

---

## REVISION INFORMATION SHEET

### CITY OF HAMILTON

## CONSTRUCTION AND MATERIALS SPECIFICATIONS MANUAL

### REVISION #2 – January 2011

This revision shall take effect on February 1, 2011. Each Manual holder is responsible for determining implementation dates and directions for use of these revisions. It is recommended that you retain superseded versions of specifications for future reference.

### ACCESS TO HAMILTON STANDARDS

All specifications and drawings are available free of charge online at the City of Hamilton website at [www.hamilton.ca](http://www.hamilton.ca). Here you will find the latest versions of the published standards, archives of the previously published standards and Revision Information Sheets for currently published standards.

Hard-copy paper versions of the standards are available for a fee of \$87.72 through our offices located at:

Public Works Department – Reception  
77 James Street North, Suite 320  
Hamilton, Ontario, L8K 6E9  
Call 905 546-2424, Ext. 4170.

### Approved Products Lists also available on “The Road Authority” website

As of April 2008, all approved products in the Road, Watermain and Sewer related product category will also be posted on the City of Hamilton’s “Pre-qualified Products” List on *The Road Authority’s* (TRA’s) web site at [www.roadauthority.com](http://www.roadauthority.com). This “online” list will be updated periodically throughout the year as revisions are made. Any Approved Products List may be revised at any time to suit specific project or tendering requirements, at the sole discretion of the City.

Where conflicts arise, the Approved Product List contained in the Construction and Material Specifications Manual shall take precedence.

## Revisions to the Construction and Materials Specifications Manual:

### 1. List of Revised Documents

Superseded / Cancelled (Remove)		Revised / New (Insert)		Comments
Document	Dated	Document	Dated	
Construction and Material Specification Manual Index	---	Construction and Material Specification Manual Index	January 2011	Updated
Form 100 Instructions to Bidders	June 2007	DELETED	----	Replaced by "Instructions To Bidders" bound in contract documents only
Form 200 General Conditions	June 2006	Form 200 General Conditions	January 2011	See revision summaries
Form 400 Specification for the Installation of Watermains	June 2006	Form 400 Specification for the Installation of Watermains	January 2011	See revision summaries
Form 500 Specification for Sewer Pipe Materials and CCTV Inspection	June 2006	Form 500 Specification for the Sewer Pipe Materials and CCTV Inspection	January 2011	See revision summaries
Form 1000 Amendments to OPSS and OPSD	June 2006	Form 1000 Amendments to OPSS and OPSD	January 2011	Updated
Approved Watermain Products List	June 2006	Approved Watermain Products List	January 2011	Updated
Approved Sewer Products List	June 2006	Approved Sewer Products List	January 2011	Updated
Standard Road Drawing Index	June 2006	Standard Road Drawing Index	January 2011	Updated
Standard Watermain Drawing Index	June 2006	Standard Watermain Drawing Index	January 2011	Updated
Standard Sewer Drawing Index	June 2006	Standard Sewer Drawing Index	January 2011	Updated

## 2. Revision Summaries

These summaries are for information purposes and will highlight major or substantial changes only. Each document should be reviewed in its entirety.

### Revisions to Form 200 – General Conditions

---

- 200.01 - Definitions and Interpretation: revisions to listed definitions.
- 200.02.01 - Notice to Proceed: new paragraph added.
- 200.02.02 - Successful Bidder Responsibilities: new paragraph added.
- 200.03.01 - Performance and Other Security: Payment bond and labour and Material Payment Bond amounts specified.
- 200.04.10 - Conflict and Omissions - wording revised.
- 200.06.02 - Contingency Allowance: new paragraph added.

### Revisions to Form 400 – Specification for the Installation of Watermains

---

- Molecularly oriented polyvinyl chloride (PVCO), Pressure Class 150(PC150), DR18 conforming to AWWA C909 approved for use in 100mm to 300mm sizes.
- Revisions to valve chamber requirements and shop drawing submissions.
- Pipe restraint requirements updated.
- Tracer wire treatment at valve boxes revised.
- End covers required on watermain pipe delivered to site.
- All proposed or replacement hydrant lead and large diameter water service pipe material (DI or PVC) shall match the proposed watermain pipe material. Fittings at the watermain can be either DI or PVC.

### Revisions to Form 500 – Specification for Sewer Pipe Materials and CCTV Inspection

---

- Precast concrete products shall be from a plant listed as prequalified by the Ontario Concrete Pipe Association.
- CCTV Data format requirements updated.

### Revisions to Form 1000 – Amendments to OPSS and OPSD

---

- References updated.

### Revisions to the Approved Watermain Products List

---

- Product listings updated and expanded.
- Standards references updated.

### Revisions to the Approved Sewer Products List

---

- Precast concrete products shall be from a plant listed as prequalified by the Ontario Concrete Pipe Association.

### 3. Standard Drawing Revisions

Superseded / Cancelled (Remove)		Revised / New (Insert)		Remarks
Drawing No.	Dated	Drawing No.	Dated	
RD-103	Nov 2005	RD-103	Jan 2011	Combined Concrete Walk and Curb and Independent Concrete Walk
RD-104	Nov 2005	RD-104	Jan 2011	Asphalt Sidewalk
RD-106	Nov 2005	RD-106	Jan 2011	Standard Approach
RD-119.03	Nov 2005	RD-119.03	Jan 2011	Measurement for Payment Diagram Realignment/Widening/Narrowing
DT:0111-01	Mar 2005	DT:0111-01	Dec 2008	Typical Installation of Underground Traffic Control Devices
WM-203.04	Nov 2005	WM-203.04	Jan 2011	Operating Nut Adaptor for Use on Open Clockwise (Right) Valves
WM-204.01	Nov 2005	WM-204.01	Jan 2011	Concrete Anchor Blocks For 300mm Dia. Watermains And Smaller
WM-204.02	Nov 2005	WM-204.02	Jan 2011	11-1/4° & 22-1/2° Angle Anchor Block Details for 400mm to 600mm Dia. D.I. Watermains
WM-204.03	Nov 2005	WM-204.03	Jan 2011	45° Angle Anchor Block Details for 400mm to 900mm Dia. D.I. Watermains
WM-204.04	Nov 2005	WM-204.04	Jan 2011	45° Angle Anchor Block with Leg for 400mm to 900mm Dia. D.I. Watermains
WM-204.05	Nov 2005	WM-204.05	Jan 2011	90° Angle Anchor Block Details for 400mm to 900mm Dia. D.I. Watermains
WM-204.06	Nov 2005	WM-204.06	Jan 2011	90° Angle Anchor Block with Leg for 400mm to 900mm Dia. DI Watermains
WM-204.07	Nov 2005	WM-204.07	Jan 2011	Tee Anchor Block Details for 400mm to 900mm Dia. D.I. Watermain Branches
WM-204.08	Nov 2005	WM-204.08	Jan 2011	Tee Anchor Block with Leg for 400mm to 900mm Dia. D.I. Branch Watermains

### 3. Standard Drawing Revisions...Cont'd.

Superseded / Cancelled (Remove)		Revised / New (Insert)		Remarks
Drawing No.	Dated	Drawing No.	Dated	
WM-204.09	Nov 2005	WM-204.09	Jan 2011	Concrete Thrust Block for 400mm to 900mm Dia. D.I. Watermains
WM-204.10	Nov 2005	WM-204.10	Jan 2011	Concrete Anchor Blocks for 100mm to 300mm Dia. D.I. Watermains at 11 1/4° & 22 1/2° Vertical Bends
WM-204.11	Nov 2005	WM-204.11	Jan 2011	Concrete Anchor Blocks for 100mm to 300mm Dia. D.I. Watermains at 45° Vertical Bend
WM-204.12	Nov 2005	WM-204.12	Jan 2011	Vertical Bend Anchor Block 7 1/2° to 22 1/2° for 400mm to 900mm Dia. D.I. Watermain
WM-204.13 (2 of 2)	Nov 2005	WM-204.13 (2 of 2)	Jan 2011	Concrete Anchor Block for 100mm to 300mm Dia. Watermain Lowering
WM-230	Nov 2005	WM-230	Jan 2011	2400mm Precast Valve chamber for 400mm Dia. Concrete or Ductile Iron Pipe with 50mm Air Valve & 100mm Blow-Off (Size 24" x 36")
WM-231	Nov 2005	WM-231	Jan 2011	1800mm x 2400mm Precast Valve Chamber for 450mm Dia. or 500mm Dia. Concrete or Ductile Iron Pipe (Size 24" x 36")
WM-232	Nov 2005	WM-232	Jan 2011	1800mm Precast Valve Chamber for 400mm to 500mm Dia. Concrete or Ductile Iron Pipe with 50mm Air Valve & 100mm Blow-Off (Size 24" x 36")
WM-233	Nov 2005	WM-233	Jan 2011	1800mm x 3000mm Precast Valve Chamber for 400mm Dia. Concrete or Ductile Iron Pipe with 100mm Dia. to 300mm Dia. Branch (Size 24" x 36")

**CITY OF HAMILTON**  
**CONSTRUCTION AND MATERIAL**  
**SPECIFICATIONS MANUAL**

**INDEX**

**GENERAL CONDITIONS**

200	General Conditions
300	General Construction Requirements

**STANDARD SPECIFICATIONS**

400	Specifications for the Installation of Watermains
500	Specification for Sewer Pipe Materials
600	Specification for Granular Fill Materials
700	Specification for Portland Cement
800	Specification for Hot Mix Asphalt
900	Specification for Standard Compaction Requirements
1000	Amendments to OPSS and OPSD

**APPROVED PRODUCTS**

Approved Watermain Product List
Approved Sewer Product List

**STANDARD DRAWINGS**

RD	Road Standard Drawings
WM	Waterworks Standard Drawings
SEW	Sewer Standard Drawings
PK	Park Standard Drawings

**INDEX**

<b>200</b>	<b>.01</b>	<b>DEFINITIONS</b>
	<b>.02</b>	<b>SCOPE OF THE WORK</b>
	.01	Notice to Proceed
	.02	Successful Bidder Responsibilities
	.03	Conformity of Work with Plans and Specifications
	.04	Supply of Materials
	.05	Contractor's Investigations
	.06	Estimated Quantities
	.07	Changes and Alterations
	.08	Extra Work
	.09	Claims
	.10	Cleaning up before Acceptance
	.11	Acceptance of the Work
	.12	Schedule Item of Work
	<b>.03</b>	<b>CONTRACTOR'S RESPONSIBILITIES TO THIRD PARTIES</b>
	.01	Performance and Other Security
	.02	Security and Deposit
	.03	Insurance Requirements
	.04	Commercial General Liability Insurance
	.05	Standard Form Automobile Liability Insurance
	.06	Non-Owned Automobile Liability Insurance
	.07	Builders Risk
	.08	Property Installation Floater All Risk Insurance
	.09	Motor Truck Cargo or Transportation Insurance
	.10	Pollution Liability Insurance
	.11	Property Insurance
	.12	Proof of Insurance and Claims Protocol
	.13	Indemnification
	.14	Notices by the Contractor and Observance of Laws, Statutes and Regulations
	.15	Assignment and Sub-Letting
	.16	Patents and Copyrights
	.17	Contractor's Responsibility for Losses and Damages
	.18	Obstructions and Utilities
	.19	Labour Disputes
	.20	Plans and Working Drawings
	.21	Explosives and Blasting
	.22	Claims - Follow Up Procedure
	.23	Construction Liaison Committee

**INDEX...Cont'd.**

- .04 CONTROL OF THE WORK**
  - .01 Project Manager's Authority
  - .02 Inspector's Authority
  - .03 Inspection
  - .04 Superintendence
  - .05 Methods and Sequence of Work
  - .06 Quality of Materials
  - .07 Modifications of Methods & Equipment
  - .08 Defective Work and Materials
  - .09 Deviation from Plans
  - .10 Conflicts and Omissions
  - .11 Lines, Levels and Grades
  - .12 Right of Entry
  - .13 Notice to Contractor
  - .14 Notice to City
  - .15 Hindrances and Delays
  - .16 Character and Conduct of Employees
  - .17 City Office Closures
  
- .05 PROSECUTION AND PROGRESS**
  - .01 Time the Essence of the Contract
  - .02 Commencement and Completion
  - .03 Non-Fulfilment of the Contract
  - .04 Extension of Time
  
- .06 PAYMENT**
  - .01 Price For Work
  - .02 Prices and Payments
  - .03 Contractor's Discharge of Liabilities
  - .04 Construction Claims Holdback Provision
  - .05 Workplace Safety and Insurance Board Certificate of Clearance
  - .06 Certificate of Status
  - .07 Inspection of Books, Payrolls, Accounts and Records
  
- .07 MAINTENANCE**
  - .01 Maintenance Review



**ALPHABETICAL INDEX**

- 200
- .02.10 Acceptance, Cleaning up before
  - .02.11 Acceptance of the Work
  - .02.07 Alterations, Changes and
  - .01.01 Approved Product Listing
  - .03.15 Assignment, Sub-letting
  - .04.01 Authority, Project Manager's
  - .06.06 Certificate of Status
  - .02.07 Changes and Alterations
  - .02.09 Claims
  - .03.22 Claims, Follow up Procedures
  - .04.16 Character and Conduct of Employees
  - .04.17 City Office Closures
  - .02.10 Cleaning up before Acceptance
  - .05.02 Commencement and Completion
  - .04.10 Conflicts and Omissions
  - .02.03 Conformity of Work with Plans and Specifications
  - .01.02 Contract
  - .01.03 Contract Documents
  - .03.23 Construction Liaison Committee
  - .05.03 Contract, Non-Fulfilment of
  - .05.01 Contract, Time the Essence of
  - .01.04 Contractor
  - .03.15 Contractor, Notices By
  - .06.03 Contractor's Discharge of Liabilities
  - .02.05 Contractor's Investigations
  - .04.13 Contractor Notices to the
  - .03.17 Contractor's Responsibility for Losses and Damages
  - .03.16 Copyrights, Patents and
  - .03.17 Damages, Contractor's Responsibility for Losses and Damages
  - .04.08 Defective Work and Materials
  - .04.15 Delays, Hindrances and
  - .03.02 Deposit, Security and
  - .04.09 Deviation from Plans
  - .06.03 Discharge of Liabilities, Contractor's
  - .03.19 Disputes, Labour
  - .01.10 Project Manager
  - .04.01 Project Manager's Authority
  - .04.12 Entry, Right of
  - .02.06 Estimated Quantities
  - .03.21 Explosives and Blasting
  - .02.08 Extra Work
  - .05.04 Extension of Time
  - .01.06 General Manager
  - .04.11 Grades, Lines, Levels and
  - .04.15 Hindrances and Delays
  - .04.03 Inspection
  - .04.02 Inspector's Authority

**ALPHABETICAL INDEX – Cont'd...**

- 200
- .01.07 Inspector
  - .06.07 Inspection of Books, Payrolls, Accounts and Records
  - .03.03 Insurance
  - .02.05 Investigations, Contractor's
  - .03.19 Labour Disputes
  - .06.03 Liabilities, Contractor's Discharge of
  - .04.11 Lines, Levels and Grades
  - .03.17 Losses and Damage, Contractor's Responsibility for
  - .07 Maintenance
  - .07.01 Maintenance Review
  - .01.08 Major Item
  - .04.08 Materials, Defective Work and
  - .04.06 Materials, Quality of
  - .04.07 Methods and Equipment, Modifications of
  - .04.05 Methods and Sequence of Work
  - .05.03 Non-fulfilment of the Contract
  - .02.01 Notice to Proceed
  - .03.14 Notices by the Contractor
  - .04.13 Notices to the Contractor
  - .04.14 Notices to the City
  - .03.18 Obstructions, Utilities and
  - .04.10 Omissions, Conflicts and
  - .03.16 Patents and Copyrights
  - .06.02 Payments, Prices and
  - .03.01 Performance and Other Security
  - .01.09 Plans
  - .03.20 Plans and Working Drawings
  - .04.09 Plans, Deviation from
  - .02.03 Plans, Specifications, Conformity of Work with
  - .06.01 Price for Work
  - .04.01 Project Manager's Authority
  - .04.06 Quality of Materials
  - .02.06 Quantities, Estimated
  - .04.12 Right of Entry
  - .02.12 Scheduled Items of Work
  - .04.05 Sequence of Work, Methods and
  - .01.11 Site
  - .01.12 Specification
  - .02.03 Specifications, Plans, Conformity of Work with
  - .01.13 Sub-Contractor
  - .03.15 Sub-Letting, Assignment and
  - .02.02 Successful Bidder Responsibilities
  - .04.04 Superintendence
  - .02.04 Supply of Materials
  - .03.02 Security and Deposit
  - .05.04 Time, Extension of
  - .05.01 Time of the Essence (time – Essence of the Contract)
  - .01.16 Work
  - .02.11 Work, Acceptance of

**ALPHABETICAL INDEX – Cont'd...**

- 200 .02.03 Work Conformity of, with Plans and Specifications  
.02.08 Work, Extra  
.04.05 Work, Methods and Sequence of  
.06.01 Work, Price for  
.02.12 Work Scheduled Item of  
.04.08 Work and Materials, Defective  
.03.20 Working Drawings, Plans and  
.06.05 Workplace Safety and Insurance Board Certificate of Clearance

**.01 DEFINITIONS AND INTERPRETATION**

The following definitions shall apply:

- .01.01** **"Approved Product List"** means the list of acceptable products and/or material approved for use within the City of Hamilton. Lists are issued on a ongoing basis and all references to approved products and materials lists shall be deemed to be to the most recent version.
- .01.02** **"Contract"** means the agreement covering the performance of Work, including the supply of all Work, labour, services, materials, implements and equipment reasonably necessary for the proper and satisfactory execution and completion of the Work, and includes the Form of Tender, Plans, drawings, Specifications, bonds and any written supplementary agreements or written change orders issued by the General Manager.
- .01.03** **"Contract Documents"** means all Tenders, Specifications, performance security, insurance, instructions to bidders, construction requirements, Contract For Works, special provisions, drawings and any and all Addenda and amendments related thereto and connected with the Work or project to be performed under the Contract.
- .01.04** **"Contractor"** means the person, firm or company undertaking the execution of the Work under the terms of the Contract. Contractor shall be synonymous with Successful Bidder.
- .01.05** **"City"** means the City of Hamilton, and where an authority or discretion is conferred upon the City under the Request for Tenders, means the appropriate official of the City as designated or appointed under its governing by-laws, resolutions or policies from time to time.
- .01.06** **"General Manager"** means the General Manager of Public Works for the City of Hamilton or approved designate.
- .01.07** **"Inspector"** means any person, partnership or corporation that the City or Project Manager may appoint for the purpose of assisting in the supervision and inspection of the Work and the materials to be used in the Work.
- .01.08** **"Major Item"** means any individually bid item that has an actual cost, calculated on the basis of its actual or estimated tender quantity, whichever is the larger, and the unit price bid, equal to or greater than 5% of the total tender cost, calculated on the basis of the total of all the estimated quantities and the unit prices bid.

