WATERMAINS

PART 1 GENERAL

1.01 OTHER CONTRACT DOCUMENTS

The General Conditions of the Contract, General Requirements, and Supplemental Condition attached hereto shall apply to and be part of this Section

1.02 DESCRIPTION OF WORK

The Work described herein shall be for the construction of watermains, appurtenances and associated works.

1.03 RELATED WORK

Section 02210 Excavation Bedding & Backfill
Section 02665 Building Connections

1.04 CLASSIFICATION OF THE WORK

Watermains shall be classified on the basis of the conduit size expressed as the nominal inside diameter of the pipe and fittings, on the basis of the type of pipe material, on the basis of the installation depth, and on the basis of the type of trench backfill required. Unless specified otherwise in Section 01001 Supplemental Conditions or shown on the Drawings, all pipe and fittings shall be PVC.

Valves shall be classified as either a Gate Valve or Butterfly Valve with each class described on the basis of the nominal inside diameter of the valve. Unless specified otherwise in Section 01001 Supplemental Conditions or shown on the Drawings, all valves shall be gate valves.

Connections shall be classified on the basis of the type of connection being made and on the basis of the nominal inside diameter of the pipe to which the connection is made.

Anodes shall be classified on the basis of the net weight of the anode being installed.

PART 2 PRODUCTS

2.01 PIPE

Pipe shall be Polyvinyl Chloride (PVC) having a cell classification of 12454B and shall be manufactured in accordance with AWWA Standard ANSI/AWWA C900-89 "Polyvinyl Chloride (PVC) Pressure Pipe 4 inch through 12 inch for Water', or C905-88 'Polyvinyl Chloride (PVC) Pressure Pipe 14 inch through 36 inch for Water' and CAN/CSA-B137.3 'Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.

PVC pipe shall be minimum DR 18 (Class 150).

Each length of pipe shall have a bell end complete with factory installed push on elastomeric ring gasket capable of withstanding pressure equal to the rated pressure of the pipe and withstanding thermal expansion and contraction. Pipe which have been manufactured in excess of thirty (30) months prior to installation will not be accepted for incorporation into the Work.

If specified in Section 01001, Supplemental Conditions, the Contractor shall supply oil and gasoline resistant gaskets, which shall be clearly identified by colour code or markings placed directly on the gaskets. Lubricant for joining pipes shall be approved by the gasket manufacturer. Pipe shall be coloured blue and supplied in lengths not in excess of 6.1 metres.

2.02 PVC FITTINGS

PVC fittings (tee, cross, bend, reducer, tapped coupler, coupler, adaptor or plug) shall be Polyvinyl Chloride (PVC) having a cell classification of 12454B and shall be manufactured in accordance with AWWA Standard C907 'PVC Watermain Fittings 4 inch through 8 inch' and CAN/CSA-B137.2 'PVC Injection-Moulded Gasketed Fittings for Pressure Applications'

Injection moulded PVC fittings shall be minimum DR 18 (Class 150).

Fabricated PVC fittings < 600mm shall be minimum DR 14 (Class 200).

Fabricated PVC 600mm fittings shall be minimum DR 18 (Class 150).

Fabricated PVC fittings shall be butt fused bonded from sections of PVC pipe of the same, class, type, size and manufacturer as the pipe to which it joins and over wrapped with fibreglass in accordance with AWWA C905/C900. The fibreglass reinforced polyester shall be applied in a manner which completely covers the fitting except for the area adjacent to the bell which shall be left uncovered a sufficient width to enable a restraining clamp to bear evenly against the pipe and bell surface around the entire circumference of the pipe.

Fittings shall be coloured blue. Fittings which have been manufactured in excess of thirty (30) months prior to installation will not be accepted for incorporation into the Work.

2.03 CAST IRON FITTINGS

Cast iron fittings (tee, cross, bend, reducer, adaptor, or plug) shall be manufactured in accordance with AWWA Standard ANSI/AWWA C110/A21.10 'Ductile Iron and Grey Iron Fittings'. All cast iron fittings shall be minimum Class 250, suitable for 1,000 kPa service and supplied complete with tie rod lugs. Joints shall be restrained push on type compatible with the class and type of pipe to which it is intended to join.

2.04 JOINT RESTRAINT

The joint restraint shall be ductile iron manufactured in accordance with ASTM A536. The clamping ring surface shall have serrations on the inside to provide positive restraint around the entire circumfrence of the pipe surface and shall be suitable for use with both rigid and resilient pipe materials and the type of joint being made.

Unless specified otherwise in Section 01001 Supplemental Conditions or shown on the Drawings, all fittings, valves and hydrants shall be supplied complete with joint restraints.

Joint restraints shall be Uni-Flange 1300, 1350, 1360, 1390 or approved equal.

2.05 GATE VALVE

The gate valve shall be manufactured in accordance with AWWA standard ANSI/AWWA C509 'Resilient - Seated Gate Valves 3 through 12 NPS for Water and Sewage Systems'. Unless specified otherwise in Section 01001 Supplemental Conditions, or shown on the Drawings, each

valve shall have push on type joints compatible with the class and type of pipe to which it is intended to join.

The gate valve shall have an epoxy fusion bonding inside and out with a Buna-N encapsulated rubber disc trim and O-Ring stem seals. Gate valve shall have a non-rising 316 stainless steel or forged bronze stem for ***right hand close*** operation thread and be capable of safely withstanding a working pressure of 1000kPa, and a pressure of 2000 kPa when open or closed. The gland and bonnet nuts and bolts and any other nuts and bolts, exposed to the atmosphere or ground, shall be T-316 stainless steel.

Gate Valve shall be Mueller A 2360, Clow F 6112 or approved equal.

2.06 BUTTERFLY VALVE

The butterfly valve shall be manufactured in accordance with AWWA standard ANSI/AWWA C504 'Rubber Seated Butterfly Valves' and unless specified otherwise in Section 01001 Supplemental Conditions, or shown on the Drawings, shall be direct bury Class 150B complete with push on type joints compatible with the class and type of pipe to which it is intended to join.

The butterfly valve shall have a fusion bonded epoxy coated cast iron body with a Buna-N encapsulated rubber disc trim, and o-ring stem seals. The valve shall be supplied complete with two (2) full faced red rubber gaskets (if flanged). The butterfly valve shall have a manual ***right hand close*** operator capable of safely withstanding a working pressure of 1000 kPa, and a pressure of 2000 kPa when open or closed. The gland and bonnet nuts and bolts and any other nuts and bolts, exposed to the atmosphere or ground, shall be T-316 stainless steel.

2.07 VALVE BOX

The valve box assembly shall be a two piece extension type with a one piece slide on cast iron casing top and PVC DR18 pipe base as shown on the Standard Drawings 1111 L & V attached to this Section. Each valve box shall be supplied complete with a tubular extension spindle with a 50 millimetre square operating nut, a plastic centering disc, cast iron valve box cover, and hinged cast iron lid. The valve box shall be vertically adjustable to suit the depth of bury specified for the

pipe and valve, plus or minus 0.3 metres. The spindle shall be of such length that when set on the valve operating nut the top of the spindle shall not be more than 150 millimetres below the lid. Each valve casing shall have an inside diameter of not less than 133 millimetres.

Valve box shall be WD Valve Box WD 46 or approved equal.

2.08 HYDRANT

The hydrant shall be manufactured in accordance with AWWA Standard ANSI/AWWA C502 'Dry Barrel Fire Hydrants for Ordinary Water Works Service', and shall be approved by the Underwriters Laboratory of Canada.

