the Contract Administrator. No allowance shall be made for pipe wall thickness tolerances or ovality (from heat, shipping, poor productions, etc.). The above shall be counted in as part of the deflection allowance. The mandrel shall be hand pulled by the Contractor through the sewer lines. Any sections of sewer not passing the mandrel test shall be excavated and the Contractor shall re-install or replace the sewermain to the satisfaction of the Contract Administrator. The repair sections shall be retested. The inspection shall be conducted no earlier than 30 days after reaching final trench backfill grade, provided in the opinion of the Contract Administrator that sufficient water densification or rainfall has occurred to thoroughly settle the soil throughout the entire trench depth.
- .2 If densification cannot be achieved in the time after installation prior to the project completion date, then the mandrel size shall be increased so that the rigid mandrels device would be sized to pass 4% or less deflection (deformation of the pipe diameter).

### **3.13 Maintenance of Service**

- .1 The Contractor shall maintain service to affected residents throughout construction. At no time shall raw sewage be allowed to discharge into any trenches. Bypass pumping will be required to divert sewer flows to permit continuity of sanitary sewer service. Payment for bypass pumping shall be incidental to the contract.

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**PART 1      GENERAL**

**1.1          Description of Work**

- .1      The work performed and materials supplied under this section shall conform to the previous specifications.
- .2      Televised sewer inspections shall be performed to observe the condition and grading of all as-built piping.

**PART 2      MATERIALS**

**2.1          Inspection Unit**

- .1      The inspection unit shall consist of a self-contained vehicle with separate areas for viewing and equipment storage. Each unit shall be equipped with a cellular telephone and a suitable communication system linking all crew members. Each inspection unit shall be equipped with fans and blowers to remove any fog, which may be present in the sewer at the time of the inspection.

**2.2          Inspection Equipment**

- .1      Inspection equipment shall consist of cameras, lighting, cables, power source, monitor, video cassette recorder, and other related equipment. The camera shall be pan and tilt type capable of panning 360° and tilting 270°. The adjustment of focus and iris shall allow optimum picture quality and the focal range shall be adjustable from 100 mm to infinity.
- .2      The light source shall be adjustable to allow an even distribution of light around the sewer perimeter without loss of contrast, flare out of picture, or shadowing. Video overlay equipment shall be capable of superimposing alpha-numeric information onto the video tape and shall be capable of providing a minimum of 15 lines of information, 30 characters per line. Video shall be in a DVD format.
- .3      The camera shall be transported through the sewer by means of a rubber tired or crawler tractor. The transport unit must be capable of passing over minor surface imperfections including, but not limited to, broken joints and solid debris up to 40 mm in height. Mounting of the camera on a float or skid for tow through the sewer shall only be permitted where the condition of the sewer or flow level precludes the use of a tractor. If the camera is towed the supporting equipment shall not impede the view of the camera and shall be stable to ensure steady and smooth progress.
- .4      The camera transport shall permit complete inspection of the sewer from the centre of the start manhole to the centre of the finish manhole. The camera transport and cable shall be capable of inspecting a minimum of 200 metres of sewer from a single access point. A remote reading counter shall be used to measure distance travelled from the centre of the

start manhole and measurements shall be recorded in metres to the nearest 100 mm.

- .5 The camera height shall be adjustable so as to position the centre of the lens in the centre of circular sewers and two thirds of the vertical dimension above the invert of egg shaped sewers.

## **PART 3 EXECUTION**

### **3.1 Sewer Inspection**

- .1 The Contractor shall provide a minimum of 24 hours notice to the Contract Administrator of the locations where the inspections will be performed on the following day(s).
- .2 Prior to beginning the inspection the distance between the centres of the start and finish manhole shall be measured on the ground surface using a steel tape. Flow control measures shall be implemented to ensure a minimum of 80% of the height of the sewer is visible for the entire inspection. All fog shall be evacuated from the sewer. The camera lens shall be kept clean at all times and the sewer shall be kept clear of fog during the entire inspection.
- .3 All inspections shall be conducted in the direction of flow. Inspections shall generally begin with the upstream sewer in the system and proceed downstream in a consecutive manner. Under no circumstances shall the inspection proceed downstream until all contributing upstream sewers have been cleaned.
- .4 The face of the start manhole shall be clearly visible at the start of the inspection and the inspection shall be performed from the centre of the start manhole to the centre of the finish manhole. At the start of the inspection the length of sewer from the centre of the manhole to the cable calibration point shall be recorded and the distance reading at the cable calibration point shall be adjusted such that zero is at the centre of the start manhole.
- .5 During the inspection automatic distance measurement shall be indicated on the screen and begin to move immediately as the camera moves. The distance measurement shall be accurate from the cable calibration point to the centre of the finish manhole. The camera speed shall not exceed 9 metres/minute.
- .6 During the inspection the picture shall be in focus from the point of observation to a minimum of two pipe diameters ahead.

### **3.2 Video Recordings**

- .1 The inspections shall be recorded in colour on DVD format at high resolution mode. The entire inspection shall be contained on one DVD.

DVDs shall be high grade, new unused only. All videos shall be first generation recordings.

- .2 At the start of each survey a video overlay system shall be used to clearly display, on the monitor and video recording, the following alpha-numeric information for 30 seconds. This information shall be entered prior to beginning the inspection:

- .1 Line 1: Contract ID e.g., City of Winnipeg, ID No. 99 000
- .2 Line 2: Street Name e.g., Conner Hill Drive
- .3 Line 3: Start MH to Finish MH Names e.g., MH at Crocus Place to mid-point manhole
- .4 Line 4: Contractor Name e.g., XYZ Limited
- .5 Line 5: Date and Time of Inspection e.g., 08/07/2004 - 14:15
- .6 Line 6: Direction of Inspection e.g., with flow

- .3 The video shall be labelled with the following information:

- .1 Contract Name e.g., City of Winnipeg – Lindenwoods Subdivision
- .2 Sewer ID Name: e.g., Conner Hill Drive & Crocus Place
- .3 Submission ID: e.g., Sewers Inspected Week of 08/24/2004 - 1 of 2

- .4 Videos shall be submitted in hard plastic cases with wrap-around clear plastic windows capable of displaying a summary sheet containing the following information:

e.g.,

Street Name	From MH	To MH	VTR
Conner Hill Dr.	Crocus Place	Hampton Drive	0:00:00

### 3.3 Final Report

- .1 Results of the video inspection shall be logged by the contractor and bound as a report.
- .2 Report shall clearly show all points of significance such as locations of building sewer connections, unusual conditions, etc.
- .3 Provide pictures of problem areas and general conditions, minimum 1 picture between manholes.