**.01 DEFINITIONS...Cont'd.**

**.01.09** "Plans" means any drawings or reproduction of drawings pertaining the Work.

**.01.10** "Project Manager" means the person designated by the City to administer and oversee the Work.

**.01.11** "Site" means the area at which the Work is to be carried out.

**.01.12** "Specification" means all written or printed descriptions or instructions pertaining to the method and manner of performing the Work or to the quantities and qualities of the materials to be furnished under the Contract, and includes the Special Provisions, Supplemental Specifications, Standard Specifications, Approved Products, Form of Tender and General Conditions together with all written agreements, made or to be made pertaining to the method or manner of performing the Work, or to the quantities or qualities of materials to be furnished under the Contract. Ontario Provincial Standard Specifications and Ontario Provincial Standard Drawings in effect on the date that the Request For Tenders is issued.

**.01.13** "Sub-Contractor" means a person, partnership, firm, syndicate, joint venture, or corporation undertaking the execution of a part of the Work by virtue of an agreement between himself and the Contractor, and who has independent control over the Work to be done under such agreement.

**.01.14** "Successful Bidder" "Successful Bidder" means the bidder to whom the City has awarded the Contract.

**.01.15** "Tender" means the Request For Tenders (RFT) for which these general conditions relate.

**.01.16** "Work" means (unless the context requires a different meaning), the whole of the Work, materials, matters and things, required to be done or supplied, mentioned or referred to in the Contract Documents and Plans, or including all extra or additional requirements which may be ordered by the Project Manager.

Any Work or materials not herein specified, but which may be fairly implied as included in this Contract, and of which the Project Manager shall be the sole judge, shall be done or furnished by the Contractor as if such Work or material has been specified.

**.01.17 Clarifications**

**01.17.01** In the Contract Documents, a word importing the masculine, feminine or neuter gender only includes members of the other genders;

- a) a word defined in or importing the singular number has the same meaning when used in the plural number, and vice versa;
- b) the provisions shall be read with such changes of number or corporate status as the context may require;
- c) a reference to any Act, by-law, rule or regulation or to a provision thereof shall be deemed to include a reference to any Act, by-law,

rule or regulation or provision enacted in substitution therefore or amendment thereof;

- d) the headings to each section are inserted for convenience of reference only and do not form part of the Contract;
- e) any reference to time shall be deemed to be a reference to Hamilton time;
- f) all technical terms having a recognized meaning as a term of art in a relevant industry or trade shall be deemed to have that meaning in this Contract; and
- g) all accounting terms have the same meaning as are applied to those terms by the Canadian Institute of Chartered Accountants;
- h) any reference to an officer of the City shall be construed to mean the person holding that office from time to time, and also the designate or deputy of that person, and shall be deemed to include a reference to any person holding a successor office or the designate or deputy of that person.

**01.17.02** The words 'approval', 'directed', 'required', 'considered necessary', 'authorized', 'acceptable', or 'satisfactory' or words of like import, means approval or directed, required, considered necessary, or authorized by and acceptable or satisfactory to the City or its consultant.

**01.17.03** Except where otherwise defined, all terms that are defined in the Construction Lien Act shall have the same meaning in the Contract Documents as in that Act.

**01.17.04** Except where to do so would lead to an absurdity or a manifestly unfair result, the Contract Documents shall be deemed to be intended to be complementary, so that

- (a) effect shall be given to each of them (i.e. provisions shall be considered to be repugnant only to the extent that they are inconsistent with each other); and
- (b) what is required by any one shall be as binding as if required by all,

but in the event of inconsistency or conflict between two or more Contract Documents, they shall each have the priority as specified in 200.04.10.

**.02 SCOPE OF THE WORK**

**.02.01 Notice to Proceed**

The City may issue a written notice to proceed to the Successful Bidder prior to the execution of the Contract for Works.

Work under the Contract shall commence on the commencement date specified in the notice to proceed, unless otherwise agreed.

**.02.02 Successful Bidder Responsibilities**

It shall be the Successful Bidder's responsibility to co-ordinate, control and check work of its own forces and of all its Subcontractors and to ascertain that all work is done in accordance with all Contract Documents, governing regulations and good construction practice, is of first class workmanship, and that only proper materials and methods are suitable for the function or performance intended have been used.

The Successful Bidder shall be responsible for faithful and proper performance of all aspects of the Contract.

Without limiting the generality of any other provision of these conditions, unless otherwise provided in the Specifications or the special provisions, the Contractor shall be required to provide and pay for:

- (a) all material, labour and service costs, charges for use of tools and equipment whether owned or rented, and where any work is to be carried out or services are to be rendered on property owned or occupied by the City, all protective and safety provisions, site signs and site conveniences, together with all cranes, scaffolding and shoring, freight costs, and material-handling and storing, and all services and incidentals whether shown or specified or required by good practice;
- (b) all bonds or other accepted forms of bid, performance, and labour and material payment security, insurance, permits and inspections; all applicable taxes, worker's compensation and all other applicable labour-compensation charges necessary to carry out the project, make the supply and complete all Work in accordance with the Contract Documents;
- (c) all services and materials required to carry out the Project, do all of the work and make all necessary or incidental supplies of goods, services, fixtures, construction components, landscaping and other finishing items, in each case fully in accordance with all Contract Documents and all instructions given by the City thereunder, and also in accordance with governing regulations and codes and in compliance with good industrial and commercial practice for first class workmanship, which in all instances, unless otherwise stipulated, shall be deemed to require work that has a finished appearance, is ready for use or occupancy and use for the purpose intended and is fully functional.

**.02.03 Conformity of Work with Plans and Specifications**

The Contractor shall perform all Work and shall supply all materials save and except those specified in the Contract Documents to be otherwise supplied and shall complete the whole of the Work all in strict conformance with the Plans and Specifications. Dimensions shall not be scaled from the Plans.

**02.04 Supply of Materials**

The Contractor shall supply all materials for this Contract unless specifically noted otherwise in the Contract Documents. All materials shall meet the Specifications as laid out in the Contract Documents and the appropriate Approved Product List, latest edition.

**.02.05 Contractor's Investigations**

The Contractor declares and represents that in tendering for the Work, and in entering into this Contract, they have either investigated for themselves the character of the Work to be done and all local conditions, including the location of any Public Utility which can be determined from the records or other information available at the offices of any person, partnership, corporation, including a municipal corporation and any board or commission thereof having jurisdiction or control over such Utility, that might affect their Bid or acceptance of the Work, or that, not having so investigated, they are willing to assume and does hereby assume, all risk of conditions now existing or arising in the course of the Work which might or could make the Work, or any items thereof more expensive in character, or more onerous to fulfil, than was contemplated or known when the Bid was made.

The Contractor also declares that in tendering for the Work and in entering into this Contract they did not and do not rely upon information furnished by the City or any of its servants or agents respecting the nature or conformation of the ground at the site of the Work, or the location, character, quality or quantity of the materials to be removed, or to be employed in the construction of the Work, or the character of the equipment or facilities needed to perform the Work, or the general and local performance of the Work, under the Contract.

**.02.06 Estimated Quantities**

The estimated quantities set forth in the Tender documents are approximate only, and the basis of payment under this Contract, will be the actual amount of the Work done and material furnished, provided, that if the quantities of the Work to be done or material to be furnished under any item vary from such estimated quantities, the Contractor shall proceed with the Work but if such variation for a Major Item exceeds plus or minus 20% of the estimated quantity and if such variation materially increases or decreases the cost of the Work or material than either party to the Contract, upon the written request of the other shall as soon as reasonably possible, negotiate upward or downwards the compensation for the portion of the Work to be done or material to be furnished which is in excess of or



**.02 SCOPE OF THE WORK...Cont'd**

**.02.06 Estimated Quantities...Cont'd.**

less than such estimated quantity plus or minus the 20% variation as the case may be.

The Contractor's written request that the City negotiate the compensation shall be made as prescribed by Section 200.02.08, for a notice of claim.

**.02.07 Changes and Alterations**

The Project Manager shall have the right, at any time before or during the prosecution of the Work, or before or after the execution of the Contract, to make or order in writing, any alterations or changes deleting, extending, increasing, decreasing, varying or otherwise altering any lines, grades, forms, dimensions, methods, Plans, materials, or the omission of any portion or portions of the Work, variations in any other way the Works Contracted for, or to order any additional or extra Work to be done or extra material to be furnished and the Contractor shall proceed with and carry out the Work as directed and shall supply such materials as directed, and shall do so without being entitled to any additional payment on account of any changes in Work or materials except as otherwise provided. The Contractor shall proceed with Work without delay and if they are of the opinion that they are entitled to additional compensation, they shall make a written claim for additional compensation as prescribed by Section 200.02.08 herein. If, in the sole opinion of the Project Manager, such order or change materially increases or decreases the cost of the Work or materials from that on which the Contractor based their bid, other than estimated quantities, the Project Manager in his/her sole discretion may increase or decrease the Contract price by an amount or amounts they consider appropriate, and his/her decision shall be final. Nothing herein contained shall preclude City or the Project Manager from having extra, additional, or other Work done by the City Workers or other parties in the event of satisfactory arrangement therefore not having been concluded between the Project Manager and the Contractor or for any other sufficient reason in the sole opinion of the Project Manager.

**.02.08 Extra Work**

No Work or materials shall be regarded as extra to the Contract Work or materials unless approved in writing as an extra to the Contractor by the Project Manager with the method of payment for it by means of a mutually agreed unit price or a specified in "Section 300.38 Method of Payment of Extra Works by Force Account", provided that the price for the said extra to the Contract is not specified in the Contract.

Where the Contractor considers Work to be extra Work, they shall so notify the Project Manager in writing before proceeding with the Work. However, they shall proceed with the Work without delay on the direction of the Project Manager.

The Project Manager shall be the sole judge of whether any Work or materials are extra Work or materials, and his/her decision shall be final.

**.02 SCOPE OF THE WORK...Cont'd**

**.02.08 Extra Work...Cont'd.**

Should circumstances arise at any time which, in the Contractor's opinion, would entitle it to additional compensation, and which are not fully provided for herein, the Contractor shall at once, on discovery of such circumstances, notify the Project Manager in writing and shall state clearly and fully what the circumstances are. The claim for the additional sum or compensation shall be submitted within 30 days of completing the Work related to the claim.

**.02.09 Claims**

In case of the Contractor's neglect or failure to observe fully the conditions set out in this paragraph, they shall forfeit all right to payment therefore which it otherwise would have been entitled to and shall not make any claim in respect thereof, and if made, the Project Manager may reject the same as invalid, and the Contractor shall not have any right to recovery in respect thereof, at law or otherwise and such decision of the Project Manager shall be final.

**.02.10 Cleaning Up Before Acceptance**

Before any Work will be finally accepted by the City, the Contractor shall do such trimming and disposal of rubbish and surplus materials as to leave the Work neat and presentable throughout, in the opinion of the Project Manager.

**.02.11 Acceptance of the Work**

The Contractor shall notify the Project Manager in writing when, in the opinion of the Contractor, the Work has been satisfactorily completed in accordance with the Contract, and the Project Manager will then cause the Work to be inspected. When it is found by the Project Manager to be completed to their satisfaction, they will give Notice of Completion in writing to the Contractor and until then no partial or entire use or occupancy of the Work by the City shall be construed as acceptance of any or all of the Work.

**.02.12 Scheduled Items of Work**

Quantities quoted for the items in the "Schedule of Quantities and Prices" are estimates only, and are for the purpose of indicating to Bidder's the magnitude of the Work. For Work done on a unit price basis, the Contractor will be paid for the actual measured quantities at the respective unit prices bid.

Description of the items of the Work to be performed under the Contract, as set out in the "Schedule of Quantities and Prices", are general in nature for the sake of brevity. It shall be the Contractor's understanding that all required Work shall be undertaken and performed by the Contractor as fully detailed in the Contract Documents.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES**

**.03.01 Performance and Other Security**

The Successful Bidder shall furnish a performance security and labour and material payment security to the City, prior to the execution of the Contract for Work and within 10 Business Days of being notified that its Bid has been accepted in accordance with the following:

- (a) the performance of the contract (a performance bond), **in an amount equal to 50% of the Base Bid Price and any contingency amount, excluding all Value Added Taxes;** and
- (b) the payment of all necessary services and materials required to complete the Contract in a satisfactory manner (a labour and material payment bond), **an amount equal to 50% of the Base Bid Price and any contingency amount, excluding all Value Added Taxes.**

A failure to provide any security described in subsection .03.01 shall:

- (c) constitute a breach of the requirements of the Tender; and
- (d) entitle the City to claim under any bid security described in the Instructions to Bidders Section 5; and
- (e) allow Procurement to present a report to the Administration and Audit Committee recommending Council not accept any further bids from the Bidder for a specified period of time.

**.03.02 Security and Deposit**

The performance bond, maintenance bond, payment bond, or other bonds or cash or securities, deposited with the City, shall be held by the City to secure the due performance of all provisions of the Contract, including, without limiting the generality of the foregoing, the payment of all Sub-Contractors and materials suppliers with respect to this Contract.

**.03.03 Insurance Requirements**

At the time of execution of a Contract for the work, the Successful Bidder will be required to deposit with the City certificates of insurance or certified copies of policies of Commercial General Liability Insurance, Automobile Insurance and Property Insurance, together with such other coverages as may be applicable to the contract for the work. Such insurance coverages shall be obtained, maintained throughout the term of the contract (including any renewal thereof) and paid for by the Successful Bidder, including all costs for any applicable deductible. Coverages shall be in the amounts specified and otherwise in accordance with all other requirements set out in these General Conditions of the Contract and be in a form approved by the City.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.04 Commercial General Liability Insurance**

Commercial General Liability Insurance, written on IBC Form 2100 or its equivalent, including but not limited to bodily and personal injury liability, property damage, products liability, completed operations liability, owners & contractors protective liability, blanket contractual liability, premises liability, and contingent employer's liability coverage, having an inclusive limit of not less than \$2,000,000 per occurrence and in the aggregate and subject to the following;

- (i) Where the work provides for or contemplates the handling of asbestos, coverage shall not contain an asbestos exclusion and same shall be noted on the certificate of insurance.
- (ii) Where the Description of the Project, Supply or Work provides for or contemplates:
  - (I) the use of explosives for blasting or;
  - (II) vibration from pile driving or caisson work or
  - (III) the removal or weakening of support of any property, building or land whether such support be natural or otherwise.

Explosion, Collapse and Underground (XCU) coverages shall be added by endorsement and same shall be noted on the certificate of insurance.

- (iii) Coverage shall be included for pollution from "hostile fires".

**.03.05 Standard Form Automobile Liability Insurance**

Standard Form Automobile Liability Insurance that complies with all requirements of the current legislation of the Province of Ontario, having an inclusive limit of not less than:

- (i) Subject to paragraph (ii), \$2,000,000 per occurrence;
- (ii) where the Contract relates to the transportation of an explosive substance, snow removal or road construction, or will involve the use of one or more automobiles or any combination of automobiles and towed vehicles having in any case a combined aggregate weight of 10 tonnes or more before loading, \$5,000,000 per occurrence,

for Third Party Liability, in respect of the use or operation of vehicles owned, operated or leased by the Contractor for the provision of services;

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.06 Non-Owned Automobile Liability Insurance**

Non-Owned Automobile Liability Insurance in standard form having an inclusive limit of not less than \$1,000,000 per occurrence , in respect of vehicles not owned by the Contractor, that are used or operated on its behalf for the provision of services under the Contract;

**.03.07 Builders Risk**

Where the Description of Project, Work or Supply provides for or contemplates the construction of a building or structure, Contractor will provide Builders Risk insurance to cover the subject property;

- (i) coverage shall be for the full amount of the Total Contract Price plus the full value of any optional features or other options that the City elects to order (but the City may require insurance up to the amount of the replacement cost of any building in structure in, on, or upon which any Work is to be done under the Contract, where in the reasonable opinion of the City's Manager of Risk Management there is a sufficient risk of damage to the same),
- (ii) coverage shall:
  - (I) apply to all risks of direct loss or damage (including theft and sinkhole) but subject to any exclusions and limitations in the Special Conditions and the actual policy form;
  - (II) apply to all products, labour, equipment and supplies of every nature, the property of the City or Contractor or for which the City or Contractor may have assumed responsibility (whether on site or in transit), that is to be used in or pertaining to site preparation, and the erection, fabrication, construction, reconstruction, re-modeling or repair of any building, structure, other fixture or thing;
  - (III) include the installation, testing and any subsequent use of machinery and equipment, including boilers, pressure vessels or vessels under vacuum;
  - (IV) include damage to the Work caused by an accident to or the explosion of any boiler or other pressure vessel or equipment forming part of the Work;
  - (V) include off-site storage, transit and installation risks as indicated in the Installation Floater and Motor Truck Cargo insurance described hereafter, if such coverages are not separately provided
  - (VI) include flood and earthquake insurance if such risks exist.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.07 Builders Risk...Cont'd.**

- (VII) include coverage for loss of income, extra expense and/or expediting expense if such exposures exist
- (VIII) be subject to a waiver of coinsurance
- (IX) be endorsed to grant permission to occupy.
- (X) be endorsed to cover the interests of all parties, including the City and all contractors and subcontractors

**.03.08 Property Installation Floater All Risks Insurance.**

Where the Description of Project, Work or Supply provides for or contemplates the supply and installation of fixtures, equipment, machinery, apparatus, etc., or other work such as minor renovations amounting to an improvement within the meaning of the *Construction Lien Act* only, the Contractor shall provide a Property Installation Floater All Risks Insurance. The amount of coverage should be adequate to provide full replacement value of the property, repairs, additions or equipment being installed, otherwise being handled or stored on or off premises.

**.03.09 Motor Truck Cargo or Transportation Insurance**

If the Installation Floater insurance does not provide transportation coverage, separate Motor Truck Cargo or Transportation insurance All Risks is to be provided for materials or equipment transported in the Contractor's vehicles from place of receipt to building sites or other storage sites.

**.03.10 Pollution Liability Insurance**

If applicable, Contractor to provide Contractor's Pollution Liability Insurance, to cover the Contractor's liability for claims caused by pollution events arising out of covered operations performed by or on behalf of the insured at project sites; providing coverage in an amount of not less than \$2,000,000 per claim or per occurrence, which coverage shall be maintained in force for 12 months following the termination of the Contract.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.11 Property Insurance**

The Contractor shall maintain Property Insurance, as may be applicable, with respect to loss or damage (including fire, theft, burglary, etc.) of its own property and property in its care, custody and control, including its equipment, tools, stock, used in connection with the Contract.

All policies of insurance policies shall:

- (a) be recorded as being a primary policy and shall be in a form and issued by an insurance company satisfactory to the City, that is licensed to carry on business in Ontario;
- (b) be maintained continuously during the course of carrying out the Project, Work or Supply; or for such period of time as may be required after completion of the Project, Work or Supply, as deemed necessary by the City,
- (c) provide for a deductible amount of no greater than \$10,000; or such other amount as the City, at its sole discretion, may deem appropriate.
- (d) (except in the case of automobile liability insurance, non-owned automobile liability insurance, professional errors & omissions liability insurance, and medical malpractice liability insurance) include the City named as an additional insured, to the extent of the Contractor's obligations to the City under the Contract Documents;
- (e) contain cross liability and severability of interest provisions, as may be applicable;
- (f) preclude subrogation claims against the City and any other person insured under the policy; and
- (g) provide that at least 30 days prior written notice (15 days, in the case of automobile liability insurance, and 10 days in the event of non-payment of premiums) shall be given to the City by the Insurer before the Insurer or Contractor takes any steps to cancel, terminate, fail to renew, amend or otherwise change or modify the insurance or any part thereof.