The hydrant shall be a compression shut off type with a push on type inlet compatible with the class and type of pipe to which it is intended to join. Unless specified in Section 01001, Supplemental Conditions, the hydrant shall have ***right hand open*** operation and shall have the drain hole factory plugged. The below grade hydrant barrel and boot shall be factory coated with coal tar pitch. The hydrant boot shall have a flat bottom and flat rear surface and have a flange connection to the hydrant barrel. The hydrant shall be supplied complete with a concrete support block. The hydrant shall have no more than one extension installed on the operating stem. However, more than one extension shall be permitted on the lower barrel. Hydrants shall have an easily repairable break away section centred no more than 100 millimetres above the ground line which will break when the hydrant body is struck. All nuts, bolts and washers exposed to the atmosphere or ground shall be T-316 stainless steel.

The hydrant shall have one 4 ½ inch (nominal) pumper connection and two 2 ½ inch (nominal) hose connections.

	4 ½"outlet	2 ½" outlets
Male O.D.	$5\ ^{25}/_{64}$"	3.000"
Male Root	$5\ ^{9}/_{64}$"	2.825"
Female Bore	$5\ ^{11}/_{64}$"	2.860"
Female Root	$5\ ^{7}/_{16}$"	3.050"

4 ½" outlets: 5 threads per inch with a Higbee cut.
2 ½" outlets: 8 threads per inch with a Higbee cut.

The operating and nozzle caps nuts shall be $1^1/_4$" x $1^1/_4$" square.

The hydrant body shall clearly display the following markings: AWWA, ULC, manufacturer's name and model designation, nominal id of the main valve, year of casting, direction of turning operating nut to operate main valve, and the ground line.

The hydrant body above grade shall be covered with one (1) coat of paint as follows;
Downtown Business District: Chinese Red/Black top & caps
All other City of Brandon locations: Chrome Yellow/Silver caps
Hydrants installed on private property: Blue

Approved Hydrants:
Mueller Centurion
McAvity Brigadier (96 or newer)
Canada Valve B-50 - B24

2.09 COUPLER

The coupler shall be a long body style with a minimum length of 175 millimetres and be suitable for 1000 kPa buried service. The center ring and end plates shall be fabricated of cast ductile iron to ASTM A536 and shall be fusion bonded epoxy coated to AWWA C213. Gaskets shall be manufactured of virgin rubber (ASTM type D2000 SBR) compounded for cold water service and be of the proper dimension for the size and type of pipe material(s) being joined. All nuts, bolts, washers and connecting rods exposed to the atmosphere or ground shall be T-316 stainless steel.

The coupler shall be a Viking Johnson/ Mueller 'Maxifit' or 'Maxistep' or approved equal.

The repair clamp shall be wrap around "O" style suitable for 1000 kPa buried service. All metal parts and welds shall be 304 stainless steel which has been fully passivated. Bolt shanks shall be forged flat to resist bending and the threads shall be rolled-type and lubricated by an anti-galling compound. Nuts, bolts and washers shall be T 304 stainless steel and shall be connected to turn independently without separating.

The rubber gasket shall have tapered ends, a gridded surface, stainless steel armors and manufactured of a synthetic equivalent to natural rubber. A clamp for pipe with a nominal inside diameter of 250 millimetres and less shall have a minimum of one row of no less than three bolts. A clamp for pipe with a nominal inside diameter of 300 and 350 millimetres shall have a minimum of two rows of no less than three bolts. A clamp for pipe with a nominal inside diameter of 400 millimetres and greater shall have three rows of no less than four bolts. The clamp length shall be no less than two times the nominal inside diameter of the pipe on which the clamp is to be installed.

Repair Clamps shall be Robar 5616,5626, 5636; Ford FS1, FS2; Romac SS1, SS2 or approved equal.

2.11 ANODE

The sacrificial anode shall be high grade, 99% pure, electrolytic zinc manufactured in accordance with ASTM B418, Type II, with a minimum 3.17 millimetre diameter steel core, and supplied in a permeable cloth bag or cardboard tube containing a low resistivity backfill mixture composed of 75% ground hydrated gypsum, 20% powdered Wyoming bentonite and 5% anhydrous sodium sulphate firmly packaged around the anode.The anode shall be supplied with a minimum of 3.0 metres of#12/7 stranded copper TWU, minus 40^{oc}, insulated connecting wire firmly connected to the anode core with silver solder or an approved equal. The connection shall be insulated by filling the recession and voids in the lead wire core connections with an electrical potting compound. The anode shall be shipped in a watertight package of adequate design to permit normal handling without tearing and shall be clearly labled with the manufacturer's name, the net weight, and anode type.

Connections shall be made with a thermite type welders and XF alloy type cartridge of suitable charge, and sleeves recommended by the manufacturer. The Contractor shall use a crucible and weld metal as manufactured by ERICO Products Inc ,Cadweld, Thermoweld or approved equal.

2.12 CONCRETE

Concrete used for the hydrant base block and reaction blocking shall be 20 MPa Type "C" manufactured using Type 50 sulphate resistant Portland cement as described in Section 02512, Ready Mixed Concrete.

PART 3 EXECUTION

3.01 DISRUPTION OF WATER SERVICE

The Contractor shall make every effort to minimize the disruption of water service during the Work. If the water supply must be taken out of service for a period exceeding one (1) hour, the Contractor shall make all the necessary arrangements with the City to have valves operated, and provide written notice to all addresses affected by the intended interruption a minimum of 24 hours prior to the shutting off the water. The form of notice shall be subject to the approval of the Engineer and at a minimum shall include the Contractor's name and phone number, and start and end times of the interruption of service. If the water supply must be taken out of service for a period exceeding six (6) consecutive hours, the Contractor shall, in addition to the previously stated requirements make available a water tank trailer for the use of the interrupted services. The tank shall be sound, tamper proof clean and approved by the Manitoba Department of Conservation for the storage and distribution of potable water. If the water supply must be taken out of service for a period exceeding eighteen (18) consecutive hours, the Contractor shall supply all affected services with a temporary pressurized water supply as outlined in Part 3.02 of this Section.

3.02 TEMPORARY WATER

The Contractor shall supply, install, and maintain a temporary water service as shown on the Standard Drawing STD 1111 I attached to this Section, described in Section 01001 Supplemental Conditions and as directed by the Engineer. The temporary water service shall be 50 millimetre aluminum irrigation or plastic pipe connected to a hydrant selected by the Engineer. Plastic pipe shall be joined with connections capable of withstanding internal thrust and normal distribution system operating pressures. Unobstructed pedestrian traffic along sidewalks shall be maintained at all times. Temporary water service pipe shall be protected from damage by timbers and warning signs at all street crossings. The Contractor shall flush and disinfect the
temporary water system prior to any customer being allowed to draw water from the system.
The Contractor shall dismantle and remove the temporary water system once the new watermain is put into service.

3.03 LINE AND GRADE

The Engineer will establish a line of offset hubs for horizontal and vertical control a sufficient distance from the proposed watermain alignment to allow construction to pass without disturbing the control line. Prior to commencing any Work the Contractor shall satisfy himself as to the meaning and correctness of all hubs, no claims shall be made for any alleged inaccuracies because of his failure to read same correctly. The Contractor shall maintain all hubs in good order and transfer the correct horizontal and vertical control to the watermain alignment and invert(s).

The use of a laser is required to maintain line and grade. The laser shall be set on the ground and emit its light beam along the centerline of the watermain alignment. Line and grade shall be transferred to the invert of the pipe with a boning rod and target. The Contractor shall follow the manufacture's instructions for the laser's use and ensure that a qualified operator handle the equipment during the Work. Pipe laying shall not commence until the laser setup has been approved by the Engineer. If, in the opinion of the Engineer, the Contractor's method of setting alignment and grade is inaccurate or insufficient, the Engineer may direct that a more suitable method be used to ensure that accurate grade and /or alignment is maintained.