The City reserves the right to require the Contractor to purchase such additional insurance coverage as the City's Risk Management Services Office may

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.11 Property Insurance...Cont'd.**

reasonably require. The City reserves the right to request such higher limits of insurance or otherwise alter the types of coverage requirements (taking into consideration such matters as the nature of the work, contract value, industry standards, and availability of insurance) as the City may reasonably require from time to time.

Any insurance coverage acquired under the Contract shall in no manner discharge, restrict or limit the liabilities assumed by the Contractor under the Contract. The dollar limit of insurance coverage shall not be limited by the dollar amount of the Contract.

The Contractor shall pay all premiums on the policies as they become due provided that the City may pay premiums as they become due and deduct the amount thereof from moneys due from the City to the Contractor should the Contractor fail to do so.

**.03.12 Proof of Insurance and Claims Protocol**

The Contractor shall deposit with the City such evidence of its insurance as provided in or required under the provisions of these Instructions, an Addendum or the Special Provisions,

- a) at the time of execution of the Contract for Work (if any), or
- b) in any event prior to commencing the Project, Work or Supply; and

and thereafter during the term of the Contract, no later than 20 Business Days prior to the renewal date of each applicable policy, the Contractor shall deposit with the City's Procurement Manager an original Certificate of Insurance originally signed by an authorized insurance representative, confirming thereon relevant coverage information including but not limited to name/description of City contract, name of Insurer, name of Broker, name of Insured, name of Additional Insureds as may be applicable, commencement and expiry dates of coverage, dollar limits of coverage, deductible levels as may be applicable, cancellation/termination provisions; or (at the City's election) a certified copy of the insurance policy or policies required under section 22. Certificate Holder will be addressed as the City Of Hamilton, City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5. All certificates, cancellation, nonrenewal or adverse change notices should be mailed to this address.

The Contractor shall not do or omit to do anything that would impair or invalidate the insurance policies. Delivery to and examination or approval by the City of any certificates of insurance or policies of insurance or other evidence of insurance shall not relieve the Contractor of any of its indemnification or insurance obligations under the Contract. The City shall be under no duty either to ascertain the existence of or to examine such certificates of insurance or policies of insurance or to advise the Contractor in the event such insurance coverage is not in compliance with the requirements set out in the Contract.



**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.12 Proof of Insurance and Claims Protocol...Cont'd.**

Claims reported to the Contractor by a third party or by the City shall be promptly investigated by the Contractor. The Contractor shall make contact with the Claimant within 48 hours of receipt of notice of a claim. The Contractor shall initiate an investigation of the claim immediately upon notice, and advise the Claimant by letter of its position regarding resolution of the claim within 20 Business Days of the notice. The Contractor shall include in its letter of resolution the reasons for its position. Failing acceptance of the resolution by the Claimant of the proposed resolution, the Contractor agrees to report the claim to its Insurer for further review and response to the Claimant. Failure to follow this procedure shall permit the City to investigate and resolve any claims and offset the resultant costs against any monies due, from time to time, under the Contract.

Upon the receipt of a third party claim notice from the City's Risk Management Services Section, the Contractor shall:

- a) Acknowledge receipt of the notice by way of a facsimile or e-mail back to Risk Management Services within 5 business days. The acknowledgment will indicate that the Contractor has received the claim and will include all pertinent contact information for the company individual responsible for the claim.
- b) Provide Risk Management Services with an initial status update within the first 30 days of receipt of the claim notice.
- c) Provide Risk Management Services with a status update upon request at any time as Risk Management Services deems necessary. This update should be provided within 10 business days of receipt of the request.
- d) Provide a closing report to Risk Management Services promptly at the conclusion of a claim

Template's for initial/interim/closing reports will be provided by the City prior to the start of any work.

**.03.13 Indemnification**

The Contractor shall indemnify and shall defend and save the City, its elected officials, officers, and employees harmless from and against any claims, proceedings, fines, penalties, expenses and costs (including legal costs on a solicitor and client basis) that are incurred by, or made or instituted against, any of them or to which any of them may be liable by reason of,

- (a) The Contractor carrying out or failing to carry out any obligation to which it is subject, or exercising any right to which it is entitled, under the Contract except to the extent that the same are caused by the

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.13 Indemnification...Cont'd.**

negligence or deliberate wrong-doing of the City or other person entitled to indemnification under this section, or

- (b) Any patent, trademark, copyright infringement or other breach of any intellectual property right of any person, for which the Contractor or any subcontractor to the Contractor is responsible.

The right of indemnification granted to the City or other person entitled to indemnification under subsection (1) shall extend to any amount paid by that person in the settlement of any claim against it, and in entering into any such settlement, that person may exercise its reasonable discretion as to the amount to be paid, but that person shall serve prior notice of any intended settlement on the Contractor, at least 5 Business Days prior to agreeing to any such settlement.

The City may enforce the rights of indemnity conferred on the elected officials, officers, and employees of the City under subsection (1) on their behalf and to the same extent as if they were parties to the Contract.

The rights to indemnity provided for in this section shall be deemed to be in addition to any rights with respect to insurance in favour of the City, its elected officials, officers and employees provided under the Contract Documents.

The rights to indemnity provided for in this section shall survive the expiration or any termination of the Contract.

**.03.14 Notices by the Contractor and Observance of Laws, Statutes and Regulations**

The Contractor shall give notice of the date of commencement of the Work to any department or Agency of the Provincial or Federal government and to any person, partnership or corporation, including a municipal corporation and any board or commission thereof who may be affected by the Work at least two (2) weeks in advance of such date. The Contractor shall obtain their own expense, all licenses or permits required by all by-laws or Statutes, and Regulations made thereunder.

The Contractor shall give reasonable notice to any department or agency of the Provincial or Federal government and to any person, partnership or corporation, including a municipal corporation and any board or commission thereof, who may be affected by the Work, before any blasting operations are carried out.

In the event of accidental damage to, or interference with any utilities, pole lines, pipe lines, farm tile or other public or other privately owned Works, the Contractor shall immediately notify the owner of the location and details of such damage or interference.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.14 Notices by the Contractor and Observance of Laws, Statutes and Regulations...Cont'd.**

The Contractor shall post prominently and maintain on the site of the Work and wherever else the Project Manager may require, legible copies of any notice schedule or other information that it is required to post under this Contract or any Statute, Regulation, by-law or agreement.

**.03.15 Assignment and Sub-Letting**

The Contractor shall not assign, transfer or sub-let the whole or any portion of this Contract, or the whole or any portion of the Work to be performed under this Contract, without the consent in writing of the Project Manager and the Contractor shall not transfer or assign any monies which may be due or which may become payable under this Contract without the consent in writing of the Project Manager, provided that any consent so given, shall not under any circumstances, relieve the Contractor of any of the liabilities or obligations assumed by them under this Contract.

Where a Bidder has withdrawn their Bid on this Contract after the closing of Tenders or, having been offered this Contract by the City, has for any reason failed to enter into it, the Contractor shall not assign, transfer or sub-let any part of this Contract nor shall they rent any equipment or purchase any material required for this Contract if such Bidder or any person, firm or corporation having an interest in such Bidder, directly or indirectly receive any benefit.

**.03.16 Patents and Copyrights**

The Contractor shall indemnify and save harmless the City from all and every claim for damages, royalties, or fees for the infringement of any patented invention or copyright occasioned by the Contractor in connection with Work done or material furnished by the Contractor under this Contract.

**.03.17 Contractor's Responsibility for Losses and Damages**

The Contractor, it's agents and all Workers and persons employed by it, or under it's control, or employed by or under the control of Sub-Contractors, shall use due care that no person or property is injured, and the Contractor shall be solely responsible for all damages by whomsoever claimed in respect of any such injury. The Contractor shall at it's own expense make such temporary arrangements as may be necessary to ensure the avoidance of any such damages or injury and to prevent the interruption of or danger to vehicular or pedestrian traffic on any railway or any public or private road allowance.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.17 Contractor's Responsibility for Losses and Damages...Cont'd.**

The Contractor will indemnify and save harmless the City from and against all actions, suits, claims and demands whatsoever of all persons whomsoever, which may be brought against or made upon the City, and for all loss, expense, costs, charges, damages, indemnities and/or liability which may be sustained, paid or incurred by the City by reason of or in consequence of this Contract, however caused.

All loss or damage occasioned to the Work or arising out of the nature of the Work to be done, or from the normal action of the elements or from any reasonably foreseeable circumstance in the prosecution of the same, or from any normal obstruction or difficulties which may be encountered in the prosecution of the Work, having regard to the nature thereof, shall be sustained and borne by the Contractor at their own expense, and all material required to replace any defective or rejected Work, or to restore any failure shall be at the expense of the Contractor.

Notwithstanding the indemnity provision contained in this section, where in the opinion of the Project Manager, the Contractor has failed to rectify any damage, or injury or infringement or has failed to adequately compensate any person for any damage, injury or infringement for which the Contractor is responsible to the Contractor of its intention so to do, may withhold payment of monies due to the Contractor under this or any other Contract with the Contractor until the Contractor has rectified such damage, injury or infringement or has paid satisfactory compensation for such damage, injury or infringement.

**.03.18 Obstructions and Utilities**

Except as otherwise provided in this section, the Contractor assumes all the risks and responsibilities arising out of any obstruction on or under the road allowance and any traffic conditions caused by such obstruction including traffic conditions on any highway or road giving access to the Contract area and they shall not make any claim against the City for any loss, damage or expense occasioned thereby.

Before commencing Work the Contractor shall notify all owners of utilities, pipes, structures or other obstructions, sewers and watermains excepted, either under, on or above the surface within or adjacent to the Work area and request their accurate field location.

It is the Contractor's responsibility to co-ordinate it's proposed Works with any Work required by utilities. The Contractor shall make all reasonable efforts to schedule and co-ordinate it's Work to avoid delays.

**.03.19 Labour Disputes**

The Contractor shall bear the risk and responsibility of any loss, damage or expense to the Work or to themselves of any nature and kind whatsoever, arising from strikes or labour disputes.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd.**

**.03.20 Plans and Working Drawings**

The Contractor shall submit to the Project Manager for approval any shop Plans and working drawings which are not furnished by the City and which may be required for any part of the finished Work and the Contractor may be required to submit for the Project Manager's approval, working drawings for any falsework, forms or other incidental details of construction required in the construction, but not required as part of the finished Work.

It is expressly agreed that neither the provisions of Plans, shop drawings and/or working drawings by the Project Manager or the City nor the approval by the Project Manager of any Plans, shop drawings and/or working drawings submitted by the Contractor, shall relieve the Contractor from any responsibility for the adequacy or soundness of such Plans, shop or working drawings or such Work, or for any deviation from such Plans, shop drawings, working drawings or Specifications.

**.03.21 Explosives and Blasting**

The Contractor shall comply with all laws respecting the handling, storage and use of explosives.

In addition to any other precaution that may be necessary, the Contractor shall, immediately prior to a blast, clear the blasting area of all residents, vehicular and pedestrian traffic, and shall post flagmen on each road entering the blasting area, who shall stop all traffic and shall prevent such traffic from entering the area until the blasting has finished. The Contractor shall provide and use a siren or whistle to warn the public and the workers that a blast is to be set off and to indicate the "all clear" after the blast has taken place. Four short soundings of the siren or whistle, two minutes before detonation of a blast shall be used for warning and for protection, and one long ten to fifteen second sounding of the siren or whistle shall be used to give the "all clear".

Notwithstanding any direction of the Project Manager in regard to explosives, drilling or methods of blasting used, the Contractor shall take all precautions necessary to ensure that persons are not injured and that property and the structures, including public utilities are not damaged. Without limiting the generality of Section 200.03.17, the Contractor shall be responsible for all claims whatsoever arising from the hauling, handling, use of or storing of explosives and all effects direct or indirect of the blasting operation.

No payment shall be made by the City for protective measures or for damages to persons or for damages or repairs to property, structures, or public utilities, or for any claim whatsoever arising from blasting operations.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd**

**.03.21 Explosives and Blasting...Cont'd.**

The Contractor shall employ, at its own expense, the services of a specialist experienced in seismic investigations to determine and control the permissible intensity of vibrations which will result from blasting operations. Investigations shall be carried out by the Contractor and the specialist before any rock excavation is started in order to determine the maximum explosive charges that can be used at different locations throughout the area of rock excavation. The Contractor shall submit a report to the Project Manager outlining the results of the investigations and tests made and detailing the control required during blasting throughout the area of rock excavation.

Further seismic reading shall be taken by the specialist during blasting operations. Such readings shall be continuous and shall be taken where buildings and structures are located within 60 metres of the blasting area.

Within the area of the above buildings and structures the monitoring equipment shall be placed to obtain representative readings. As construction proceeds, the monitoring equipment shall be repositioned on an on-going basis.

In addition to the above, vibrations generated shall not exceed a vibrational peak particle velocity of 50 mm per second when monitored at the nearest building or structure.

If the monitoring station is not at the nearest structure, then the allowable particle velocity shall be reduced in accordance with the increased distance from the blast and shall be determined by the blasting specialist.

Additional monitoring and readings shall be obtained in other sensitive areas where the pre-blast survey indicates the need.

The Contractor and specialist shall visit the Owners of properties and buildings where tests and/or investigations are required and shall describe blasting and seismic investigations to them and obtain their permission to carry out the necessary investigations and notify them of the blasting schedule.

The Specialist will be an advisor to the Contractor and the acceptance of their reports and recommendations by the Project Manager will in no way relieve the Contractor of any responsibility for damage or injury by blasting.

All costs incurred by the Contractor in the employment of the specialist in seismic investigations shall be deemed to be included in the items in the Contract under which any rock excavation is required.

**.03 CONTRACTOR'S RESPONSIBILITY TO THIRD PARTIES...Cont'd**

**.03.22 Claims - Follow Up Procedure**

The Contractor shall retain an independent adjuster who will determine the Contractor's liability for all third party claims and advise the claimants in writing of the determination of liability within thirty (30) days of service of the claim on the Contractor.

If the Contractor's independent adjuster fails to determine the liability for any of the third-party claims as noted above, the City reserves the right to have an independent adjuster review the claim and determine liability therefore. Any monies paid by the City in satisfaction of any third-party claim determined to be the Contractor's liability plus all associated costs will be deducted from monies owing to the Contractor by the City.

**.03.23 Construction Liaison Committee**

Upon the request of the Project Manager, the Contractor shall participate in a Community Construction Liaison Committee.

This committee may consist of local residents, the Contractor and City representative(s) and shall meet on a regular basis to discuss issues related to the Work being performed by the Contractor. In these cases, the City, and the Contractor will aid the local residents in establishing a Community Construction Liaison Committee.

**.04 CONTROL OF WORK**

**.04.01 Project Manager's Authority**

The Project Manager may supervise all Work included herein and shall determine the quantities, quality, acceptability and fitness of the several kinds of Work and materials which are to be paid for under this Contract, and determine all questions relating to the said Work and materials and the construction thereof. The Project Manager shall in all cases be the sole judge of all questions of fact which may arise in respect to the Contract, including, but not so as to limit the generality of the foregoing, all claims by the Contractor and all questions relating to the execution and progress of the Work, the supplying of materials and the interpretation of the documents comprising the Contract. The Project Manager's decision shall in all cases be final.

The Project Manager has authority to stop the progress of the Work or any part or parts thereof in an emergency or whenever in it's opinion such stoppage may be necessary to ensure the safety of life, or the structure, or neighbouring property, or whenever in his/her opinion the Work or any parts thereof is being carried out in an unsatisfactory manner, and the City shall not be responsible for any loss, expense, costs, charges, damages, indemnities and/or liability which may be sustained, paid or incurred by the Contractor, any other Contractor or Contractors, any Sub-Contractor or Sub-Contractors or any other person or persons by reason of such order to stop by the Project Manager.

**.04 CONTROL OF WORK...Cont'd.**

**.04.01 Project Manager's Authority...Cont'd.**

If the Contractor should neglect to prosecute the Work properly or fail to perform any provision of this Contract, the City after five (5) days written notice by the Project Manager to the Contractor, may without prejudice to any other right or remedy the City may have, make good such deficiencies and may deduct the cost thereof from any monies then or thereafter due the Contractor.

Notwithstanding any other provisions in the Contract, in case of immediate danger to public safety, the City may take such emergency measures or may cause such immediate corrective repair Work to be done as the Project Manager deems necessary under the circumstances and shall notify the Contractor of the City's action, in writing, as soon as possible.

The cost of such emergency Work shall be borne by the Contractor, and the cost shall be deducted, collected or recovered by the City as provided in the Contract and in the Performance of Contract Security.

**.04.02 Inspector's Authority**

Inspectors of the City shall see that the provisions of the specifications are faithfully adhered to, especially with regard to the quality of workmanship and materials. Work done in the absence of an Inspector may be ordered to be opened-up for thorough examination, and if unacceptable, must be rebuilt or replaced as directed, at the Contractor's sole expense. Approval by an Inspector shall not be taken as, or construed into, an acceptance of defective or improper Work or materials, which must be removed and properly replaced whenever discovered at any stage of the Work. Directions given by Inspectors relating to the quality of material and workmanship, shall be obeyed at once by the Contractor. Inspectors do not have the power to set out Work or give any stakes, lines gauges, levels, or grades. Any orders or directions given by the Inspector, other than as herein provided for, shall not be binding upon the City.

The Inspector is responsible for public relations on the project site. The Contractor must restrain its employees from giving unauthorized information and shall refer all inquiries from whatever source, relating to the Works to be undertaken within the scope of the Contract, to the Inspector.

**.04.03 Inspection**

The Contractor shall at all times and at its own expense furnish all reasonable aid and assistance required by the Project Manager or Inspector for the proper inspection and examination of the Work or any part thereof. The Contractor shall, at its own expense, furnish samples for testing when required and shall furnish all reasonable facilities for the inspection of material and workmanship. The Contractor shall obey the directions and/or instructions of the Project Manager or his/her authorized representatives such directions and/or instructions and they shall be made in writing at the request of the Contractor.



**.04 CONTROL OF THE WORK...Cont'd**

**.04.03 Inspection...Cont'd.**

Notwithstanding any inspection that the City might carry out, the failure of the Project Manager or the Inspector to condemn or object to any defective Work or material shall not constitute a waiver of any Specification or approval or acceptance of such defective Work or material and except as otherwise expressly provided herein the Contractor shall be and remain liable within the terms of the Contract for such defective Work or materials, any losses, damages, costs, charges or expenses in connection therewith.

**.04.04 Superintendence**

The Contractor shall at all times have on the Work as it's agent a competent superintendent or foreman capable of reading and thoroughly understanding the Plans and Specifications and of adequately communicating with the Project Manager and their representatives, and thoroughly experienced in the type of Work being performed who shall receive instructions from the Project Manager or his/her authorized representatives. The superintendent or foreman shall have full authority to execute the orders or directions of the Project Manager without delay, and to promptly supply such materials, equipment, tools, labour and incidentals as may be required. Such superintendence shall be furnished irrespective of the amount of Work sub-let.

The Project Manager shall be provided, to his/her satisfaction, with the address and telephone number of the Contractor's representative who may be contacted and available within reasonable notice 24 hours a day, 7 days a week, on matters relating to this Contract.

**.04.05 Methods and Sequence of Work**

Before starting the Work the Contractor shall submit in writing to the Project Manager, their proposed methods and sequence of Work and shall obtain approval thereof and such approval shall not relieve the Contractor of any of their duties and obligations under this Contract.

The Contractor must notify the City at least one full week prior to the scheduled start of the Contract in order that the necessary inspection forces and traffic control procedures can be established.

Within seven (7) days of the award of this Contract, the successful Bidder shall submit Three (3) copies of a construction schedule bar chart for approval by the Project Manager. This chart shall show clearly the proposed dates of commencement and completion of each major phase of the Work.

The Contractor will be required to employ a sufficient number of working crews to complete the Work within the working time specified in the Contract Documents.

**.04 CONTROL OF THE WORK...Cont'd**

**.04.06 Quality of Materials**

All materials supplied by the Contractor shall conform to the requirements of the Specifications and be approved by the Project Manager prior to use in the Work. Where required by the Project Manager, the Contractor shall furnish a complete written statement of the origin, composition and manufacture of all materials to be supplied by it and shall furnish samples thereof for testing purposes. The Contractor shall not change the source of supply of materials without the prior written authorization of the Project Manager.

Approval of any materials by the Project Manager shall not be considered as waiver of objection to the Work or materials at any subsequent time, due to their failure to conform with the Specifications.

**.04.07 Modifications of Methods and Equipment**

The Contractor shall furnish for the Project Manager's approval, such materials tests, mix designs and tests of items manufactured or fabricated off the job site as the Project Manager may require.

The Contractor shall make such alterations in its method, equipment and working forces as the Project Manager in writing directs if at any time the method or equipment or working forces are found by the Project Manager to be unsafe or inadequate to ensure the protection, safety, or quality of the Work or to ensure a rate of progress sufficient in the opinion of the Project Manager to complete the Work within the time limit specified under the Contract, but notwithstanding the foregoing, the onus is on the Contractor to ensure that such required safety protection, progress and quality of the Work is maintained.

**.04.08 Defective Work and Materials**

The Contractor shall correct or replace any defective Work or material supplied by them, at its own expense, upon the direction of the Project Manager.

If the Contractor should refuse or neglect to remove any defective Work or material supplied by it in accordance with a written notice from the Project Manager, such Work or material may be removed by order of the Project Manager, at the Contractor's expense, and in addition to any other remedies available to the City, to recover the cost and expense of such removal, the City may deduct the cost and expense of such removal from any monies due to or to become due to the Contractor on any account.

**.04.09 Deviation from Plans**

The Contractor shall not deviate from the approved Plans, Specifications, or working drawings without the prior written consent of the Project Manager.

**.04 CONTROL OF THE WORK...Cont'd****.04.10 Conflicts and Omissions**

The documents comprising the Contract are complementary and what is required by any one of them shall be as binding as if required by all of them. The Contractor shall do all Work and furnish all materials in accordance with the best Construction and Engineering practices. In the event of a conflict between them, each shall enjoy priority against the others (subject to any express term or condition to the contrary) in accordance with the following successive order:

- (1) Contract For Work
- (2) Addenda
- (3) Special Provisions
- (4) Plans
- (5) Specifications
- (6) standard drawings and standard specifications
- (7) Form of Tender
- (8) General Conditions – Form 200
- (9) General Construction Requirements – Form 300
- (10) Supplementary Instructions to Bidders
- (11) Instructions to Bidders

Neither party to the Contract shall take advantage of any apparent error or omission in the Plans or Specifications, but the Project Manager shall be permitted to make such corrections and interpretations as may be necessary for fulfillment of the intent of the Plans and Specifications. Any Work material not herein specified but which may be fairly implied as included in this Contract, of which the Project Manager shall be the sole judge, shall be done or furnished by the Contractor as if such Work or material had been specified and the Project Manager's decision shall be final.

**.04.11 Lines, Levels and Grades**

The City will provide the locations of published vertical bench marks and horizontal control points to the Contractor. The Contractor shall employ at its own expense a qualified person who shall establish all other necessary lines, elevations and grades, and shall erect required batter boards and sight lines necessary to construct all proposed Works under the Contract. All monuments and reference stakes shall be placed so as to be undisturbed during excavation operations, and subsequent construction. The name of the person who is going to do this Work, their qualifications and experience must be submitted to the Project Manager for approval.

From time to time, the above mentioned person shall verify by an instrument, base lines, bench marks and all other reference marks and the Contractor shall be responsible for the accuracy of all lines and levels and of the Work as built in accordance therewith.

**.04 CONTROL OF THE WORK...Cont'd**

**.04.11 Lines, Levels and Grades....Cont'd**

The Project Manager may, at any time, check the lines, elevations, grades, batter boards and any other reference marks, set by the person employed by the Contractor, and the Contractor shall correct any errors disclosed by such check.

Such check shall not be construed to be approval of the Contractor's Work and shall not relieve the Contractor of the responsibility for the accurate construction of the entire Work.

In the event that the Contractor elects to use laser equipment to establish reference marks for any portion of the work, the Contractor shall provide the Inspector with the means of checking grades and/or reference marks including but not limited to batter boards or other means as may be approved by the Project Manager.

**.04.12 Right of Entry**

At any time during the currency of this Contract, the City, its Contractors, employees or agents, may enter the property or location for the purpose of constructing or installing such collateral Works as the City may desire, and the Contractor shall not interfere with or prevent the construction of such collateral Works.

**.04.13 Notice to Contractor**

Any notice in writing to be given to the Contractor in relation to any matter arising under the Contract or in respect of the Work to be done hereunder may be given by delivering same to the Contractor, or the Contractor's representative, for the time being, or by mailing the same addressed to the Contractor at such address as it may have specified in their Bid and in default of any such address being so specified, such notice shall be deemed to have been given at the time of mailing of such notice to the last address which the City may have for the Contractor.

**.04.14 Notice to City**

Any notice to be given to the City may be served personally or by prepaid registered mail upon the Project Manager.

**.04.15 Hindrances and Delays**

The Contractor shall upon written notice from the Project Manager, discontinue or delay any or all of the Work when in the opinion of the Project Manager it is unwise to proceed for any reason whatsoever, and the Work shall not be resumed until the Project Manager shall in writing so direct.

**.04 CONTROL OF THE WORK...Cont'd**

**.04.16 Character and Conduct of Employees**

When the Work under this Contract is for any reason discontinued, and will not be resumed until the following working season, or for any extended period, the Contractor shall, when directed by the Project Manager, open and place the roadway in a passable, safe and satisfactory condition for public travel, and the roadway shall not again be closed to pedestrian or vehicular traffic thereon or be obstructed without written authority of the Project Manager.

The Contractor shall employ only orderly, experienced and competent persons to do the Work and should the Project Manager inform them in writing that any person or persons on the Work, are in the opinion of the Project Manager, inexperienced, incompetent or disorderly such person or persons shall be discharged from the Work and shall not again be employed on the Work without the consent in writing of the Project Manager.

The Contractor shall neither permit, nor allow the introduction or use of alcoholic liquors or beverages upon or about the Works in this Contract, or upon any of the grounds occupied under this Contract by them.

**.04.17 City Office Closures**

The Contractor shall not carry on its operations under any Contract on Sundays, holidays or any days on which the City's administrative offices are closed, without the prior written permission of the Project Manager.

**.05 PROSECUTION AND PROGRESS**

**.05.01 Time - The Essence of the Contract**

Time shall be of the essence of this Contract.

**.05.02 Commencement and Completion**

The Work shall be commenced on the commencement date specified in the Notice to Proceed, and shall be continuously and with utmost diligence and dispatch carried on to completion unless otherwise provided in the Contract, and shall be completed and full possession given to the City within the time allowed in the Special Provisions, said time to commence on the commencement date specified in the Notice to Proceed, unless a longer time shall be allowed in writing by the Project Manager, in which case the Contract shall be carried on to completion and possession given to the City within the additional time as allowed.

**.05 PROSECUTION AND PROGRESS...Cont'd****.05.03 Non-Fulfilment of the Contract**

If the Contractor fails or neglects to commence the Work or to prosecute the Work diligently and at a rate of progress that in the opinion of the Project Manager, will ensure the entire completion of the Work within the time limited therefore under this Contract; or should the Contractor become bankrupt or insolvent, or commit any act of insolvency, or bankruptcy, or abandon the Work or fail to observe and perform any of the provisions of this Contract, of which the Project Manager shall be the sole judge, or should the Contractor default in the completion of the Work within the time or extended time limit therefore under this Contract or if the Work or any part thereof, is not progressing continuously and in such a manner as to ensure its entire completion, in the opinion of the Project Manager, within the time stipulated for completion, or if the Contractor fails or refuses to remedy any

defective or unsatisfactory Work or remove any defective material or cease any unsatisfactory Work when so ordered by the Project Manager or to comply with any reasonable order of the Project Manager, or if the Contractor shall persist in any course of action in violation of any of the provisions of this Contract, then in any or all of such cases, the Project Manager may notify the Contractor to discontinue all Work under the Contract, and the City may then employ such means as it may deem necessary to complete the Work, including exercising any right of the City under the Performance of Contract Security, and in such case the Contractor shall remain liable for all losses, damages, expenses, or costs which may be suffered by the City by reason of such delay and/or default by the Contractor. If the said losses, damages, expenses, or costs exceeds the sum which would have been payable under this Contract, if the same has been completed by the said Contractor, the Contractor or their surety, or both, shall pay the amount of such excess to the City or such amount or any portion thereof may be deducted from any monies due or to become due to the Contractor under this Contract.

All property, materials, articles and things whatsoever, including all machinery, tools, plant and equipment, and all rights, proprietary or otherwise, licenses, powers and privileges, whether relating to or affecting real or personal property, acquired, possessed or provided by the Contractor or by the City for the purpose of the Work shall be the property of the City and may be used, exercised and employed by the City as fully as they might have been used, exercised and employed by the Contractor, and the City may sell or otherwise dispose of at public auction, or private sale or otherwise, the whole or any portion or number of such property, materials, articles and things, at such price or prices, as it may deem fit and retain the proceeds of any sale of disposition and all other amounts then or thereafter due by the City to the Contractor on account of or in part satisfaction of any losses, damages, expenses or costs which the City may sustain or have sustained by reason of any delay or default or defect aforesaid.

**.05 PROSECUTION AND PROGRESS...Cont'd.****.05.04 Extension of Time**

An extension of time for completion of the Work or part thereof under this Contract may be granted in writing, by the Project Manager in the event of delay caused by strikes on the part of the workers employed, or by any act of the City, or any combination thereof or from such other cause as is beyond the Contractor's control, or in the event of extra or additional Work being ordered by the Project Manager. Such extension shall be for such time as the Project Manager may prescribe as being fair and reasonable, and the Project Manager shall fix the terms on which the said extension may be granted. An application for an extension of time as herein provided shall be made in writing by the Contractor to the Project Manager at least fifteen (15) days prior to the date of completion fixed by the Contract. Any additional time granted for the completion of the Contract will be conditional upon the Contractor providing the City with evidence that all bonds or other securities, furnished to the City by the Contractor have been increased and extended at least to the limit of the time extension. Any extension of time that may

be granted to the Contractor shall be so granted and accepted without prejudice to any rights of the City whatsoever under this Contract, and all of such rights shall continue in full force and effect after the time limited in this Contract for the completion of the Work and whenever in this Contract, power and authority is given to the City or the Project Manager or any person to take any action consequent upon the act, default, breach, neglect, delay, non-observance or non-performance by the Contractor in respect of the Work or Contract, or any portion thereof, such powers and/or authorities may be exercised from time to time and not only in the event of the happening of such contingencies, before the time limited in this Contract for the completion of the Work, but also in the event of the same happening after the time so limited in the case of the Contractor being permitted to proceed with the execution of the Work under an extension of time granted by the Project Manager. In the event of the Project Manager granting an extension of time, time shall continue to be of the essence of this Contract.

**.06 PAYMENT****.06.01 Price for Work**

Unless otherwise provided in the Contract, the Contractor shall accept the compensation as herein provided in full payment for furnishing all necessary labour, materials, services, taxes, tools, equipment, supplies, light, power, water and other incidentals, and for performing all Work under the Contract.

**.06.02 Prices and Payments**

A Progress Payment Certificate will be given by the General Manager of Public Works Department using the Contractor's invoice as a guide only, once a month, as to the estimated amount of Work done and material furnished to the satisfaction of the General Manager of Public Works Department and of the value thereof in the opinion of the General Manager of Public Works Department according to the terms of the Contract. The City will pay to the Contractor 90 percent of the

**.06 PAYMENT...Cont'd.**

**.06.02 Prices and Payments...Cont'd.**

amount shown on such certificates, less previous payments and the amount of any liens (plus 25% of any such liens for costs) of which the City has notice and any amounts that the City deems necessary to retain for its protection against claims or liabilities or for any claim or claims the City may have, or have notice of, against the Contractor under this Contract, other Contracts, or otherwise and such payments shall not in any way be construed as an acceptance of all or any part of the Work or material under this Contract.

Along with the Contractor's notification of completion of the Work as per Section 200.02.11, the Contractor shall submit, in quadruplicate, a Completion Invoice addressed to the General Manager of Public Works Department.

If the Work has been completed to the satisfaction of the Project Manager, subject to and upon such approval, and subject to a current Workplace Safety and Insurance Board Certificate, a Completion Payment Certificate will be issued to the Contractor. Payment shall then be made in an amount equal to the amount of the said certificate less 10 per cent holdback and less all amounts previously paid to the Contractor, provided that the City may retain any proportion or all of such payment that it deems necessary for its protection against claims, liabilities, damages, or costs or for any claims that the City may have or have notice of against the Contractor under this Contract or other Contracts or otherwise. Within one calendar month after the issuance of the Completion Payment Certificate, the Contractor shall notify the Project Manager of any errors or omissions herein.

Hold Back Monies Will Be Released On The Following Basis:

**Substantial Performance**

Holdback monies will be released sixty (60) days after the date of substantial performance provided that "Section 32" of the Construction Lien Act, as amended from time to time has been complied with and satisfactory evidence thereof has been submitted to the City.

Substantial Performance shall be defined in "Section 2" of the Construction Lien Act, as amended from time to time.

**Contract Completion**

A Final Payment Certificate for any balance of holdback monies due, less any liens (plus 25% of any such liens for costs) which the City has notice and less any amounts that the City deems necessary to retain for its protection against claims, liabilities, damages or costs for any other claims the City may have against the Contractor otherwise, and such payment shall not in any way be construed as an acceptance of all or any part of the Work or material required under this Contract.

The final Payment Certificate will become due and payable sixty (60) days after date of acceptance of the entire Work.



**.06 PAYMENT...Cont'd**

**.06.02 Contract Completion...Cont'd.**

The Contract shall be deemed to be completed and services or materials shall be deemed to be last supplied to the improvement when the price of completion, correction of a known defect or last supply is not more than the lessor of,

- a) 1% of the Contract Price; or
- b) \$1,000.00

The Final Payment Certificate will be released only after satisfactory evidence has been given to the City that Section 32 of the Construction Lien Act, as amended has been complied with.

**Contingency Allowance**

Where a contingency allowance is provided for in any of the Contract Documents, the Successful Bidder shall not be entitled to payment of the whole or any part of that amount, except to the extent that it can be shown that extra or additional work has been carried out by the Successful Bidder beyond that contemplated within the Contract Documents, and that a Change Order has been issued by the Project Manager entitling the Successful Bidder to receive such payment.

**.06.03 Contractor's Discharge of Liabilities**

The Contractor shall discharge all liabilities incurred by it for labour, materials or services, used or reasonably required for use in the performance of this Contract on the date upon which each become due.

The Contractor shall cause each Sub-Contractor engaged in the performance of this Contract to discharge all liabilities incurred by such Sub-Contractor for labour, materials, or services used or required for use in the performance of this Contract. Workers employed by a Sub-Contractor shall be paid in full at intervals not less frequently than semi-monthly and other liabilities of the Sub-Contractor, as aforesaid, shall be discharged on the date upon which each becomes due. At the request of the City, the Contractor shall furnish the City with evidence satisfactory to the City that the Contractor's liabilities and those of its Sub-Contractors as aforesaid have been discharged and this shall include a Certificate of Clearance or statement of status from the Workplace Safety and Insurance Board (WSIB) that the Contractor has complied with the requirements of the Workplace Safety and Insurance Board and is in good standing before the Board. Further, the Contractor shall immediately advise the City if there is any change in the Contractor's status with the WSIB and provide the City with the necessary certificate or statement associated therewith.

**.06 PAYMENT...Cont'd**

**.06.03 Contractor's Discharge of Liabilities...Cont'd.**

No payment to which the Contractor is otherwise entitled under this Contract shall, in the discretion of the Project Manager, be due and payable to it so long as it or any of such Sub-Contractors are in default under this Section. Upon such default occurring, the Project Manager may notify the Contractor to discontinue all Work under the Contract and the City shall have the same rights and privileges as are provided in Section 200.05.03 of these General Conditions. The City, after notice in writing to the Contractor and/or its Surety, may pay any such liability of the Contractor and of the Sub-Contractors, as aforesaid, and deduct the amount so paid from any monies due or that may become due to the Contractor on any account, and, if there are insufficient monies due or to become due to the Contractor to permit of such deduction, the Contractor shall pay to the City upon demand, an amount sufficient to make up the deficiency. In making payments under this Section the City may act upon any evidence that it deems sufficient and may compromise any disputed liability and such payment should not be open to dispute or question by the Contractor or the surety, if any, but are final and binding upon them.

**.06.04 Construction Claims Holdback Provision**

The City reserves the right to withhold funds from payment to the Contractor in the event the Contractor fails to satisfy the claims handling requirements as specified in 200.03.12 and/or if it is evident that the Contractor is not responding to the claim in a legitimate manner.

The amount of the holdback will be based on an assessment by Risk Management Services of damages claimed in addition to potential investigation and administration costs.

**.06.05 Workplace Safety and Insurance Board Certificate of Clearance (WSIB)**

The Contractor shall supply the following to the City prior to the execution of the Contract for Works or before commencing the Project, Work or Supply of any materials:

- (a) shall submit to the City an original Clearance Certificate from the Ontario Workplace Safety and Insurance Board and shall provide additional certificates with respect to such coverage as often as the City deems necessary during the term of the Contract to ensure continued good standing with the Workplace Safety and Insurance Board; or
- (b) furnish proof in a form satisfactory to the City from the Workplace Safety and Insurance Board that the Contractor does not require Workplace Safety and Insurance Board insurance, but in such a case if the Contractor changes its status during the term of the Contract so that such

**.06 PAYMENT...Cont'd.**

**.06.05 Workplace Safety and Insurance Board Certificate of Clearance...Cont'd.**

coverage is required, the Contractor shall immediately provide the City with the certificate required under clause (a).

- (c) during the term of the Contract, when submitting each payment invoice, a copy of the Contractor's current certificate of clearance from the WSIB for itself as well as all major Sub-Contractors as determined by the City's Project Manager must be provided. Where a substantial portion of the work to be done under the Contract is to be carried out by a subcontractor, the City may require the Contractor to furnish the same evidence as provided under subsection (1).