3.04 TOLERANCES

Watermain pipe, fittings, appurtenances, valves, hydrants, and service connections shall be installed accurately to the required line and grade shown on the Drawings or as set out on the Site by the Engineer. Vertical and horizontal variance from line shall not exceed 25 millimetres. Sharp bends will not be permitted even thought the pipe remains within the manufacturer's recommended tolerances.

3.05 EXCAVATION

Excavation shall be in accordance with Section 02210, Excavation Bedding & Backfill.

3.06 CONNECTION TO EXISTING MAIN

The Contractor shall make a connection to an existing watermain where shown on the Drawings and as directed by the Engineer. The Contractor shall notify the City, and all others affected by any interruption in water service as stated in Part 3.01 of this Section.

The Contractor shall carefully excavate, expose and clean the existing watermain and/or fitting and remove the existing thrust blocking and plug. If a bell and plug do not exist, the Contractor shall carefully cut and trim the existing watermain pipe and install either a new fitting complete with end pieces of new pipe, or join a new section of pipe to the existing watermain. The interior of the existing pipe and the new pipe or fitting shall be disinfected with a solution containing 50 ppm of chlorine prior to joining the new watermain to the existing bell. Joining of pipe and fittings shall be as described in Part 3.07 of this Section. All connections made without a bell and spigot joint shall be made with an approved coupling in strict accordance with the manufacturer's printed installation instructions. Pipes shall be neatly cut at a right angle to the axis of the pipe and all surfaces shall be smooth, free of dirt, corrosion and burs. Pipes shall be aligned correctly, and the installed coupling shall form a watertight connection. Under NO circumstances shall two pipes be connected with a repair clamp.

If a connection is made with a tapping sleeve, the Contractor shall install and hydrostatically test each tapping sleeve and valve assembly prior to tapping the existing watermain. The Contractor shall install a plug on the tapping valve outlet and backfill the excavation if the water main is not connected to the tapping valve within 48 hours following completion of the tap.

3.07 INSTALLATION OF PIPE

Each section of watermain pipe shall be accurately placed on a dry, firm but slightly yielding foundation of bedding material to the line and grade stated in Parts 3.03 and 3.04 of this Section and backfilled as described in Section 02210 Excavation Bedding & Backfill. The watermain shall be installed at a depth below the proposed finished ground elevation to provide a minimum of 3.0 metres of cover above the top of the pipe and fittings. Pipe laying shall proceed as directed by the Engineer upgrade with the bell ends facing in the direction of installation.

All watermain pipe and fittings shall be joined using elastomeric gaskets and in strict accordance with the pipe manufacturer's printed assembly instructions to form a watertight connection with the adjoining pipe. Prior to joining

pipes, the Contractor shall obtain the approval of the Engineer for the method of joining to be used and, if requested, shall demonstrate, his ability to carry out the method proposed. Extreme care should be taken during joining to insure that all interior and exterior joining surfaces are clean and free of any foreign materials. Displaced or contaminated gaskets shall be removed, cleaned and lubricated or replaced prior to joining. Pipes shall be carefully aligned and inserted by hand, bar and wooden block, lever type or friction pullers. The use of hydraulic excavation equipment as the means of pushing or moving the pipe to grade will not be permitted. Each joint shall be satisfactorily completed prior to installation of the next length of pipe. The Contractor shall check the gasket to ensure it has not pushed out of the seat and it is uniformly compressed around the circumference of the pipe.

The Contractor will not be permitted to deflect straight pipe sections to create curves or correct alignment errors. Curves and bends on pipes shall be made with either radius pipe or approved fittings. Pipe shall be cut square with a fine toothed hand saw, power saw, hack saw, or disk cutter, but not with a chain saw. The spigot end of solid wall PVC pipe shall be bevelled. At the end of each workday, or when watermain pipe is not being installed, the open end of the pipe shall be protected by a close fitting stopper to keep the pipe clean, with adequate precautions taken to overcome possible uplift. Plugs shall be installed complete with restrainer clamp and stainless steel tie-rods as a means of additional trust restraint.

3.08 VALVE & VALVE BOX

Each valve and valve box shall be installed at the locations shown on the Drawings, as directed by the Engineer, or as specified in Section 01001 Supplemental Conditions all in accordance with the Standard Drawings STD 1111L,V attached to this Section, or as shown on the Drawings.

Prior to backfilling, the Contractor shall wrap the valve and bottom one metre of the valve casing with 6 mil polyethylene film to prevent any debris from entering the bottom of the valve casing. The valve lid shall be installed so that the lid closes with the direction of traffic.

The valve box base shall be set evenly on the valve bonnet, supported so it does not transmit shock or stress to the valve and braced to prevent lateral movement to the sides of the trench. The valve stem, casing and/or extension shall be installed plumb and centered on the valve nut. The valve box casing and top shall be adjusted to the elevation required to facilitate the progress of the Work prior to being set at the finished grade as shown on the Drawings as directed by the Engineer. A valve box, which is not plumb or centred over the valve nut, shall be excavated and set properly at the Contractor's sole expense.

A 32 millimetre x 89 millimetre x 2 metre wooden valve marker post (painted red) shall be installed (minimum bury 0.9 metres) at all valve locations, excluding gravel and paved roadways.

3.09 HYDRANTS

The hydrant shall be installed at the locations and to the elevations shown on the Drawings, as directed by the Engineer, or as specified in Section 01001 Supplemental Conditions all in accordance with the Standard Drawings STD 1111J attached to this Section, or as detailed on the Drawings.

Each hydrant shall be installed plumb with the pumper connection facing the street. Hydrants shall be connected to the watermain by a hydrant lead complete with a gate valve installed on the lead not less than 1.0 metre from the Hydrant. Concrete reaction blocking (thrust blocks) shall be installed at each cross, tee, bend, reducer, plug and hydrant as shown on the Standard Drawing STD 1111H attached to this Section and as directed by the Engineer.

Reaction blocking shall be placed between solid undisturbed trench soil and the fitting or hydrant base in such a manner as not to interfere with the base flange barrel bolts or restraining rods and joint flexibility is not restricted. The entire face of the excavation against which the block bears shall be flat and at the proper angle with the pipe. A bond breaker consisting of 8 mil polyethylene sheeting shall be installed between fitting or hydrant and the concrete to enable future removal of the thrust block. No horizontal struts or braces required for trench bracing shall remain in the concrete thrust block. Prior to any concrete being placed, all thrust block form work shall be inspected and approved by the Engineer.

3.10 THRUST RESTRAINT

Joint restraint clamps as described in Part 2.04 of this Section shall be installed at all cross, tee, bend, reducer, plug, valve and hydrant to pipe connections unless directed otherwise by the Engineer. The supply and installation of joint restraint clamps shall be considered incidental to the supply of the cross, tee, bend, reducer, plug, valve or hydrant.

The Engineer may also direct that assemblies of fittings and valves be permanently tied together with restraint rods. Restraint rods, nuts, bolts and washers shall be T-316 stainless steel with the length and diameter as directed by the Engineer. The supply and installation of stainless steel joint restraint rods, nuts, bolts and washers shall be as a Change in Work unless noted otherwise in Section 01001 Supplemental Conditions.