The Contractor will not be paid any amount until or unless all required certificates of clearance have been provided by the Contractor to the City or alternately the City will withhold funds in an amount satisfactory to the Project Manager to protect the City's potential liability of WSIB arrears.

If the City suspects that a certificate presented is not authentic or accurate, payment will be withheld until an original copy of the certificate has been received.

The City reserves the right to contact the Workplace Safety Insurance Board directly to confirm that the Contractor or Sub-Contractor is in good standing with the Board. In such cases that the City is advised that there are outstanding Workplace Safety Insurance Board payments, the provisions specified in 200.06.03 shall apply. The City will advise the Contractor when monies are withheld or deducted due to non compliance with the requirements of the Workplace Safety and Insurance Board by the Contractor or Sub-Contractor.

**.06.06 Certificate of Status**

All successful Bidders which are corporations shall submit to the City a Certificate of Status from the Ministry of Consumer and Commercial Relations indicating that the successful Bidder is in good standing and has not been dissolved. The Certificate of Status shall be submitted to the City once per calendar year together with the executed Contract for the first Contract awarded by the City to the successful Bidder in each calendar year.

**.06.07 Inspection of Books, Payrolls, Accounts and Records**

The Contractor shall maintain and keep sufficient complete and accurate books, payroll, accounts and records relating to the Work or any extension or additions thereto or claims arising therefrom to permit the verification and audit thereof and shall have no claim for payment of any nature and kind whatsoever, therefore, unless such books, payrolls, accounts and records have been so maintained and kept.

The City may inspect and audit the books, payrolls, accounts and records of the Contract at any time during the period of the Contract and at any time thereafter as

**.06 PAYMENT...Cont'd.**

**.06.07 Inspection of Books, Payrolls, Accounts and Records... Cont'd.**

deemed necessary by the City and the Contractor shall supply certified copies of payrolls and any other records required, whenever requested, by the City.

The Contractor shall preserve all original records pertaining in any way to the Work of the Contract, or any extensions or additions thereto or claims arising therefrom, for a period of twelve (12) calendar months after the expiration of the maintenance period and the Contractor shall require that all Sub-Contractors employed by it preserve all original records pertaining in any way to the Work of the Contract, or any extensions or additions thereto or claims arising therefrom for a similar period of time.

The Contractor shall file with the City forthwith upon the appointment of each Sub-Contractor a consent and covenant of each Sub-Contractor under seal by which the Sub-Contractor agrees to the provisions in the same Section in the same way as if the Section read, "Sub-Contractor" for "Contractor".

**.07 MAINTENANCE**

The Contractor shall maintain the Works and every part thereof, in perfect order and in complete repair during the period of twenty-four (24) calendar months from the date of the established completion thereof, as herein provided, and make good in a permanent manner, satisfactory to the Project Manager, any and all damage or injury to the Works, both during their construction and during the period of maintenance, as aforesaid, and should the Contractor from any cause fail to do so, then the City through the Project Manager, may do so, and the whole costs, charges and expenses so incurred, may be deducted, or collected by the City as provided for herein. The decision of the Project Manager is to be final as to the necessity of repairs or of any Work done or required to be done under the provisions of this or any clause in the Contract Documents and for any amount of monies expended thereunder.

**.07.01 Maintenance Review**

The City will notify the Contractor prior to the expiry of the twenty-four (24) calendar month maintenance period to permit the Contractor to coordinate a final deficiency review. The Contractor will walk and review the entire physical limits of the Contract with the Project Manager or designate to review Work completed. The review will consist of all above and below ground components covered by the scope of Work of the Contract.

The Contractor will be responsible for providing all equipment required to conduct any necessary testing for the review. All deficiencies identified by the review will be corrected at the cost of the Contractor to the satisfaction of the Project Manager prior to the expiry of the maintenance period.

**.01 SCOPE**

- .01 General
- .02 Work Included

**.02 RESPONSIBILITY FOR MATERIAL**

- .01 Material Furnished by the Contractor
- .02 Material Furnished by the City
- .03 Safe Storage
- .04 Replacement of Damaged Material
- .05 Disposition of Defective Material

**.03 HANDLING OF MATERIAL**

- .01 Loading and Unloading
- .02 Transporting, Unloading, Storing and Handling Pipe

**.04 APPROVED WATERMAIN MATERIALS**

**.05 DUCTILE IRON PIPE WATERMAIN**

- .01 Ductile Iron Pipe Watermain – 100 mm to 300mm
  - .01.01 Polyethylene Encasement of Ductile Iron Watermain
- .02 Ductile Iron Pipe Watermain – 400mm and larger
  - .02.01 Submissions

**.06 CONCRETE PRESSURE PIPE WATERMAIN (400mm and Larger)**

- .01 Submissions

**.07 POLYVINYL CHLORIDE PIPE**

- .01 Polyvinyl Chloride (PVC) Pipe Watermain – 100mm to 300mm
  - .01.01 Service Connection Fittings and Appurtenances
- .02 Polyvinyl Chloride (PVC) Pipe Watermain– 400mm to 750mm
  - .02.01 Submissions
  - .03 Installation of Pipes
  - .04 Jointing Polyvinyl Chloride (PVC) Pressure Pipe
  - .05 Changes in Line and Grade
  - .06 Polyvinyl Chloride (PVC) Pipe - Cathodic Protection

**.08 TRUNK WATERMAIN DESIGN AND OPERATING PARAMETERS – 400mm AND LARGER**

**.09 VALVE CHAMBERS**

- .01 Chambers
- .02 Valve Chamber Piping
- .03 Ductile Iron
- .04 Concrete Pressure Pipe
- .05 Chamber Fittings
- .06 Bolts
- .07 Design
- .08 Submittals

**.10 VALVES**

- .01 Gate Valves
- .02 Butterfly Valves
- .03 Air Release and Vacuum Valves

**.11 TRACER WIRE AND CONDUCTIVITY TESTING**

- .01 Tracer Wire
- .02 Conductivity Testing

**.12 TEMPORARY WATER SERVICE BY-PASS FOR CONSUMERS**

- .01 General Description
- .02 By-Pass Pipe and Materials
- .03 Service of Water to Feed By-Pass
- .04 Temporary Connection to Customer
- .05 Disinfection of Temporary Service Connections

**.13 EXCAVATION AND PREPARATION OF TRENCH**

- .01 General
- .02 Width of Trench
- .03 Alignment and Grade
- .04 Deviations Occasioned by Other Structures
- .05 Pipe Bell Bedding
- .06 Excavation to Grade
- .07 Excavation in Poor Soil
- .08 Excavation in Rock
- .09 Special Foundation in Poor Soil
- .10 Preparation of Trench Bottom
- .11 Preparation of Trench Bottom Below Grade
- .12 Care of Surface and Excavated Material for Reuse
- .13 Piling Excavated Material
- .14 Interruption of Service, Shutting Down or Charging of Mains

**.14 BEDDING AND BACKFILL OF WATERMAINS**

- .01 General
- .02 Bedding
- .03 Backfill
- .04 Summary of Bedding and Backfill Materials
  - .01 Ductile Iron and Polyvinyl Chloride (PVC) Pipe Watermain
  - .02 Concrete Pressure Pipe Watermain
  - .03 Water Services
  - .04 Hydrants

**.15 LAYING**

- .01 Laying Pipe
- .02 Cutting Iron Pipe
- .03 Bell Ends to Face Direction of Laying
- .04 Unsuitable Conditions for Laying Pipe

**.16 JOINTING MECHANICAL-JOINT PIPE**

- .01 Assembling Joint
- .02 Bolting of Joint
- .03 Permissible Deflection in Mechanical-Joint Pipe

**.17 JOINTING STEEL CYLINDER REINFORCED CONCRETE PIPE**

**.18 JOINTING TYTON-JOINT PIPE**

- .01 Cleaning and Assembling Joint
- .02 Preparation of Spigot on Site
- .03 Electrical Conductors
- .04 Permissible Deflection in Tyton-Joint Pipe
- .05 Jointing Flange Pipe

**.19 SETTING VALVES AND FITTINGS**

- .01 Valve Boxes
- .02 Drainage of Mains
- .03 Dead Ends

**.20 HYDRANTS**

**.21 BACKFLOW PREVENTERS**

**.22 ANCHORAGE**

- .01 Anchorage for Fittings
- .02 Metal Harness

**.23 WATER SERVICES**

- .01 Services -19mm and 50mm Diameter
- .02 Services - 100mm Diameter and Larger
- .03 Curb Boxes
- .04 Trench for Water Services
- .05 Laying Water Service Pipe
- .06 Leaks in Services

**.24 CONCRETE AND MORTAR**

- .01 Materials
- .02 Proportioning and Mixing of Mortars
- .03 Jointing Old and New Work
- .04 Placing in Water
- .05 Forms
- .06 Form Removal
- .07 Curing of Concrete
- .08 Finish
- .09 Defects
- .10 Reinforcing Steel

**.25 CONNECTION, SWABBING, FLUSHING, DISINFECTION, LEAKAGE AND BACTERIOLOGICAL TESTING OF WATERMAINS (APPENDIX A)**



**.01 SCOPE****.01.01 General**

This Specification covers the requirements for the installation of ductile iron, polyvinyl chloride and concrete watermains. All watermains and water services shall be supplied and installed in accordance with OPSS 441 as amended by this specification.

**.01.02 Work Included**

The Contractor shall, unless specified otherwise, furnish all equipment, tools and labour necessary to do the work required under this contract and unload, haul and distribute all pipe, fittings, valves, hydrants and accessories. The Contractor shall also remove the pavement as stipulated; excavate the trenches and pits to the required dimensions; excavate the bell holes; construct and maintain all bridges for traffic control; sheet, brace and support the adjoining ground structure where necessary; handle all drainage or ground water; provide barricades, guards and warning lights; lay and test the pipe, fittings, valves, hydrants and accessories; backfill and consolidate trenches and pits; restore roadway surface, unless otherwise stipulated; remove and dispose of surplus excavated materials as directed; clean the site of the work; and maintain the street or other surface over trenches as specified.

**.02 RESPONSIBILITY FOR MATERIAL****.02.01 Material Furnished by the Contractor**

Unless otherwise noted in the contract documents, the Contractor shall supply all materials required to complete the works. This will include but not be limited to:

The proposed watermain pipe(s) complete with all valves, connections, fittings, specials, thrust blocks, anchor blocks, tee's bends, sleeves, and all lowerings in accordance with the elevations and grades shown on the contract drawings.

Water for testing and disinfection will be supplied by the Contractor. Hydrant usage will require the necessary permit and meterage charges. The Contractor shall be responsible for the transportation of this water from source of supply to point of use.

The Contractor shall be responsible for all material furnished by them and shall replace all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labour required for the replacement of installed material discovered defective prior to the final acceptance of the work.

In addition to Form 200.04.06, all materials supplied by the Contractor shall be in accordance with the applicable current Approved Products List or contract specification. Any material used that is not approved or not appropriate shall be removed and replaced by the Contractor at no cost to the City.

**.02.02 Material Furnished by the City**

Where the contract documents or drawings indicate that the City will supply materials, the Contractor shall pick-up the required materials at the designated location and haul such materials to the site as required.

The Contractor's responsibility for material furnished by the City shall begin F.O.B. at the point of delivery to the Contractor. Materials already on the site shall become the Contractor's responsibility on the day of the execution of the Contract. The Contractor shall examine all material furnished by the City at the time and place of delivery to and shall reject all defective material.

**.02.03 Safe Storage**

The Contractor shall be responsible for the safe storage of material furnished by or to them, and accepted by them and intended for the work, until it has been incorporated in the completed project. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

**.02.04 Replacement of Damaged Material**

Any material furnished by the City that becomes damaged after acceptance by the Contractor shall be replaced by the Contractor.

**.02.05 Disposition of Defective Material**

Prior to acceptance of responsibility for safe storage by the Contractor under Section .02.03, any material furnished by the City found to be defective shall be set aside and removed from the site or the work by the City. All defective materials furnished by the Contractor shall be promptly removed by from the site.

**.03 HANDLING OF MATERIAL****.03.01 Loading and Unloading**

All pipe fittings, pipe, valves, hydrants, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

**.03.02 Transporting, Unloading, Storing and Handling Pipe**

All pipe up to and including 600mm shall be delivered to the site with end covers and a tamper evident seals in accordance with OPSS 441.07.07.

**.04 APPROVED WATERMAIN MATERIALS**

All watermain pipe, fittings and other materials shall be as listed on the Approved Watermain Products List, as amended. Materials shall meet the current version of the applicable standards, including but not limited to CSA, ASTM, AWWA, NSF Standard 61 and OPSS.

Acceptable pipe materials are ductile iron, polyvinyl chloride and concrete pressure pipe.

**OPSS 441.05.02 Ductile Iron Pipe** - acceptable refer to 400.05

**OPSS 441.05.03 Concrete Pressure Pipe Products** - acceptable refer to 400.06

**OPSS 441.05.04 Polyvinyl Chloride Pipe Products** - acceptable refer to 400.07

**OPSS 441.05.05 Polyethylene Pipe Products** - not acceptable

**OPSS 441.05.06 Steel Pipe Products** - not acceptable.

**OPSS 441.05.08 Composite Pipe** - not acceptable.

**.05 DUCTILE IRON PIPE WATERMAIN**

All watermain materials shall be in accordance with AWWA C104, C105, C110, OPSS 441, this specification and be selected from the Approved Watermain Products List, latest version.

**.05.01 Ductile Iron Pipe Watermain – 100mm to 300mm**

Ductile iron pipe shall be Pressure Class 350, cement lined, tyton joint, for 300mm and smaller pipe as per OPSS 441.05.02 with cement lined fittings.

All pipe and mechanical joints of pipe shall be protected Polyethylene Encasement in accordance with this specification and the manufacturers recommendation. Field cut pipe shall be kept to a minimum.

Anchor blocks and joint restraint shall be used at all fittings in accordance with the City's standard drawings, contract documents and the following:

All fittings and valves shall be restrained for 3 full pipe lengths (up to 18m) in each direction. All fittings at dead ends shall be restrained for 3 full pipe lengths (up to 18 m).

All fittings shall be restrained for 3 full pipe lengths (up to 18m) on all water services 100mm or greater and shall extend to property line.

**.05.01.01 Polyethylene Encasement of Ductile Iron Watermain**

Polyethylene encasement shall be in accordance with ANSI/AWWA C105/A21.5 and the following:

- (i) Material to be Low Density, polyethylene film having a nominal thickness of 8 mil (.008 inch) in accordance with Section 4.1.1.3
- (ii) Installation Method "A" only to be used. (Poly-Tube with overlap - No sheets)
- (iii) Direct service connection tapping through Triple polyethylene adhesive tape & the polyethylene film is to be used for all service taps.
- (iv) Junctions between wrapped & existing unwrapped pipe - Polyethylene wrap is to cover the adjacent pipe for a distance of at least 0.9 m. Secure the end with sufficient circumferential turns of tape.
- (v) Attached service lines of dissimilar metals shall be wrapped with polyethylene or suitable dielectric tape for a minimum clear distance of 0.9 m away from the ductile iron pipe.

**.05.02 Ductile Iron Pipe Watermain – 400mm and Larger**

All ductile iron watermain shall be designed in accordance with the Trunk Watermain Design and Construction Parameters given in 400.08.

Pipe shall be Class 52, ductile iron cement lined, with Tyton and/or restrained Joints as per OPSS 441.05.02, with cement lined fittings. All pipe and mechanical joints of pipe shall be protected Polyethylene Encasement in accordance with this specification and the manufacturers recommendation. Field cut pipe shall be kept to a minimum.

Restrained Mechanical Joint for D.I. will be required at all fittings and for suitable length as recommended by the Supplier and shall be installed with strict accordance with the manufacturer's specifications and recommendations. Joints alone shall be capable of withstanding thrust up to 150 psi test pressure.

Anchor blocks and joint restraint shall be used at all fittings in accordance with the City's standard drawings and contract documents.

The maximum permissible joint deflection shall be less than or equal to 50% of the values recommended by the manufacturer.

Polyethylene encasement shall be in accordance with ANSI/AWWA C105/A21.5 and as described in subsection .05.01.01.

Closure pipe shall consist of Restrained Mechanical Joint Fittings and Solid Sleeve.

All dead ends on watermain shall be closed with cast iron plugs/caps or bulkheads that are adequately restrained for pressure testing and provided with a 50mm corporation main stop.

**.05.02.01 Submissions**

The Contractor shall supply 2 copies of the following information to the Project Manager prior to installing any pipe:

- a) Letter confirming that the proposed pipe material, fittings and restraint are designed to operate as a complete system that meets all specified watermain design and operating parameters.
- b) Pipe layout drawings and schedules showing the location and type of all pipe, fittings, restrained lengths, valves, method of restraint, location and size of all anchor blocks;
- c) Drawings showing the proposed location of all valve chambers, including detailed dimensions and a listing of all internal components.
- d) Where the City has provided a stamped standard watermain valve chamber drawing, the Contractor shall construct all valve chambers in accordance with the approved standard drawing. Any variations to the approved drawing will require a revised stamped valve chamber drawing submission by the Contractor.
- e) All submissions shall be stamped by an Engineer licensed by Professional Engineers Ontario (PEO) to practice in the Province of Ontario.

**.06 CONCRETE PRESSURE PIPE WATERMAIN (400mm and Larger)**

All concrete watermain shall be in accordance with AWWA C301 and/or C303, OPSS 441, this specification and be selected from the Approved Watermain Products List, latest version. Non-cylinder pipe is not permitted.

400 mm concrete pressure pipe will only be permitted for short repair sections or where specifically approved for use by the City.

All concrete watermain shall be designed in accordance with the Trunk Watermain Design and Construction Parameters given in 400.08.

Restrained Joint Concrete Pressure Pipe will be required at all fittings and for suitable length as recommended by the Manufacturer. Joints alone shall be capable of withstanding thrust up to 150 psi test pressure. Joint restraint shall be in accordance with the manufacturer's recommendations, welded joints will not be permitted.

Anchor blocks and joint restraint shall be used at all fittings in accordance with the City's standard drawings and contract documents

Tracer wire shall be installed on concrete pressure pipe shall be light coloured, plastic coated and strapped to the pipe at 6 m intervals and in accordance with 400.11.

Closure pipe shall consist of two lengths of pipe with a dresser coupling. The lengths of pipe shall be made to lengths measured in the pipe trench by the Contractor.

The maximum permissible joint deflection shall be less than or equal to 50% of the values recommended by the manufacturer.

#### **.06.01 Submissions**

The Contractor shall supply 2 copies of the following information to the Project Manager prior to installing any pipe:

- a) Letter confirming that the proposed pipe material, fittings and restraint are designed to operate as a complete system that meets all specified watermain design and operating parameters.
- b) Pipe layout drawings and schedules showing the location and type of all pipe, fittings, restrained lengths, valves, method of restraint, location and size of all anchor blocks;
- c) Drawings showing the proposed location of all valve chambers, including detailed dimensions and a listing of all internal components.
- d) Where the City has provided a stamped standard watermain valve chamber drawing, the Contractor shall construct all valve chambers in accordance with the approved standard drawing. Any variations to the approved drawing will require a revised stamped valve chamber drawing submission by the Contractor.
- e) All submissions shall be stamped by an Engineer licensed by Professional Engineers Ontario (PEO) to practice in the Province of Ontario.

#### **.07 POLYVINYL CHLORIDE (PVC) PIPE WATERMAIN**

All PVC watermain shall be in accordance with OPSS 441, AWWA C605, C900, C905, C907, C909, this specification and be selected from the Approved Watermain Products List, latest version.

#### **.07.01 Polyvinyl Chloride (PVC) Pipe – 100mm to 300mm**

Pipe shall be in accordance with OPSS 441.05.04, and the following:

##### **OPSS 441.05.04 Polyvinyl Chloride Plastic Pipe Products**

PVC pipe in sizes 100 mm through 300 mm shall have cast iron outside diameters (CIOD) in all sizes. Pipe shall be jointed by means of integral elastomeric-gasket joints conforming to ASTM D3139. Acceptable PVC materials are as follows:

- a) Polyvinyl chloride pipe (PVC) Class 150, DR18 conforming to AWWA C900;

- b) Molecularly oriented polyvinyl chloride (PVCO), Pressure Class 150(PC150), DR18 conforming to AWWA C909.

Fittings for 100mm, 150mm and 200mm PVC pipe shall be injection molded PVC conforming to AWWA C907. Fittings for 250 mm and 300 mm shall be manufactured from segments of AWWA C900 PVC pipe, bonded together and over-wrapped with fibreglass-reinforced polyester to meet the requirements of CSA B137.3.

Anchor blocks and joint restraint shall be used at all fittings in accordance with the City's standard drawings, contract documents and the following:

All fittings and valves shall be restrained for 3 full pipe lengths (up to 18m) in each direction. All fittings at dead ends shall be restrained for 3 full pipe lengths (up to 18 m).

All fittings shall be restrained for 3 full pipe lengths (up to 18m) on all water services 100mm or greater and shall extend to property line.

Where metal fittings are used on PVC mains, protective coatings and cathodic protection must be provided to the satisfaction of the Project Manager.

#### **.07.01.01 Service Connection Fittings and Appurtenances – PVC Pipe**

##### **OPSS 441.05.12 Service Connection Fittings and Appurtenances**

Add the following:

Service connections to 100, 150 and 200 PVC mains shall be made by using PVC molded tapped couplings, conforming to AWWA C907 and CSA B137.2.

Service connections to 250mm and 300mm PVC mains shall be made using a service saddle.

Service saddles shall be used on any size mains requiring a direct tap.

Service saddles and all fasteners shall be stainless steel 304, a minimum 18 gauge construction and shall have AWWA taper (CC) outlet thread. Service saddles shall be selected from the Approved Watermain Products list.

All proposed or replacement water services, 100mm or larger, shall be constructed using a pipe material that is the same as proposed watermain material.

**.07.02 Polyvinyl Chloride (PVC) Pipe – 400mm to 750mm**

All PVC watermain 400mm to 750mm shall be designed in accordance with the Trunk Watermain Design and Construction Parameters given in 400.08.

**OPSS 441.05.04 Polyvinyl Chloride Plastic Pipe Products**

Revised as follows:

PVC pipe in sizes 400mm to 750mm shall conform to AWWA C905 and shall be designed according to AWWA Manual M23: PVC Pipe-Design and Installation, 2<sup>nd</sup> Edition. All 400mm pipe shall be DR18. Joints alone shall be capable of withstanding thrust up to 150 psi test pressure.

Fittings for 400mm through 750mm PVC pipe shall be manufactured from segments of AWWA C905 PVC pipe, bonded together and over-wrapped with fibreglass-reinforced polyester to meet the requirements of CSA B137.3.

Anchor blocks and joint restraint shall be used at all fittings in accordance with the City's standard drawings and contract documents.

Where metal fittings are used on PVC mains, both corrosion protection and cathodic protection must be installed provided to the satisfaction of the Project Manager.

**.07.02.01 Submissions**

The Contractor shall supply 2 copies of the following information to the Project Manager prior to installing any pipe:

- a) Letter confirming that the proposed pipe material, fittings and restraint are designed to operate as a complete system that meets all specified watermain design and operating parameters.
- b) Pipe layout drawings and schedules showing the location and type of all pipe, fittings, restrained lengths, valves, method of restraint, location and size of all anchor blocks;
- c) Drawings showing the proposed location of all valve chambers, including detailed dimensions and a listing of all internal components.
- d) Where the City has provided a stamped standard watermain valve chamber drawing, the Contractor shall construct all valve chambers in accordance with the approved standard drawing. Any variations to the approved drawing will require a revised stamped valve chamber drawing submission by the Contractor.
- e) All submissions shall be stamped by an Engineer licensed by Professional Engineers Ontario (PEO) to practice in the Province of Ontario.



**.07.03 Installation of Pipes**

**OPSS 441.07.14 Installation of Pipes**

Add the following:

Excavation and Preparation of Trench shall be completed in accordance with the manufacturers recommendations and AWWA C605.

**.07.04 Jointing Polyvinyl Chloride (PVC) Pressure Pipe**

**OPSS 441.07.15.04 Jointing Polyvinyl Chloride Plastic Pressure Pipe**

Add the following:

PVC pipe shall be laid in accordance with AWWA C605. Pipe deflection shall be in accordance with subsection .07.05 Changes in Line and Grade.

**Bell and Spigot Joints**

The pipe shall be jointed in accordance with AWWA C605 and the manufacturer's specifications. If elastomeric gaskets are supplied separately, they shall be inserted into the groove of the bell end of the pipe.

Lubricant for gaskets shall conform to pipe manufacturers recommendations and shall be NSF-61 approved. Clean the gasket, the bell, the groove area and the spigot area with a clean rag to remove any dirt or foreign material before assembling. Insert the gasket into the groove and seal it firmly. Apply lubricant, as provided by the manufacturer, to the beveled spigot end. Push the lubricated end past the gasket into the bell until the reference mark is even with the bell.

**.07.05 Changes in Line and Grade**

**OPSS 441.07.17 Change in Line and Grade**

Add the following:

All pipe joint deflections shall be less than or equal to 50% of of the values recommended by the manufacturer. No deflection of the pipe barrel for changes in line or grade are permitted.

**.07.06 Polyvinyl Chloride (PVC) Pipe - Cathodic Protection**

The following are minimum requirements. Specific soil conditions may require changes to the cathodic protection system. The installation and placement of anodes and tracer wires shall be in accordance with OPSD 1109.011 and the following:

Cathodic protection shall be provided for all tracer wires on P.V.C. watermain pipes. One (1) 5.4 kg zinc anode will be provided for every 1000 m tracer wire.

One (1) 5.4 kg zinc anode is to be installed on all copper service connections, by means of a service ground clamp, coated with T.C. Mastic or wrapped with “Scotchfill” electrical putty or approved equal. The anode is to be placed at least 1.0 m away from the water service and as deep as the service and within 1.0 m of the curb stop.

One (1) 10.8 kg zinc anode is to be installed on each hydrant. If P.V.C. pipe is used between the hydrant tee or anchor tee and the hydrant boot, two (2) 10.8 kg zinc anodes shall be used.

One (1) 5.4 kg zinc anode is to be installed on every valve, and every metallic fitting connected to a P.V.C. watermain. Fittings include bends, tees, crosses, sleeves, reducers, plugs, caps, joint restrainers and couplings.

One (1) 14.5 kg magnesium anode is to be connected to the first length of an existing metallic watermain pipe when connected to a new P.V.C watermain.

All sacrificial zinc anodes shall conform to ASTM B-418 Type II and shall be made of high grade electrolytic zinc, 99.99 % pure. Magnesium anodes shall conform to ASTM B-107-Type M1.

For all anodes connected to new pipe, fittings or to existing metallic watermains, a Cadwelder and CA-15 or equivalent cartridge shall be used. All thermite weld connections to be coated with T.C. Mastic (Tapecoat of Canada), Roybond 747 Primer and Royston “Handy Cap” or approved equal.

Contractors are advised that there is no specific pay item for Cathodic Protection, all costs shall be included in all other appropriate items.

**.08 TRUNK WATERMAIN DESIGN AND OPERATING PARAMETERS – 400 mm AND LARGER**

All trunk watermains shall be in accordance with the following requirements:

The pipe manufacturer shall calculate the joint restraint required based on the trench width, cover over the pipe, bedding and pressures indicated in this specification and on the contract drawings.

Watermains, fittings and restraint shall be designed and constructed for operation under the following parameters:

Design / Field Test Pressure	Working Pressure	Surge Pressure (Additional)	Additional External Loads
150 psi	100 psi	100 psi	Hwy. H-20 S16

- a) The factor of safety for pipe and fitting restraint shall be 2 times the design / field test pressure (300psi).
- b) Pipe joints alone shall be capable of withstanding 150 psi test pressure

- c) Trench Type 5 shall be used.
- d) Proposed joint restraint shall be able to accommodate all operating, test and surge pressures independent of anchor blocks.
- e) Anchor Blocks will be required in addition to joint restraint.
- f) All restrained joints shall be installed in strict accordance with the manufacturer's specifications and recommendations and shall include appropriate corrosion protection.
- g) Depth of bury shall be a maximum of 1.6m to top of pipe or less. Where drawings or documents indicate depth of bury less than 1.6m to top of pipe, that value will be used.

**.09 VALVE CHAMBERS**

**.09.01 Chambers**

Valve chambers shall be in accordance with OPSS 402, OPSS 1351, City standards and contract drawings. Chambers shall be capable of withstanding the required thrust forces and be selected from the Approved Watermain Products List.

Pre-cast chambers shall be supplied from a plant listed as Prequalified under the Plant Prequalification Program by the Ontario Concrete Pipe Association.

**.09.02 Valve Chamber Piping**

Chamber piping materials shall be ductile iron or concrete pressure pipe in accordance with the following:

**.09.03 Ductile Iron**

Ductile Iron Pipe shall be a minimum of Class 54, conform to AWWA C151 and be cement lined as per AWWA C104.

**.09.04 Concrete Pressure Pipe**

Prestressed Concrete Cylinder Pipe shall conform to AWWA C301.

**.09.05 Chamber Fittings**

Ductile Iron Fittings shall conform to AWWA C110.  
Prestressed Concrete Cylinder Pipe shall conform to AWWA C301.

**.09.06 Bolts**

All nuts, bolts and washers shall be stainless steel. Bolt size, type and diameter shall be in accordance to AWWA C207. Bolt length shall be sufficient to

accommodate flanges, gaskets and insulators. Protective coatings shall be applied to all nuts and bolts inside chambers.

**.09.07 Design**

All pipe and fittings shall be designed to the values given in the Trunk Watermain Design and Operating Parameters – 400 mm and Larger, subsection 400.08.

**.09.08 Submittals**

Contractor shall supply the following information before ordering or installing any chamber components:

- a) shop drawings, specifications and data sheets for all pipe specials;
- b) valve type, catalogue data, actuator type (with input and output torque ratings), principle dimensions, schedule of parts and materials and expected time of delivery;
- b) Layout drawings for all chamber pipe and internal components.

**.10 VALVES**

**OPSS 441.05.09 Valves**

All valves shall be selected from the Approved Watermain Products List or as specified in the contract documents.

**OPSS 441.05.09.01 General**

Revised as follows:

Valve types shall be in accordance with the following:

- a) All gate and butterfly valves installed within the boundaries of the former City of Hamilton are to be open right (clockwise), with the City's 25 mm standard operating nut WM-203.04.
- b) All gate and butterfly valves in the remainder of the new City are open left (counter clock-wise), with the City's 50mm operating nut.

The remainder of the new City of Hamilton shall be defined as the former municipalities of Ancaster, Dundas, Flamborough, Glanbrook and Stoney Creek.

- c) Track and roller option required for horizontal position valves.
- d) Bell end valves not acceptable.
- e) Fasteners including nuts, bolts and and bolt studs shall be stainless steel.

**.10.01 Gate Valves**

**OPSS 441.05.09.03 Gate Valves**

Add the following:

Valves 75mm to 400 mm shall be ductile iron gate valves.

**.10.02 Butterfly Valves**

**OPSS 441.05.09.04 Butterfly Valves**

Add the following:

- a) Valves greater than 400 mm shall be butterfly valves selected from the approved Watermain Products List.
- b) Torque ratings shall be as specified by the City. Contractor shall supply detailed actuator information upon request.
- c) Butterfly valves shall be installed so that the valve seat adjustment faces the spool piece side.

**.10.03 Air Release and Vacuum Valves**

**OPSS 441.05.09.05 Air Release and Air Vacuum Valve**

Revised as follows:

Air release and air/vacuum valves shall be double acting type selected from the Approved Watermain Products List.

**.11 TRACER WIRE AND CONDUCTIVITY TESTING**

**.11.01 Tracer Wire**

Tracer wire shall be installed on all new installations of polyvinyl chloride and concrete pressure pipe including mains, branches and services. The wire shall be positioned along the top of the pipe and fastened at 6 metre intervals. Tracer wire shall be as listed on the Approved Watermain Products List.

The wire is to be installed between each valve and/or the end of the new watermain. Joints in the wire between valves shall be avoided. At each valve and hydrant secondary valve, the tracer wire loop shall be brought up the outside of the valve box and inserted into the tracer wire opening in the upper section. Insertion point shall be clear of the lid and use a protective grommet. Tracer wire shall be secured to the outside of the valve box near the top prior to backfilling. The tracer wire shall also be connected to the cathodic protection system as required.

Splices in tracer wire shall be done using a splice kit approved for use in direct bury underground use.

**.11.02 Conductivity testing**

The Contractor will be required to conduct all tracer wire conductivity testing to ensure that the tracer wire is installed correctly and intact. Testing shall be conducted by authorized personnel using approved testing equipment and shall be supervised by the Contract Inspector or Project Manager. No payments for watermain works shall be processed until tracer wire testing is completed and accepted by the City. All costs for conductivity tests shall be included in the watermain item. If the tracer wire is not electrically continuous from valve to valve, the contractor shall, at their expense, replace or repair the wire as required.

**.12 TEMPORARY WATER SERVICE BY-PASS FOR CONSUMERS**

Where called for or where needed, the Contractor shall provide, maintain and remove by-pass piping in accordance with OPSS 493, Appendix A attached to this specification and the following requirements.

**.12.01 General Description**

Temporary by-pass pipe, where required, shall be laid above ground to supply water to consumers connected to a pipeline while that pipeline is out of service. An approved back-flow preventer shall be used by the Contractor whenever connecting to a hydrant.

Temporary by-pass shall include hoses and the necessary outlet/fittings to each house service connection. The contractor shall maintain the temporary water lines in safe operating condition at all times. The Contractor shall be required to mound over the by-pass wherever it crosses a street, driveway, or sidewalk, in order to prevent injury to vehicular and pedestrian traffic. Lights and barricades shall be furnished and maintained by the Contractor when required by the Project Manager. When a replaced section of watermain is restored to service, the Contractor shall remove any corresponding temporary pipe and house service connection and shall leave the street, sidewalk and adjacent property in a neat and orderly condition.

**.12.02 By-Pass Pipe and Materials**

The size, pipe, hose and other materials furnished by the Contractor for the temporary service pipe and connections to house services/branches, shall be approved by the Project Manager and be fully adequate to withstand the indicated pressures and all other conditions of use. The pipe and fittings shall provide adequate water tightness and be disinfected prior to being put into service.

**.12.03 Service of Water to Feed By-Pass**

The Contractor shall furnish all above and below ground connections required to provide the necessary pressurized water to feed the temporary by-pass line. All connections shall be at reasonably close and convenient locations and hydrants will be used whenever available.

**.12.04 Temporary Connection to Customer**

The Contractor shall make all shut-offs of consumers services and the final connections from the by-pass pipe to the consumer using flexible hose. Special connections requiring excavation, cutting or tapping shall be made by the Contractor. The Contractor shall notify the customer concerning this operation in advance. When the pipeline has been replaced, the Contractor shall clean the service by back-flushing with air or water. Once the pipeline is returned to service, the Contractor shall restore the consumer to service and disconnect the hose from the consumer connection. Where admittance to the customer's premises is denied or impossible, by virtue of absence, the connection cannot be cleared, it may be necessary to excavate and clear the service at the main. This shall be paid for on a unit price basis stated in the Form of Tender - Schedule of Quantities and Prices.

Where 100mm diameter Temporary Connections to the Consumers are called for, the length of the 100mm diameter piping required will be paid at the unit price for 100mm diameter Temporary By-Pass Piping. Cutting-in or tapping shall be provided by the Contractor and is included in the price bid.

All temporary service Connection materials shall conform to the NSF 61 standard. All hose used for individual property connections shall be minimum 20mm I.D., designed for a working pressure of 860 kPa and be free from defects in materials and workmanship.

The pipe, hose and all other materials supplied by the Contractor for temporary servicing shall be approved by the Project Manager. Materials shall be fully adequate to withstand the pressures and other conditions of use and shall be of material which does not impart any taste or odour to the water in accordance with NSF 61 Standard. The pipe and fittings shall provide adequate water tightness and care shall be exercised throughout the installation of any temporary pipe and service fittings to avoid the possible pollution of any City main/property services or the contamination of the temporary service pipe. Flushing of the private service connections and chlorination of the by-pass line prior to their use will be required. The temporary service connection shall be valved near the point of connection to the by-pass and also to the private plumbing system so that, except for the final connection, the by-pass line and private services may be chlorinated.

During freezing, stormy or inclement weather, no work shall be done except that which is directed by the Project Manager. No by-pass service pipe or property service connections shall be installed during freezing or inclement weather and pipes already in use shall be removed or drained and services restored when directed by the Project Manager. Removal and re-installation of such pipes or services shall be done at the Contractor's expense.

Each home shall have its own temporary water service connection to the by-pass pipe and a connection to the private plumbing via a wye at an outside tap. The branching of wyes from a single spigot shall not be permitted; nor will connecting homes in series. An approved hose connection vacuum breaker (HCVB) shall be supplied on the open end of all wyes.

It shall be the responsibility of the Contractor to ensure an adequate water supply at all times. During the construction process, the Contractor is responsible for restoring a customer's water supply within two hours of notification from the Project Manager.

**.12.05 Disinfection of Temporary Service Connections**

Temporary service connections shall be chlorinated at the commencement of the contract works. Disconnection and relocation of service connections from one site to another within the contract works will not be subject to re-chlorination, unless otherwise directed by the Project Manager.

Where temporary service connections are disinfected in conjunction with the temporary by-pass watermain no physical connections to hose bibs will be permitted until after successful disinfection.

Where temporary by-pass service connections are disinfected offsite in a controlled environment, one set of samples shall be collected from every 350m of service hose connected in a series. One set of samples shall also be taken from source and at each end of any hose group connected in series, regardless of the total length. Where temporary by-pass service connections are disinfected in conjunction with the temporary by-pass water main additional samples must be taken at the end of any two (2) temporary by-pass service connections for every 350m of temporary by-pass watermain disinfection.

**.13 EXCAVATION AND PREPARATION OF TRENCH**

**.13.01 General**

The trench shall be excavated only so far in advance of pipe laying as permitted. Removals shall be in accordance with Form 300 – General Construction Requirements.