3.11 SACRIFICIAL ANODES

Sacrificial anodes shall be installed on all new metal pipe, fittings, hydrants, valves, couplers, encasement pipes and at any location where the existing uncoated metallic distribution system is exposed or as directed by the Engineer all in accordance with the Standard Drawings STD 1111W,X attached to this Section.

The Contractor shall install, a 16.3 kilogram (36 lb) anode on an existing cast iron watermain/fitting connected to a new watermain/fitting. The Contractor shall install a 5.4 kilogram(12 lb) anode on a new cast iron fitting, valve, or hydrant installed on a non-metallic watermain.

The anode shall not be transported by the anode connecting wire. The Contractor shall remove the plastic bag from the anode, and place the anode, with cardboard or cloth container intact at the same elevation or deeper and parallel to the pipe or fitting. Anodes shall be placed a minimum distance of 1.0 metre from the watermain or any other anode. The Contractor shall backfill and uniformly compact native soil backfill around the anode and pour a minimum of 10 litres of water on the anode to initiate the anode operation.

The Contractor shall thermite weld (Cadweld) the anode wire by first removing a small portion of any coating material from the area where the weld will be made and file or grind the surface to a shiny roughened metal area approximately 75

millimetres square. The Contractor shall insure the pipe surface and mould are dry during all welding operations. The Contractor shall then firmly crimp a copper sleeve onto the bared end of the wire to be welded. The type of crucible and weld metal shall be in accordance with the manufacturer's specifications and the pipe diameter. The Contractor shall remove any slag from the completed weld, file sharp edges smooth and verify the wire is securely fastened to the pipe. Finally he shall thoroughly coat the weld and adjacent area that has had the coating removed with Polyken 927 primer and apply a moulded plastic patch 'Handicap' as manufactured by ERICO, or approved equal.

3.12 TESTING

Prior to acceptance of the Work, the entire watermain shall be hydrostatic pressure tested in the presence of the Engineer. The length of pipe to be tested shall not exceed the distance between neighbouring valves unless otherwise directed by the Engineer. Hydrostatic testing shall not commence until at least 7 calendar days after the installation of the last thrust block on the watermain. All water used for testing and flushing the watermain shall be potable and unless stated otherwise in Section 01001 Supplemental Conditions will be supplied by the City, at no cost to the Work, in sufficient quantity to disinfect and flush the watermain once. Water required for additional disinfection and/or flushing will be supplied by the City at the Contractor's sole expense.

The Contractor shall provide all necessary labour, materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plugs, valves, liquid filled pressure gauges capable of reading a minimum pressure change of 7kPa (1psi) and all other appurtenances necessary for filling and pressurizing the pipe and recording the pressure and leakage losses. If requested by the Engineer, the Contractor shall provide evidence that the pressure gauges used are accurate.

If stated in Section 01001 Supplemental Conditions the Contractor shall pass three (3) foam swabs through the new watermain in succession to remove any accumulations of debris prior to the hydrostatic testing. The watermain shall be slowly filled from the lowest point possible, at a maximum

velocity of 0.5 metres per second with water from a hydrant or main tap selected by the Engineer. All corporation valves, main line valves and hydrants shall be open and all curb stop valves shall be closed. Entrapped air shall be expelled from the watermain at each hydrant, vent, flushout or through a temporary corporation valve installed by the Contractor at a high point(s) selected by the Engineer. When the watermain and building service lines have been completely filled with water and all entrapped air removed, the watermain shall be maintained in a static state at the required test pressure for a minimum of five (5) minutes with NO change in the pressure reading prior to commencing the hydrostatic test.

The hydrostatic test pressure shall be 1035 kPa (150 psi) or the maximum operating pressure for the class of pipe being tested, whichever is less. The watermain shall be maintained in a static state at the required test pressure for one (1) hour with all intermediate main valves and corporation valves open and the curb stops closed. A loss of pressure in excess of 14 kPa (2psi) over the one hour test period will be considered a failure, and the entire test will be repeated until the loss of pressure is within the limit stated above. Following the one hour test period, any loss of water in the test barrel due to a change in pressure shall be replaced by pumping a measured quantity of water into the test section until the original test pressure is again established and held without change.

Where connections are made to existing water mains, the pressure used to test sections of new mains which cannot be isolated from the existing mains shall be established by the Engineer. This shall not relieve the Contractor from his obligation to repair leaks or replace defective material.

The test section will not be accepted if the leakage in **litres per hour per 100 joints** is greater than that specified below for each size of watermain pipe;

150mm 2.1 litres/hour/100 joints
200mm 2.8 litres/hour/100 joints
250mm 3.5 litres/hour/100 joints
300mm 4.2 litres/hour/100 joints
400mm 5.6 litres/hour/100 joints
450mm 6.3 litres/hour/100 joints
600mm 8.5 litres/hour/100 joints

If the leakage exceeds the allowable, the Contractor shall locate and repair the leak or defect and repeat the hydrostatic test until the leakage does not exceed the allowable stated above.

Upon completion of a successful hydrostatic test, the Contractor shall remove all temporary air bleed lines and close the main (corporation) valve.

3.13 DISINFECTION

All new or repaired watermains and building connections shall be chlorinated throughout their entire lengths prior to being placed into service. The method used to introduce the disinfectant into the watermain shall be approved by the Engineer. Acceptable forms of chlorine which may be used to prepare disinfecting solutions include calcium hypochlorite granules or sodium hypochlorite solutions.

The chlorine shall be injected into the watermain at an initial concentration of fifty parts per million (50mg/l) of available chlorine and held for a minimum period of 24 hours, during which all valves and accessories shall be operated several times to allow penetration of the chlorine solution. Disinfection will be accepted when after the 24 hour chlorine contact period, the chlorine residual in the watermain as measured by the Engineer is *greater than* 5 parts per million (5mg/l). If the chlorine residual is less than or equal to 5 parts per million, the entire disinfection process shall be repeated until an acceptable reading is obtained.

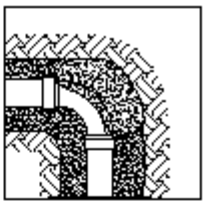
Once an acceptable reading is obtained the Contractor shall thoroughly flush the watermain until the quality of the water within the new watermain is equal to that within the existing distribution system. The water used for flushing and disinfection shall be discharged in a method approved by the Engineer and in accordance with Manitoba Conservation guidelines. No water shall be discharged into a body of water until the chlorine concentration is less than 0.1 mg/l.

When the watermain has been hydrostatic tested, disinfected and flushed to the satisfaction of the Engineer, the Engineer will open all valves and curb stops and place the watermain into service.

END OF SECTION

MIN. BEARING AREAS OF THRUST BLOCKS

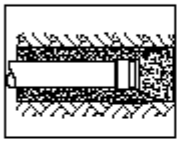
PIPE DIA.	TEES DEAD ENDS	90° BENDS	45° BENDS	22 1/2°
100mm	.19 m^2	.27 m^2	1.4 m^2	.08 m^2
150mm	.37 m^2	.51 m^2	.27 m^2	1.4 m^2
200mm	.60 m^2	.88 m^2	.46 m^2	.27 m^2
250mm	1.02 m^2	1.44 m^2	.79 m^2	.42 m^2
300mm	1.44 m^2	2.04 m^2	1.11 m^2	.56 m^2
375mm	2.32 m^2	3.67 m^2	2.00 m^2	1.02 m^2

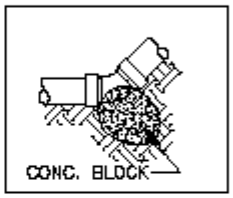


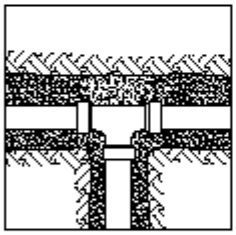
TYPICAL THRUST BLOCK AT 90° BENDS

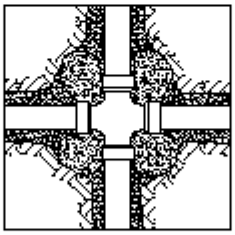
NOTE:

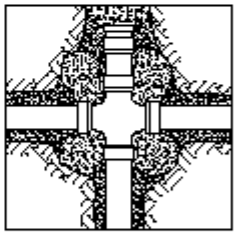
1. ALL CONCRETE TO BE 20 Mpa.
2. ALL BLOCKING IS TO BE AGAINST UNDISTURBED SOLID GROUND.