**.13.02 Width of Trench**

Refer to OPSS 441.07.14.

**.13.03 Alignment and Grade**

Refer to OPSS 441.07.14., 441.07.17

**.13.04 Deviations Occasioned by Other Structures**

Refer to OPSS 441.07.14, Form 200.02.05, 200.02.06 and 200.03.17.

**.13.05 Pipe Bell Bedding**

Refer to OPSS 441.07.14.



**.13.06 Excavation to Grade**

Refer to OPSS 441.07.08 and 441.07.14.

**.13.07 Excavation in Poor Soil**

Where the bottom of the trench at the required pipe grade is found to be unstable or to include ashes, cinders, all types of refuse, vegetable or other organic material or large pieces or fragments of inorganic material which in the opinion of the Project Manager should be removed, the Contractor shall excavate and remove such unsuitable material to the width and depth required by the Project Manager. The Contractor shall be allowed extra compensation for this work provided for in Form 200.

**.13.08 Excavation in Rock**

Where excavation is made in rock or boulders, the trench shall be excavated to the width and depths that are required to provide for the granular bedding shown on plans.

In areas where the proposed watermain trench bottom varies from rock to earth, the Contractor shall taper the bottom of the earth trench over a two (2) metre length and supply, place and compact Granular "A" in this section to minimize any differential settlement between the two (2) bedding conditions.

**.13.09 Special Foundation in Poor Soil**

Where the bottom of the trench at subgrade is found to consist of material which is unstable to such a degree that, in the opinion of the Project Manager, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, the Contractor shall construct a foundation for the pipe, consisting of piling, timbers or other materials, in accordance with plans prepared by the Project Manager. Extra compensation will be allowed for such additional work as per Form 200.

**.13.10 Preparation of Trench Bottom**

The bottom of the trench at pipe grade shall be finished to within 9mm of a straight line between pipe joints or batter boards and all tolerances shall be above the specified grade. It will only be permissible to disturb the finished surface over a distance of 450mm near the middle of each pipe for the withdrawal of slings or other lifting tackle.

**.13.11 Preparation of Trench Bottom Below Grade**

Where the trench has been excavated below pipe grade the Contractor shall place Granular "A" in 150mm layers to the required grade. Each layer shall be compacted by approved vibratory tampers to obtain 95% of the Standard Proctor Maximum Dry Density. The surface of the compacted granular material shall be finished to provide a continuous uniform support for the pipe at grade to the accuracy specified in subsection .13.10.

Unless otherwise specified, when the trench bottom has been excavated below the required pipe grade, the preparation of the trench bottom to pipe grade will be at the Contractor's expense. When the trench bottom is excavated below the pipe grade at the direction of the Project Manager, the preparation of the bottom of the trench to pipe grade will be allowed as extra compensation as provided for in Form 200.

**.13.12 Care of Surface and Excavated Material for Reuse**

Refer to Form 300.22.

**.13.13 Piling Excavated Material**

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants, valves, utilities and drainage courses shall be left unobstructed and accessible until the work is completed.

**.13.14 Interruption of Service, Shutting Down or Charging of Mains**

**OPSS 441.07.21 Shutting Down or Charging of Mains**

Revised by the following:

No valves or other controls on the existing system shall be operated for any purpose by the Contractor. Only City employees will operate such valves, hydrants, blow-offs and curb stops. Refer to Form 300.20 Connecting to Existing Plant and Appendix A.

**.14 BEDDING AND BACKFILL OF WATERMAINS**

**.14.01 General**

OPSS 441.07.13, 441.07.14 and 401.07.10 are revised by the following:

Bedding and backfill shall be conducted in accordance with the depths and widths specified on the standard drawings and/or on the contract drawings. No type of slag including steel slag, blast furnace slag or nickel slag will be permitted for bedding or backfilling of watermains or water service trenches. All granular bedding and cover materials shall meet the requirements of Form 600.

**.14.02 Bedding**

Bedding shall be Granular material conforming to Form 600, placed in accordance with WM-200.01 and 200.02. Granular material shall extend to a minimum of 300 mm above the top of pipe. Bedding materials shall conform to Form 600 and shall be compacted in accordance with Form 900.

No type of slag including steel slag, blast furnace slag or nickel slag will be permitted for bedding of watermains.

**.14.03 Backfill**

Unless otherwise specified on the contract drawings or documents, trenches may be backfilled with select, approved native excavated earth materials from trenches. Where these materials are unavailable or deemed to be unsuitable, granular backfill will be used. Where granular backfill materials are used, they shall conform to Form 600 and shall be compacted in accordance with Form 900.

No type of slag including steel slag, blast furnace slag or nickel slag will be permitted for backfilling of watermain trenches.

The use of unshrinkable fill shall be employed where normal means cannot produce the required compaction of the material.

**.14.04 Summary of Bedding and Backfill Materials**

Bedding and backfill of watermains shall be in accordance with the following:

**.14.04.01 Ductile Iron and Polyvinyl Chloride (PVC) Pipe Watermain**

Bedding and cover - Granular "A"

Backfill - Select approved excavated native materials or Granular "A" or "B"

**.14.04.02 Concrete Pressure Pipe Watermain**

Bedding and cover - Granular "A" or "B"

Backfill - Select approved excavated native materials or Granular "A" or "B"

**.14.04.03 Water Services**

Bedding and cover – Granular D (crushed stone)

Backfill: approved excavated native materials or Granular "A" or "B"

**.14.04.04 Hydrants**

Bedding and cover - 19mm washed crushed stone

Backfill approved excavated native materials or Granular "A" or "B"

**.15 LAYING**

**.15.01 Laying Pipe**

At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a suitable watertight plug. Before filling main with water in freezing weather, exposed pipe and fittings shall be covered with straw, or other approved means shall be taken in order to prevent freezing.

Refer to also OPSS 441.07.14 and 441.07.15.

**.15.02 Cutting Iron Pipe**

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe and in accordance with the manufacturer's recommendations.

The flame cutting of pipe by means of an oxyacetylene torch shall not be allowed nor shall the cutting of pipe with hammer and chisel be allowed.

**.15.03 Bell Ends to Face Direction of Laying**

Refer to OPSS 441.07.14

**.15.04 Unsuitable Conditions for Laying Pipe**

Refer to OPSS 441.07.14

**.16 JOINTING MECHANICAL-JOINT PIPE**

**.16.01 Assembling Joints**

Refer to OPSS 441.07.15.

**.16.02 Bolting of Joint**

Refer to OPSS 441.07.15 and all nuts shall be tightened with a suitable torque-limiting wrench. The torque for various sizes of bolts shall be as follows:

SIZE Mm	RANGE OF TORQUE N.m
16	55-80
19	80-120
25	95-135
32	120-160

Nuts spaced 180° apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland.

**.16.03 Permissible Deflection in Mechanical-Joint Pipe**

Refer to Table 4.1 in Form 1000 – Amendments to Ontario Provincial Standards Volume 1, Division 4 - Drainage and Tunnels.

**.17 JOINTING STEEL CYLINDER REINFORCED CONCRETE PIPE**

Refer to OPSS 441.07.15 Jointing

**.18 JOINTING TYTON-JOINT PIPE**

**.18.01 Cleaning and Assembling Joint**

Refer to OPSS 441.07.15 Jointing

**.18.02 Preparation of Spigot on Site**

Where spigots require preparation on site, the outside of the spigot shall be filed to produce an angle of approximately 30 degrees.

**.18.03 Electrical Conductors**

"Lockwedges" or strap-type electrical connections supplied by the pipe manufacturer shall be provided at each joint to ensure electrical conductivity. A minimum of two wedges per joint shall be installed in accordance with the manufacturer's directions.

Strap-type electrical connections shall be connected at each joint in accordance with manufacturer's directions.

The wedges shall be installed only after the pipe has been laid to proper line and grade and shall be preferably located at 180° apart.

**.18.04 Permissible Deflection in Tyton-Joint Pipe**

Refer to Table 4.2 in Form 1000 – Amendments to Ontario Provincial Standards Volume 1, Division 4 - Drainage and Tunnels.

**.18.05 Jointing Flange Pipe**

Unless otherwise specified, the Contractor shall furnish all bolts, studs, nuts and gaskets required to completely connect up all flanged pipe, fittings, flanges and other appurtenances attached to the pipe.

All bolts and nuts shall have American Standard threads of the Coarse Thread Series, and shall conform to ASA B18.2. For sizes 28mm diameter and below, they shall be of the conventional type and the material shall conform to ASTM

A-307 (Grade B). Materials for bolts and studs 31mm diameter and above shall conform to ASTM A-193 (Grade B-7) or to ASTM A-325 (S.A.E. Grade 5). Nuts shall conform to ASTM A-194 Grade 2H. Bolts shall have hexagonal heads and shall be held with hexagonal semi-finished nuts. The length of any bolt shall be such that it will not project beyond the nut more than 13mm or less than 6mm, and no bolt shall be less than the diameter of the hole in which it fits by more than 3mm.

Gaskets shall be red rubber full faced 3mm thick in accordance with dimensions given in the latest edition of ASA B16.21 for Non Metallic Gaskets for Pipe Flanges.

## **.19 SETTING VALVES AND FITTINGS**

### **.19.01 Valve Boxes**

Valve boxes shall be used for secondary valves at hydrants and where indicated on the watermain plans and profiles. Valve boxes shall be centred and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed. Refer to Standard Drawing WM-202. Installed valve boxes over gate valves shall be staked and the marking on the stake shall read "Gate Valve".

### **.19.02 Drainage of Mains**

Drainage branches, blowoffs, air vents and appurtenances shall be provided with gate valves. Drainage branches or blowoffs shall not be connected to any sewer, submerged in any stream or be installed in any other manner that will permit back siphonage into the distribution system.

### **.19.03 Dead Ends**

All dead ends on new mains shall be closed with cast iron plugs or caps and provided with a 19mm corporation main stop.

## **.20 HYDRANTS**

Hydrants supplied shall be in accordance with OPSS 441.05.10, as amended by City standards and must be selected from the Approved Watermain Products List. Hydrants shall be installed in accordance with OPSS 441.07.19, as amended and the following:

The contractor shall supply and install the standard 3-way hydrants complete with secondary valves. Hydrant extensions and connections to the proposed watermains in accordance with drawing WM-203.01 and WM-203.02, in the locations shown on the contract drawings. All hydrant extensions shall be done from the bottom, at the boot. No extension from the top will be permitted.

All proposed or replacement hydrant lead pipe material (DI or PVC) shall match the proposed watermain pipe material. Fittings at the watermain can be either DI or PVC.

The contractor shall paint all parts of the hydrant above ground "Red", including caps and bonnets, using Exterior Gloss Alkyd type CGSB 1-GP-59 paint. The Contractor shall apply a minimum 2 mm thickness in addition to the factory supplies primer and finish coat as required by Annual Supplies Specifications. The surface to be painted shall be clean, dry and free of grease.

For bedding and backfill requirements refer to 400.14.

**.21 BACKFLOW PREVENTERS**

**OPSS 441.05.11 Double Check Valve Backflow Preventers**

Backflow preventers shall be as selected from the Approved Watermain Products List, as amended.

**.22 ANCHORAGE**

**.22.01 Anchorage for Fittings**

All fittings shall be anchored according to the method shown on the standard drawings or as otherwise directed. The concrete shall be placed such that the joints will be accessible for repairs.

**.22.02 Metal Harness**

Metal harness of tie rods or clamps of adequate strength to prevent movement may be used instead of concrete backing, or if directed. Steel rods or clamps shall be galvanized or otherwise rustproof treated, or shall be painted as shown or directed.

**.23 WATER SERVICES**

Water services shall installed in accordance with AWWA C800, OPSS 441 and be selected from the Approved Watermain Products List.

**.23.01 Services – 19mm and 50mm Diameter**

Refer to OPSS 441.07.15.07 Service Connection Pipe

All service pipe shall be Type K soft copper in accordance with ASTM B88.

Service saddles shall be used on any size mains requiring a direct tap.

Service saddles and all fasteners shall be stainless steel 304, a minimum 18 gauge construction and shall have AWWA taper (CC) outlet thread. Service saddles shall be selected from the Approved Watermain Products list.

**.23.02 Services - 100mm Diameter and Larger**

Refer to OPSS 441.07.15.07 Service Connection Pipe

Service Pipe shall be either ductile iron or polyvinyl chloride in accordance with Section 400.05 or 400.07 and shall be constructed using the same pipe material as the proposed watermain. Fittings at the main can be either DI or PVC.

Service saddles shall be used on any size mains requiring a direct tap.

Service saddles and all fasteners shall be stainless steel 304, a minimum 18 gauge construction and shall have AWWA taper (CC) outlet thread. Service saddles shall be selected from the Approved Watermain Products list.

All fittings shall be restrained for 3 full pipe lengths (up to 18 m) on all water services 100 mm or greater and shall extended to property line.

**.23.03 Curb Boxes**

Curb boxes are to be located in accordance with standards watermain drawing WM-207.01 and 207.02 or as otherwise directed.

The Contractor shall indicate the positions of all water services installed in the following manner:

At each curb box location, a 1.83 metre, 50mm x 100mm wooden stake shall be planted and shall have a 1 metre bury. Stakes shall be painted white, and each shall bear, on its broad side, above ground, the words "WATER SERVICE", painted in black.

The Contractor shall be responsible for the preservation of all marker stakes. Where stakes are damaged or displaced in any way, the Contractor shall arrange to have the stakes replaced and accurately positioned, at their own expense.

**.23.04 Trench for Water Service**

The Contractor shall excavate and backfill the service trench from the watermain to the street line to a minimum depth of 1.6 metres below the proposed road grade whichever is the lower elevation unless otherwise directed.

**.23.05 Laying Water Service Pipe**

The Contractor shall lay the service pipe and install fittings to the street line. Soldered joints will not be permitted.

The service shall be bedded in accordance with Standard Drawing No. WM-200.01 and WM-200.02.

If laid over a Sewer Service or in a rock trench, the pipe shall be laid on a minimum of 150mm of tamped earth or sand. Service corporation fittings shall be installed into the watermain under pressure.

Valves in service pipe lines shall be properly braced before any pressure test is conducted.

Backfill for water service trenches shall be as specified for the watermain trench.

Service pipe at street line shall be temporarily plugged to prevent entrance of foreign material.



**.23.06 Leaks in Services**

All leaks that may develop in service lines laid by the Contractor within two years after date of completion of contract shall be immediately repaired by the Contractor when notified by the Project Manager. Emergency repairs will be made by the City at the Contractor's expense.

**.24 CONCRETE AND MORTAR**

**.24.01 Materials**

Refer to OPSS 441.05.13, 441.07.23 and Division 9. Concrete shall be Type 50 sulphate resistant in accordance with Form 700.

**.24.02 Proportioning and Mixing Mortars**

Refer to OPSS 441.05.14 and Division 9.

**.24.03 Jointing Old and New Work**

All joints between different sections of concrete masonry shall be made in an approved manner after the adjoining surfaces are cleaned, washed, roughened and coated with a neat cement grout, at locations approved of by the Project Manager, suitable provisions being made for the bonding of said joints.

**.24.04 Placing in Water**

No concrete shall be laid in water, except by permission of the Project Manager, nor shall water be allowed to rise and flow over newly placed concrete for a period of 24 hours.

**.24.05 Forms**

Forms shall be of such strength and rigidity and so supported that they will not deflect objectionably under the weight of pressure of the wet concrete.

They shall be properly braced and tied together so as to maintain position and shape, and prevent leakage of mortar.

Forms shall be so constructed that the finished concrete will conform to the shapes, lines, grades and dimensions indicated on the plans.

The face adjacent to the exposed concrete face shall consist of dressed lumber, smooth and clean.

**.24.06 Form Removal**

Shoring and forms shall not be removed before the time determined by the Project Manager.

**.24.07 Curing of Concrete**

After concrete has sufficiently set, its exposed surfaces shall be kept continuously moist for a period of at least seven (7) days.

Effective means shall be provided for maintaining the temperature of the concrete at not less than 10 Degrees C for at least 72 hours after placing. The temperature shall then be reduced at a maximum rate of 5.6 C. Degrees per day until that of the surrounding atmosphere has been reached.

No concrete shall be deposited on ground that is frozen or which contains frozen materials.

Hydrostatic testing shall not be carried out until concrete anchor or thrust blocks have a minimum of 5 days curing time.

**.24.08 Finish**

Special care shall be used to secure smooth, uniform finish to the exposed surface of concrete. After form removal, concrete surfaces shall be immediately rubbed smooth to a uniform, satisfactory finish, and all surfaces subject to wear shall be faced with facing mixture where shown on the plans.

**.24.09 Defects**

Should any voids or other defects be discovered in any part of the work when the forms are taken down, or at any other time, the defective work shall be removed and the space refilled with a suitable concrete mortar in a proper manner at the expense of the Contractor.

**.24.10 Reinforcing Steel**

The ties for reinforcing shall not show on the exposed face of the concrete. All steel for reinforced concrete shall be supplied by the Contractor.

**.25 CONNECTION, SWABBING, FLUSHING, DISINFECTION, LEAKAGE AND BACTERIOLOGICAL TESTING OF WATERMAINS**

OPSS 441.07.25 - Flushing and Disinfecting Watermains

Revised as follows:

All connections, flushing, hydrostatic testing, swabbing, and bacteriological testing procedures shall be in accordance with Appendix A attached to this specification.

## 1. INTRODUCTION

### 1.1 Scope: Watermain Installation and Testing Procedures

This procedure covers the cleaning, disinfection, hydrostatic testing and sampling of watermains. Unless specified otherwise this procedure applies to all new watermains, above ground by-pass watermains and relined watermains.

### 1.2 Definitions

Project Manager – shall be the City of Hamilton, Public Works, Capital Planning, Development Engineering and Implementation Project Manager.

Construction Inspector – shall be the City of Hamilton, Public Works, Environment and Sustainable Infrastructure construction inspector.

Development Engineering Inspector - shall be the City of Hamilton's Planning and Economic Development construction inspector.

Specialist – shall be a company specializing in regulated water systems or a company approved by the Project Manager, whose personnel hold a minimum MOE, O.Reg. 170/03 Water Distribution Licence or licenced City of Hamilton Staff.

Contractor – shall be the person, partnership or corporation undertaking the Work as identified in the agreement.

CHEL – shall be the City of Hamilton Environmental Laboratory

CSR – shall be a City of Hamilton Customer Service Representative

CS&C0 – shall be City of Hamilton Customer Service and Community Outreach section

Disinfectants – shall be Calcium or Sodium Hypochlorite that meets or exceeds AWWA Standard B300.

LIMS – shall be the City of Hamilton Environmental Laboratory work order database

LWO Number – shall be the City of Hamilton Environmental Lab Work Order Number

Neutralizing Agent – shall be Sodium Thiosulfate that meets or exceeds AWWA Standard C651.

SDWA- Ontario Safe Drinking Water Act.