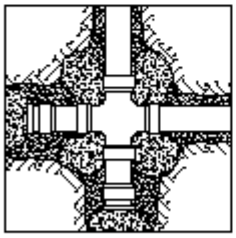


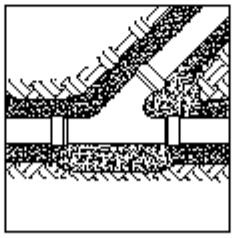


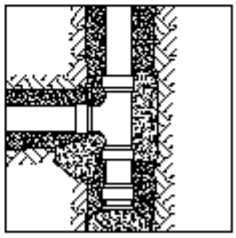




THRUST BLOCKS FOR FITTINGS

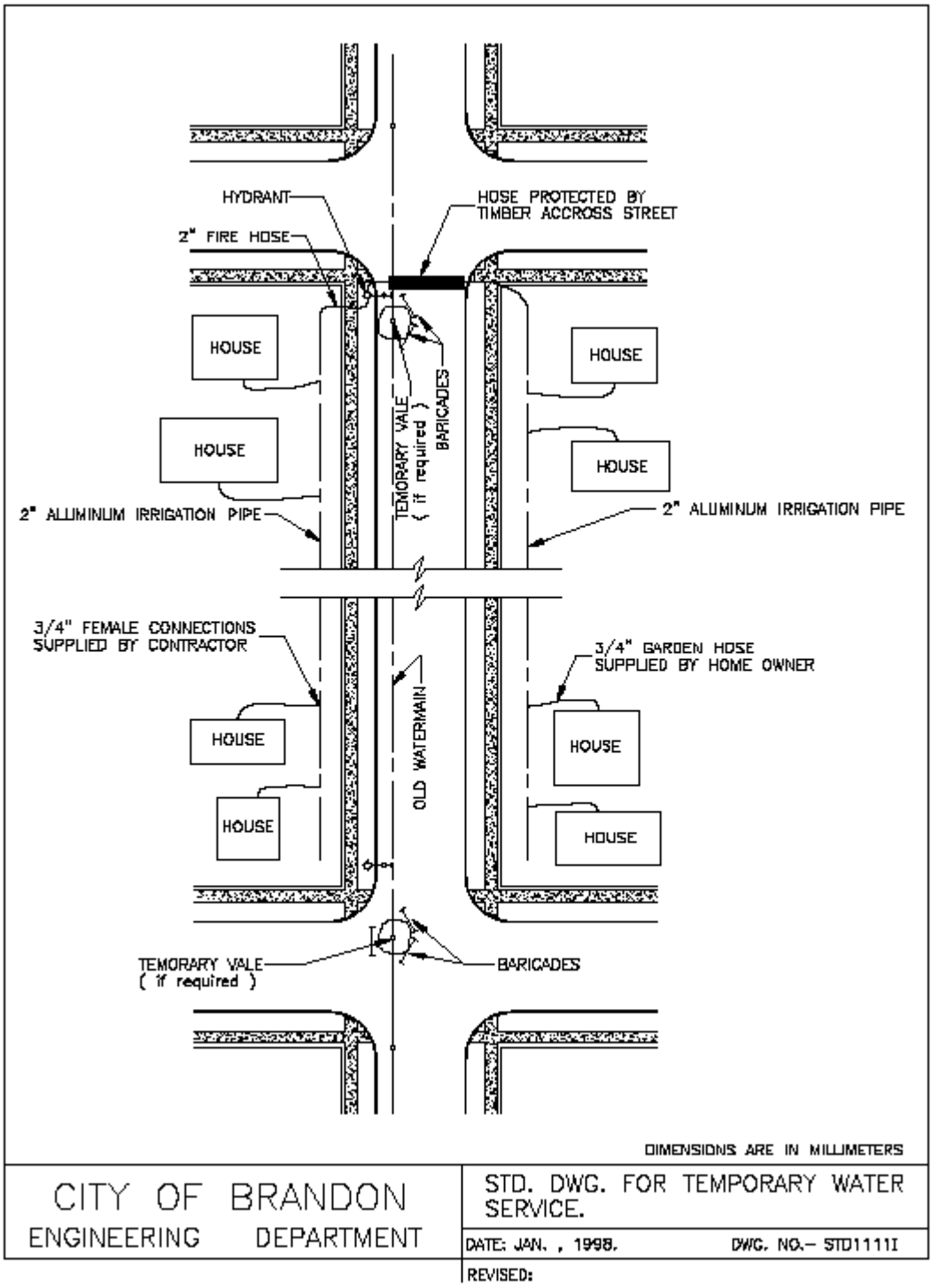


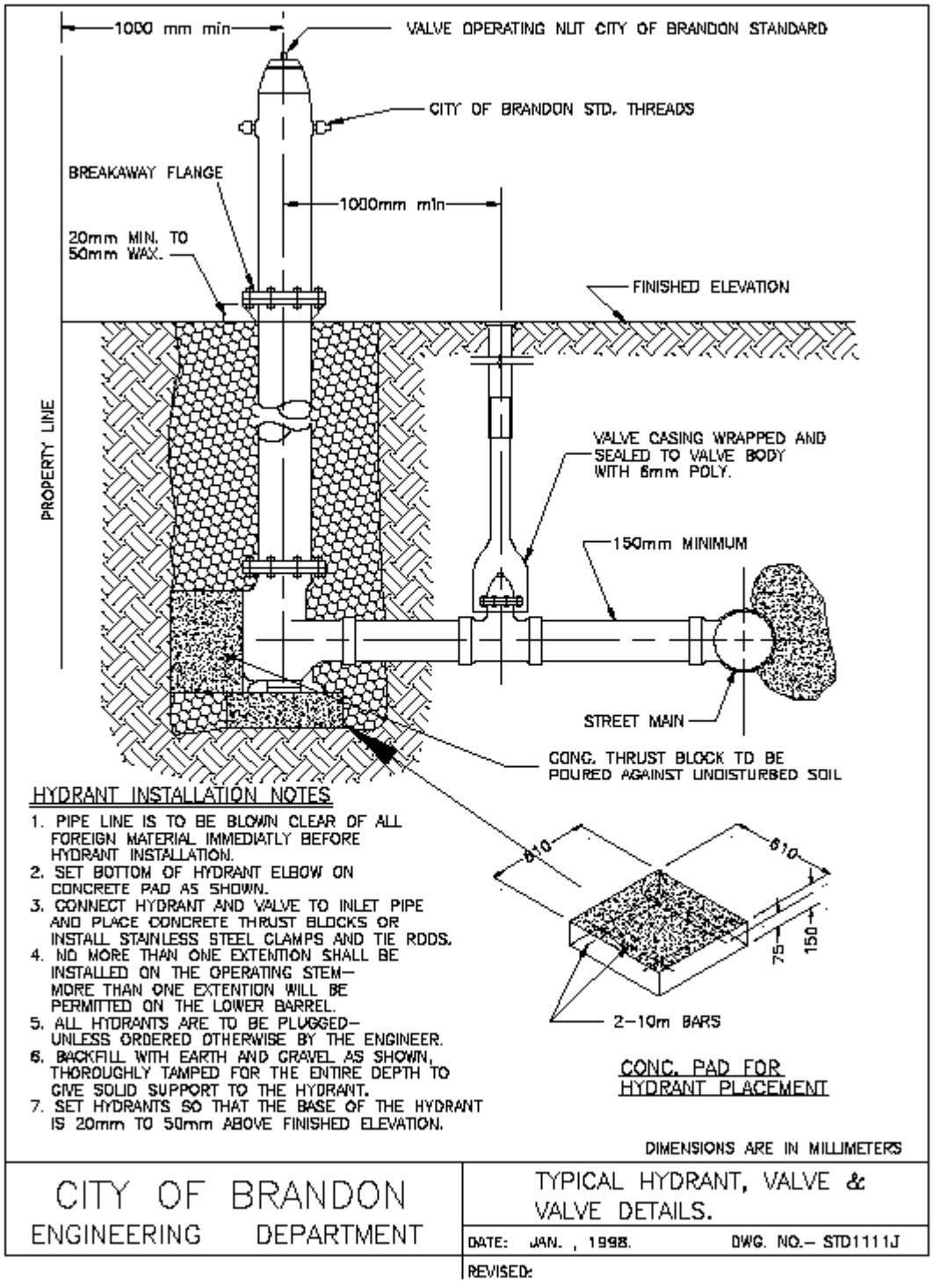


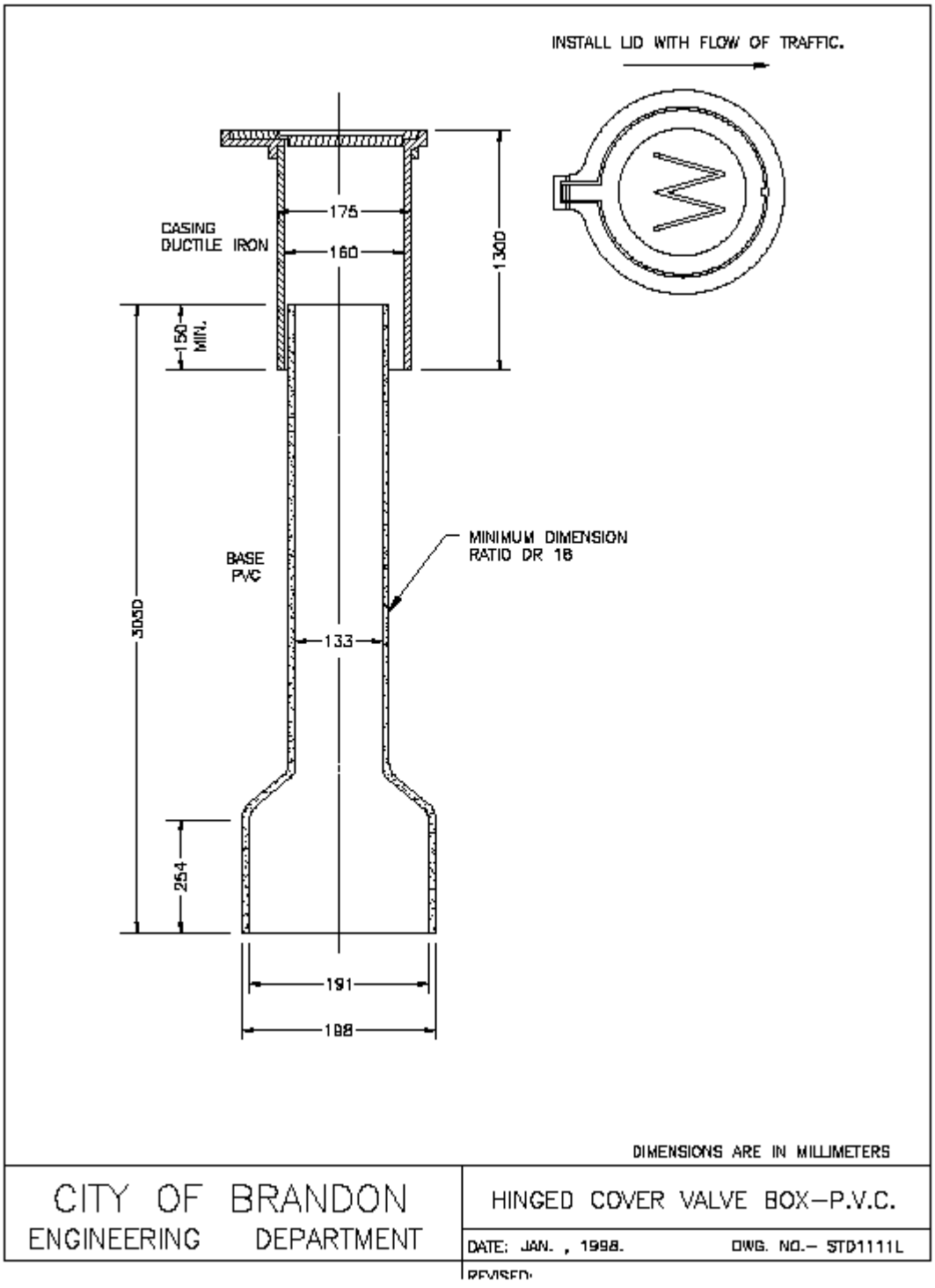


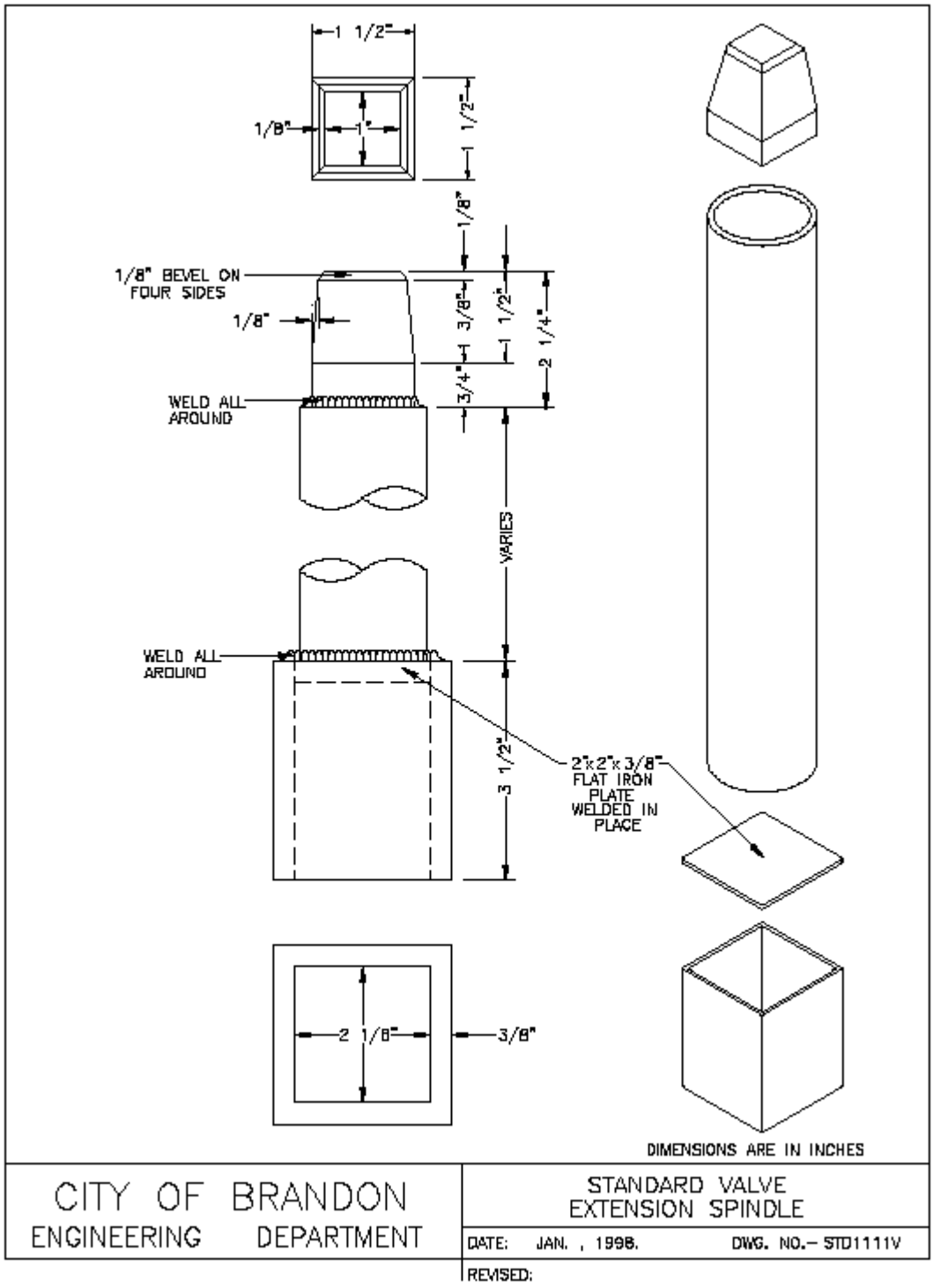
DIMENSIONS ARE IN MILLIMETERS

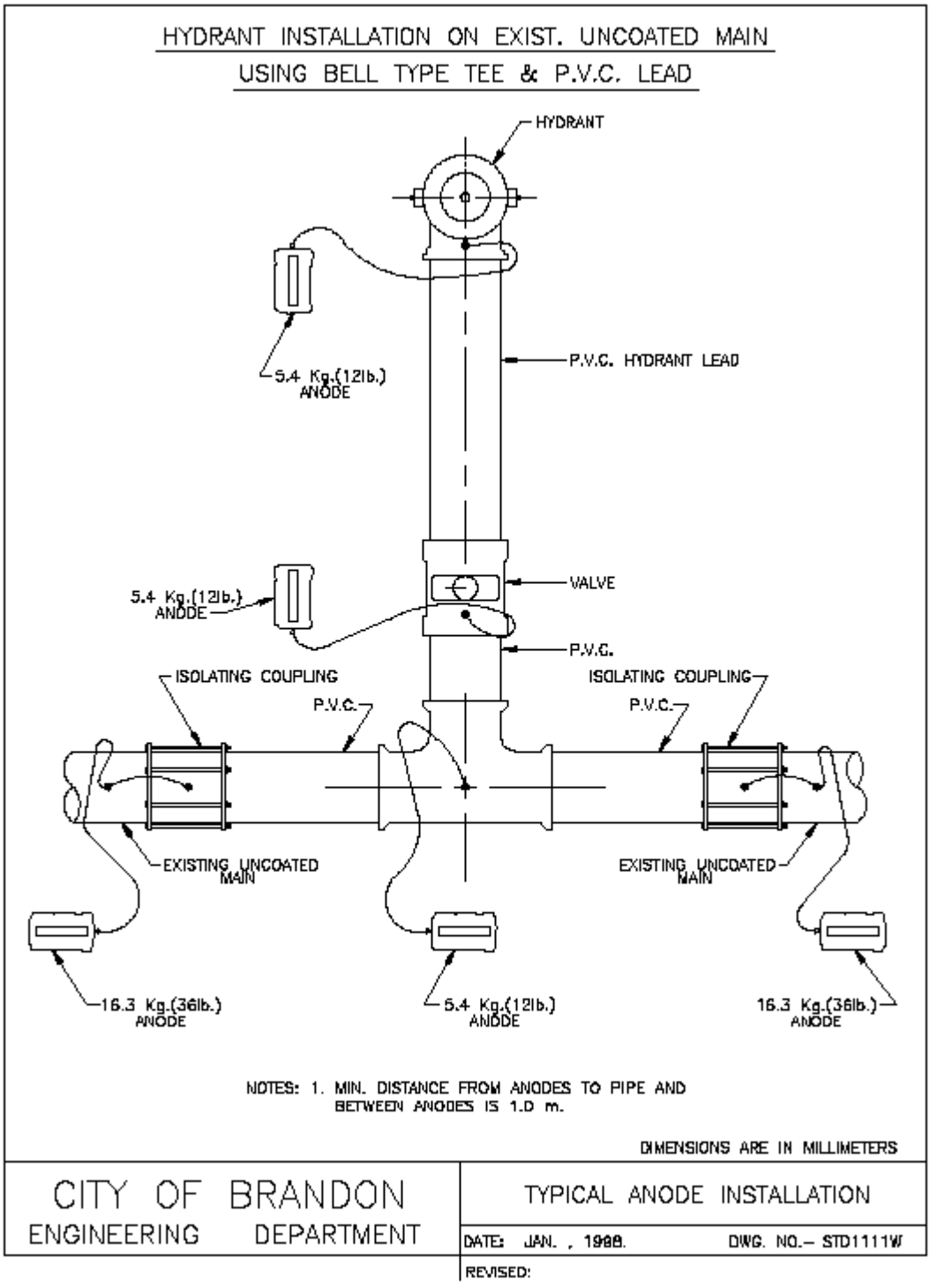
CITY OF BRANDON ENGINEERING DEPARTMENT	STANDARD THRUST BLOCKS
	DATE: JAN. , 1998. DWG. NO.– STD1111H
	REVISED:

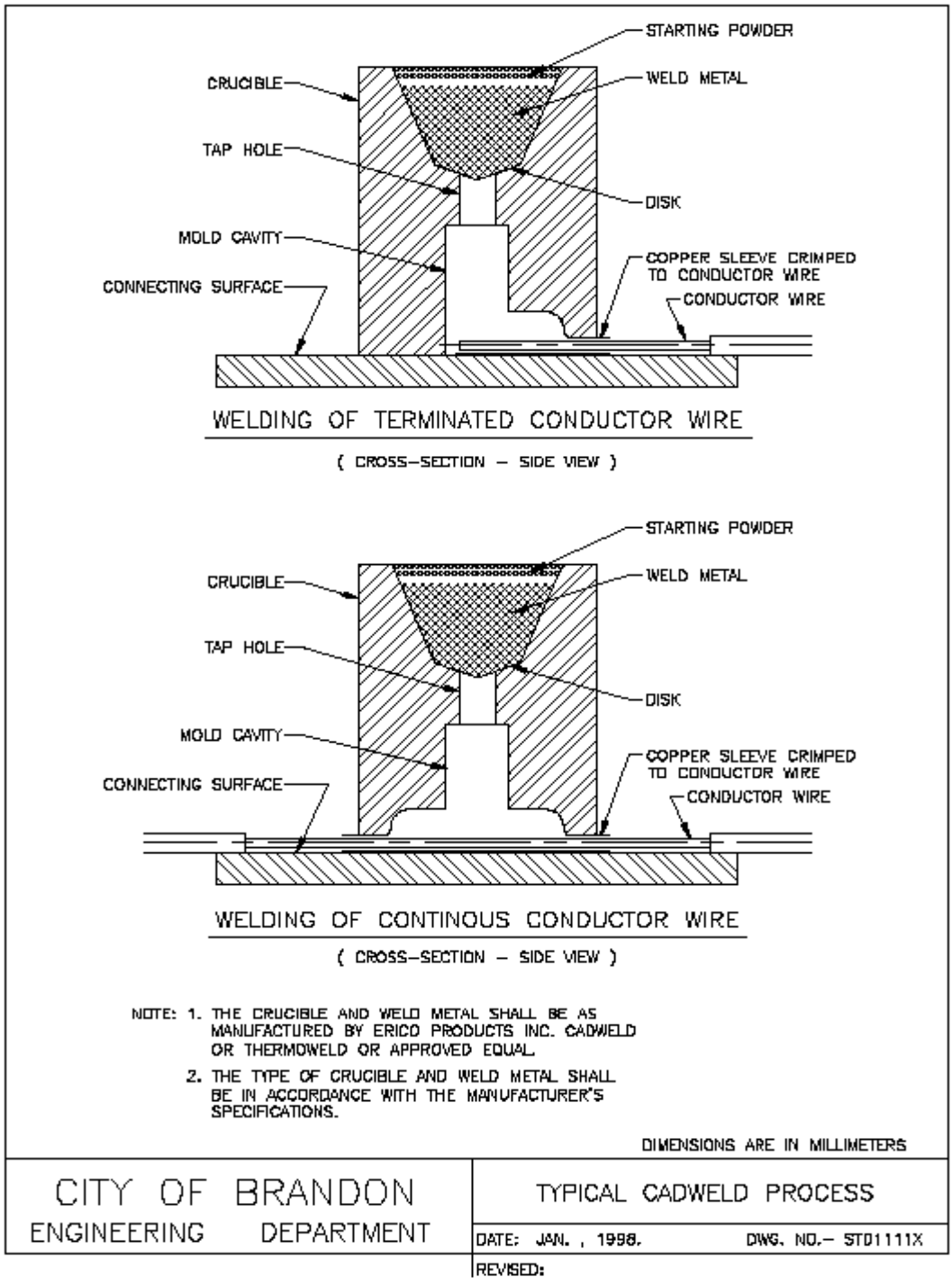

HYDRANT
2" FIRE HOSE
HOSE PROTECTED BY TIMBER ACCROSS STREET
HOUSE
HOUSE
HOUSE
HOUSE
TEMORARY VALE (if required)
BARICADES
2" ALUMINUM IRRIGATION PIPE
2" ALUMINUM IRRIGATION PIPE
3/4" FEMALE CONNECTIONS SUPPLIED BY CONTRACTOR
3/4" GARDEN HOSE SUPPLIED BY HOME OWNER
OLD WATERMAIN
HOUSE
HOUSE
HOUSE
HOUSE
TEMORARY VALE (if required)
BARICADES
DIMENSIONS ARE IN MILLIMETERS
CITY OF BRANDON
ENGINEERING DEPARTMENT
STD. DWG. FOR TEMPORARY WATER SERVICE.
DATE: JAN. , 1998.
DWG. NO.- STD1111I
REVISED:


1000 mm min
VALVE OPERATING NUT CITY OF BRANDON STANDARD
CITY OF BRANDON STD. THREADS
BREAKAWAY FLANGE
1000mm min
20mm MIN. TO
50mm MAX.
FINISHED ELEVATION
PROPERTY LINE
VALVE CASING WRAPPED AND
SEALED TO VALVE BODY
WITH 6mm POLY.
150mm MINIMUM
STREET MAIN
CONC. THRUST BLOCK TO BE
POURED AGAINST UNDISTURBED SOIL
610
610
75
150
2-10m BARS
CONC. PAD FOR
HYDRANT PLACEMENT
HYDRANT INSTALLATION NOTES
1. PIPE LINE IS TO BE BLOWN CLEAR OF ALL FOREIGN MATERIAL IMMEDIATLY BEFORE HYDRANT INSTALLATION.
2. SET BOTTOM OF HYDRANT ELBOW ON CONCRETE PAD AS SHOWN.
3. CONNECT HYDRANT AND VALVE TO INLET PIPE AND PLACE CONCRETE THRUST BLOCKS OR INSTALL STAINLESS STEEL CLAMPS AND TIE RODS.
4. NO MORE THAN ONE EXTENTION SHALL BE INSTALLED ON THE OPERATING STEM— MORE THAN ONE EXTENTION WILL BE PERMITTED ON THE LOWER BARREL.
5. ALL HYDRANTS ARE TO BE PLUGGED— UNLESS ORDERED OTHERWISE BY THE ENGINEER.
6. BACKFILL WITH EARTH AND GRAVEL AS SHOWN, THOROUGHLY TAMPED FOR THE ENTIRE DEPTH TO GIVE SOLID SUPPORT TO THE HYDRANT.
7. SET HYDRANTS SO THAT THE BASE OF THE HYDRANT IS 20mm TO 50mm ABOVE FINISHED ELEVATION.
DIMENSIONS ARE IN MILLIMETERS
CITY OF BRANDON
ENGINEERING DEPARTMENT
TYPICAL HYDRANT, VALVE & VALVE DETAILS.
DATE: JAN. , 1998.
DWG. NO.- STD1111J
REVISED:


INSTALL LID WITH FLOW OF TRAFFIC.
175
160
CASING
DUCTILE IRON
1300
150
MIN.
MINIMUM DIMENSION
RATIO DR 18
BASE
PVC
305D
133
254
191
198
DIMENSIONS ARE IN MILLIMETERS
CITY OF BRANDON
ENGINEERING DEPARTMENT
HINGED COVER VALVE BOX—P.V.C.
DATE: JAN. , 1998.
DWG. NO.— STD1111L
REVISED:


1 1/2"
1/8"
1"
1 1/2"
1/8"
1/8" BEVEL ON FOUR SIDES
1/8"
1 3/8"
1 1/2"
2 1/4"
3/4"
WELD ALL AROUND
VARIES
WELD ALL AROUND
3 1/2"
2"x2"x 3/8" FLAT IRON PLATE WELDED IN PLACE
2 1/8"
3/8"
DIMENSIONS ARE IN INCHES
CITY OF BRANDON
ENGINEERING DEPARTMENT
STANDARD VALVE EXTENSION SPINDLE
DATE: JAN. , 1998.
DWG. NO.- STD1111V
REVISED:


HYDRANT INSTALLATION ON EXIST. UNCOATED MAIN
USING BELL TYPE TEE & P.V.C. LEAD
HYDRANT
P.V.C. HYDRANT LEAD
5.4 Kg.(12lb.) ANODE
VALVE
5.4 Kg.(12lb.) ANODE
P.V.C.
ISOLATING COUPLING
P.V.C.
ISOLATING COUPLING
P.V.C.
EXISTING UNCOATED MAIN
EXISTING UNCOATED MAIN
16.3 Kg.(36lb.) ANODE
5.4 Kg.(12lb.) ANODE
16.3 Kg.(36lb.) ANODE
NOTES: 1. MIN. DISTANCE FROM ANODES TO PIPE AND BETWEEN ANODES IS 1.0 m.
DIMENSIONS ARE IN MILLIMETERS
CITY OF BRANDON
ENGINEERING DEPARTMENT
TYPICAL ANODE INSTALLATION
DATE: JAN. , 1998.
DWG. NO.– STD1111W
REVISED:



END OF SECTION