NSF 61 – National Sanitation Foundation

### **1.3 References**

These procedures are based on, and shall be used in conjunction with, the Ontario Provincial Specifications (OPS), the American Waterworks Association (AWWA C651) Standards, and the Ontario Safe Drinking Water Act, City of Hamilton Design Criteria, CAN/CSA-B64.10

### **1.4 General Requirements For Watermain Installation**

Keep pipes clean and dry. Take precautions to protect the interiors of pipes, fittings, and valves against contamination. Night plugs to be install when work is not in progress. Remove plugs only when connecting next pipe or appurtenance or continuing work. Pipes shall not be laid in water. Existing watermains, which are dead ended during construction, shall have a minimum 25 mm bleeder installed at the dead end. New watermains which are temporarily dead ended shall have a minimum 50mm blow off installed with a temporary cap if there is no hydrant "downstream" of the last water service on the watermain.

### **1.5 Supervision, Testing and Records**

The City of Hamilton's Construction Inspector shall witness all cleaning, hydrostatic testing, disinfection, and sampling activities. The Specialist / qualified person carrying out the cleaning and disinfection in conjunction with the City's Construction Inspector shall take and record measurement on The City of Hamilton approved Watermain Disinfection, Pressure Testing and Acceptance form.

### **1.6 Valve Operation**

The Contractor should note that The City of Hamilton Water Distribution staff must perform the operation of all existing valves inclusive of hydrant secondary valves. In an emergency the City of Hamilton's Inspector may direct or operate valves.

The opening and closing of any valve should be coordinated with The City of Hamilton's Construction Inspector. All residences shall be notified 48 hours prior to a planned disruption of water service.

### **1.7 Forms**

The following forms are attached to this document: "Watermain Disinfection, Hydrostatic Testing and Acceptance", "Chlorine Residual", and "Schedule".

### **1.8 Connection and Testing Procedures Plan**

The Contractor shall provide a plan to the Project Manager and Construction Inspector, detailing the connection locations, swabbing locations, hydrostatic testing, chlorination and dechlorination methods, disposal of water, and final connection methods. If the project is being constructed in phases, this plan shall detail each of these items for each phase.

## **2. WATERMAIN TESTING PROCEDURE**

This document to be read in conjunction with the forms entitled “Watermain Disinfection, Pressure Testing and Acceptance”, “Chlorine Residual”, and “Schedule”. These procedures are to be used in conjunction with the Ontario Provincial Specifications (OPS), the American Waterworks Association (AWWA) and the Ontario Safe Drinking Water Act (SDWA).

All required low-end chlorine residual tests shall be performed by the Specialist / Construction Inspector, with an electronic tester such as a Hach Pocket Colourimeter or equivalent, which is to be supplied by the Contractor/Specialist and witnessed by the Construction Inspector.

All works associated with leakage, testing, swabbing, chlorination, dechlorination and sterilization of the watermain are to be performed by a company specializing in this work or a company approved by the Project Manager.

Temporary by-pass piping shall meet all procedures and requirements of new watermain with the exception of hydrostatic pressure testing. A visual check shall be performed at line pressure on a temporary by-pass to ensure that it is leak free.

### **2.1 Temporary Connection and Backflow Preventer**

The temporary connection is to be used for all water supplies to maintain continuous supply of water, unless otherwise noted. The size of the temporary connection shall be; 50mm diameter for watermains up to and including 200mm diameter, and 100mm diameter for watermains 250mm diameter to 400mm diameter inclusive. (All materials for the temporary connections are to conform to The City of Hamilton Approved Watermain Products List.). Watermains larger than 400mm in diameter shall be as per design standards.

The hydrant adapter (backflow preventer / meter) shall be a reduced pressure principle type and shall be supplied by the City of Hamilton upon receipt of request from the Project Manger on behalf of the contractor. Development Engineering will have special considerations as per the City of Hamilton Development Inspector. The adapter shall be installed and hydrant charged by a City of Hamilton Water Distribution Operator. The hydrant(s) that will be utilized as the source for the temporary by pass will be determined by the City of Hamilton Project Manager in consultation with City of Hamilton Water Distribution staff.

The existing distribution systems and the backflow preventer shall be physically disconnected from the test section during hydrostatic testing.

### **2.2 Charging of Watermains**

The watermain is to be loaded via a temporary connection equipped with a backflow preventer.

### **2.3 Swabbing**

The watermain is to be loaded (charged or pressurized) prior to the commencement of swabbing. The Construction Inspector is to record, on the “Watermain Disinfection Pressure Testing and Acceptance form”, the number of swabs inserted and retrieved. The main valve

seat of the hydrant must be removed and a blind seat installed to prevent undermining the soil at the hydrant boot. Full reinstatement of the hydrant shall begin immediately after the swabbing process is completed. All swabs must be inspected prior to insertion and immediately after they exit the watermain to ensure that they have remained intact and that pieces of the foam do not stay in the watermain. The swabs should also be numbered and carefully controlled by the Specialist and Construction Inspector to ensure that all swabs that are introduced into the watermain are retrieved and accounted for. Only new swabs will be permitted for use and under no circumstances will used swabs be allowed.

All watermain pipes must be swabbed with a minimum of THREE swabs plus a minimum of one swab shall be passed through each hydrant lead, large diameter water service, stub or blow-off. Additional swabs shall be used as directed by the Project Manager or Construction Inspector if discharge water does not run clear within ten seconds of the swab exiting the discharge point. No additional payment shall be made for subsequent swabbing. Swabs shall be forced through the watermain using potable water so that they maintain a minimum velocity of 0.6 to 1 meter per second. The Project Manager must approve all methods of disposal of the discharged water. The Contractor shall take the necessary precautions to minimize soil erosion and shall reinstate the area upon completion.

The swabs must be new open cell polyurethane foam, having a density of 1.5 pounds per cubic foot (24 kilograms per cubic meter), and are to be a minimum of 50mm larger than the nominal pipe diameter with a length at least one and a half times its diameter. Watermains 300mm or smaller shall be swabbed through hydrants on approval by the Project Manager. Procedures for swabbing watermains larger than 300mm must also be approved by the Project Manager.

## **2.4 Hydrostatic Testing**

Leakage tests shall be applied to the section of watermain after the swabbing. The Contractor shall ensure that no air pockets are present in the section of watermain. The existing distribution systems and the backflow preventer shall be physically disconnected from the test section during hydrostatic testing. All hydrant assemblies shall be removed and a "blind flange" installed prior to conducting the pressure test. The ends of the mains shall be capped and the main filled with potable water under a pressure of 1035 kPa after which all visible leaks shall be stopped. Leakage shall then be measured by a calibrated meter with readings taken at fifteen minute intervals for a period of two hours and recorded on the "Watermain Disinfection, Pressure Testing and Acceptance form". The average rate of leakage shall not exceed 1.54 litres per mm of pipe diameter per km of pipe per day, and if the leakage exceeds this figure the contractor shall locate and correct the leaks. The watermain is to be tested in sections, where a section is a length of watermain between two valves, or a valve and a dead end. Should the contractor wish to test more than one section at a time, the Project Manager/ Inspector will calculate the allowable leakage for all sections within the tested portion and the smallest calculated leakage will become the allowable for the entire tested portion. The cost of the labour and the materials required shall be borne by the Contractor.

If the test is not successful the leak is to be found, repaired and the hydrostatic test to be applied again until it is successful.

Temporary above ground by-pass piping shall meet all procedures and requirements of new watermain with the exception of hydrostatic pressure testing. A visual check shall be performed

at line pressure on a temporary by-pass to ensure that it is leak free.

## **2.5 Disinfection of Watermains**

The method of disinfection to be used is the continuous feed method. The chlorine is to be injected into the system through the access point on the temporary connection. The chlorine solution is to be thoroughly mixed prior to pumping it into the system. The Specialist shall ensure that no air pockets are present in the section of watermain. The chlorine solution shall be applied so that the chlorine concentration is a minimum of 50mg/L throughout the system and does not exceed 100mg/L and recorded. The chlorine solution is to be flowed through each hydrant and blow-off. The high chlorine residual is to be measured by the Specialist at each sample location and recorded by the Construction Inspector.

The high chlorine concentration will be isolated in the system for a minimum of 24 hours and recorded on the "Watermain Disinfection, Pressure Testing and Acceptance form". After the required contact time, the chlorine residual is to be taken at each sample location by the Specialist and recorded by the Construction Inspector. Flow required to take the chlorine residuals shall be provided through the temporary connection. If the chlorine residual is at or above 10mg/L the chlorine is ready to be discharged. In the event that the chlorine residual is less than 10mg/L, the chlorine in the system is to be discharged, and the system is to be rechlorinated. The Construction Inspector has the authority to require further swabbing if the residual is less than 10mg/L.

## **2.6 Removal/Disposal of Super Chlorinated Water**

The Contractor shall be capable of de-chlorinating the discharge water to protect receiving streams and other bodies of water, via catch basins or other points of entry, as per the Ministry of Environment (MOE) regulations and ANSI/AWWA C651 as amended. Dechlorination is not required when discharging directly into a Sanitary Sewer or Combined Sanitary Sewer system. If in near proximity to the sewer treatment plant, the plant is to be notified and approve receiving the water. The Contractor will be required to supply all labour, equipment and materials to dechlorinate water which includes, but is not limited to, dechlorination mats, diffusers, dechlorination chemicals and techniques. There shall be no separate payment for de-chlorination.

## **2.7 Bacteriological Sampling**

Before the watermain, or temporary above ground by-pass system can be approved for connection to the existing water distribution system, two (2) consecutive rounds of water samples, taken 24 hours apart, shall pass both the chlorine residual and bacteriological requirements. Prior to chlorine residual and bacteriological testing, all other testing and disinfection shall be completed and any super chlorinated water removed from all portions of the watermain system under consideration including hydrant leads, stubs, branches, services, etc.

The City of Hamilton will ensure the temporary connection is open and take a bacteriological sample at each sample location and deliver it to the City of Hamilton Environmental Laboratory. The watermain test section shall be immediately shut down and must not be disturbed or flushed for the period between this sample round and the next bacteriological sample round 24 hours later.



Samples shall be taken from the end of every dead end and from every 360 metres or less of new watermain pipe. No hose or hydrant shall be used in the collection of bacteriological samples.

The watermain must remain continually pressurized from the start of bacteriological testing until the connection to the existing system is undertaken.

## 2.8 Sample Results

### Procedure

Once the new watermain is installed and pressure tested, the proper number of water samples are to be collected by Construction Inspectors & Development Engineering Inspectors. Inspectors shall drop off sample bottles at CHEL along with the completed chain of custody form(s).

Lab staff will process and log in the bottle(s). Each chain of custody form will be assigned an "LWO Number". In addition to the LWO, sample bottles will be assigned their own unique "record number".

Samples delivered after 3:30pm on working days will be set up the same day, but may not be logged in until the next day. Samples delivered after 4:00pm on working days may not be set up for analysis nor logged in until the next day.

Lab staff, using the LIMS database, will generate an email that will be sent to the Inspector. The email will contain the LWO and record numbers that can then be used by the Inspector when calling in to the lab.

If special arrangements are made to bring sample bottles to the lab on a weekend, Construction Inspectors & Development Engineering Inspectors are to call CHEL on the Friday and provide the sample location, account number and the project/permit number (if applicable). In this case, CHEL will pre-log the samples into LIMS.

Construction Inspectors & Development Engineering Inspectors can call the CHEL after 24 hours and 48 hours to determine the status of water quality testing, with the understanding that these results are still provisional data until they have gone through the data approval process. The new watermain cannot be put into service until the Final Approved Lab Report from the CHEL has been obtained.

After the 48-hour testing period, data are entered into the LIMS database and go through a data approval process. CHEL will create a PDF file of the Final Approved Lab Report for each LWO and save the file at the following locations:

For CS&CO staff, the PDF file is saved at N: \ environmental laboratory reports\CSCO\_WmRech

For Planning and Economic Development, the PDF file is saved at N: \ environmental laboratory reports\ Development\_Engineering

For Environment and Sustainable Infrastructure, the PDF file is saved at N: \ environmental laboratory reports \Construction





FORM 400 - APPENDIX A  
SPECIFICATION FOR CONNECTION TO EXISTING WATERMAINS,  
SWABBING, FLUSHING, DISINFECTION, LEAKAGE  
AND BACTERIOLOGICAL TESTING OF WATERMAINS

January 2011

The files will be named as follows:

ROADS-PRIVATE\_#\_#####\_YYYY-MM-DD HH-MM-SS Final Report.pdf

where:

##### represents the LWO Number

YYYY-MM-DD is the date that the PDF was created

HH-MM-SS is the time that the PDF was created

If changes are required to the staff permissions for the files above, the Project Manager Lab Services must be contacted (ext 7804).

Construction Inspectors and Development Engineering Inspectors shall also contact a CSR 24 hours and/or 48 hours ahead of the proposed watermain shutdown, depending on the project, to facilitate the connection of the new watermain to the source watermain and inform the CSR of the following information: Name of the Inspector, Contract Number or Development Site, Where/When to meet WDO, Duration of Shutdown and LWO number.

The CSR will create a Service Request containing (as a minimum) information listed above. The CSR will also attach by OLE the corresponding LWO PDF file from the network drive N: \ environmental laboratory reports\CSCO\_WmRech . The CSR will then create the Service Request for a WDO to connect the new watermain to the existing water distribution system.

If sample results are successful the system will be put into service once a certified copy of the form entitled "Watermain Disinfection, Pressure Testing and Acceptance" has been received and accepted. A single failed bacteriological parameter will constitute a failure of the entire sampling round. If sample results do not meet requirements the failed section must be flushed or re-disinfected, as directed by the Project Manager and re-sampled at sample locations determined by The City of Hamilton until two (2) consecutive rounds of water samples, taken 24 hours apart pass both chlorine residual and bacteriological requirements.

ACCEPTABLE BACTERIOLOGICAL TEST RESULTS

E. Coli	0 CFU/100ml
Total Coliform	0 CFU/100ml
Total Coliform Background	200 CFU/100ml
Heterotrophic Plate Count	500 CFU/ml



### **3. CONNECTION TO EXISTING WATER DISTRIBUTION SYSTEM**

#### **3.1 Procedure**

Once the final rounds of bacteriological tests have passed, the connection to the existing watermain shall be performed.

A sump, minimum 300mm depth, shall be excavated in the trench bottom, and filled with clear stone, to provide a location to collect water and pump water.

Watermains shall be cut back to remove any temporary taps. The Contractor shall disinfect the connection watermain pipe as outlined below and shall, using all means possible, dewater the watermains and trench in a controlled manner as to not allow backflow of water into the watermains.

If trench water, dirt, or debris has entered the watermain during the final connection, the watermain shall be aggressively flushed and additional bacteriological samples shall be taken as directed by the Construction Inspector.

#### **3.2 Connections Equal to or Less than One Pipe Length**

For a final connection length equal to or less than one pipe length, the new pipe, fittings and valves required for the connection shall be spray-disinfected and swabbed with a minimum 1% to maximum 5% solution of chlorine, immediately prior to being installed. As well the existing watermain being connected to shall be cleaned in the immediate area of the connection and spray-disinfected with the same solution.

The Contractor shall make every possible effort to ensure that the final connection is no more than one pipe length.

#### **3.3 Connections Greater than One Pipe Length**

For a final connection that is greater than one pipe length, the new pipe required for the connection shall be set up above ground, disinfected and bacteriological sample rounds taken as required for new watermain. After two consecutive rounds of satisfactory sample results have been received for the 'pre-disinfected' pipe, the pipe can be used in connecting the new main to the active distribution system. Between the time the satisfactory bacteriological sample results are received and the time that the connection piping is installed, the ends of the piping must be sealed with clean, disinfected, watertight plugs or caps.

All caps shall be kept in place during the installation procedure until immediately prior to making the connection.

The existing watermain in the immediate area of the connection as well as the newly required fittings and valves, shall be cleaned, and spray-disinfected with a minimum 1% to maximum 5% solution of chlorine immediately prior to the connection.



#### **4. WATER SERVICES**

Service connections shall be tapped and connected under pressure. Inspect connections to ensure drip tight prior to backfilling. The pipe shall be left exposed where directed by the Construction Inspector, after which backfilling shall be completed.

All new water service pipe 38mm in diameter up to but not including 100mm diameter, as well as all sized of temporary by-pass service hose, shall be disinfected. The chlorine solution shall be applied so that the chlorine concentration is a minimum of 25mg/l and does not exceed 100mg/l. Pre-disinfected pipe shall be sealed immediately following disinfection until immediately prior to connection.

All services shall be thoroughly and aggressively flushed prior to connecting to existing service. Required fittings and valves shall be cleaned and spray-disinfected with a minimum 1% to maximum 5% solution of chlorine immediately prior to the connection.

Services 100mm in diameter and larger shall be considered mainline and shall meet all mainline procedures and testing requirements.

All by-pass services hoses to be used will be of potable water grade and shall meet the requirements of NSF 61 Standard.

- Service hoses to be capped on both ends with brass caps until installed.
- Service hoses will not be installed on by-pass piping until the day of the change over from distribution watermain to the above ground by-pass watermain.

#### **5. WATERMAIN BREAKS**

Watermain breaks shall be treated the same as noted in "Connection to Existing Water System".



FORM 400 - APPENDIX A  
 SPECIFICATION FOR CONNECTION TO EXISTING WATERMAINS,  
 SWABBING, FLUSHING, DISINFECTION, LEAKAGE  
 AND BACTERIOLOGICAL TESTING OF WATERMAINS

January 2011

**Watermain Disinfection, Pressure Testing, and Acceptance Form**

Contract / Development No.: \_\_\_\_\_ Date: \_\_\_\_\_

Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

Construction Inspector / Development Engineering Inspector: \_\_\_\_\_

√	Description	Performed By	Date	Witnessed By
<input type="checkbox"/>	Loading Watermain - Location			
<input type="checkbox"/>	Swabbing – Number(s)		Re-swabbing – Number(s)	
<input type="checkbox"/>	Swabs Retrieved – Number(s)			
<input type="checkbox"/>	Hydrostatic Pressure Tests (record on attached table)			
<input type="checkbox"/>	Chlorination			
	High Chlorine Residual (50 mg/L to 100 mg/L) _____		24 hr Chlorine Residual (> Or = 10 mg/L)	
	If 24 hr residual fails, flush, re-chlorinate, note further residual results			
	High Chlorine Residual (50 mg/L to 100 mg/L) _____		24 hr Chlorine Residual (> OR = 10mg/L)	
<input type="checkbox"/>	Removal / Disposal of Super Chlorinated Water			
<input type="checkbox"/>	Sample Round #	Sample Number(s)		<input type="checkbox"/> pass <input type="checkbox"/> fail
<input type="checkbox"/>	Sample Round #	Sample Number(s)		<input type="checkbox"/> pass <input type="checkbox"/> fail
<input type="checkbox"/>	Sample Round #	Sample Number(s)		<input type="checkbox"/> pass <input type="checkbox"/> fail
<input type="checkbox"/>	Sample Round #	Sample Number(s)		<input type="checkbox"/> pass <input type="checkbox"/> fail
<input type="checkbox"/>	Results - Passed			
<input type="checkbox"/>	Valves operated - Location			
Comments:				

We acknowledge that this section of water system was constructed, cleaned, disinfected, and sampled as per the City of Hamilton Standards and Specifications and as outlined in the Procedure For Disinfection of Watermains In Ontario

Contractor Signature: \_\_\_\_\_

Water Distribution Operator Signature: \_\_\_\_\_

Construction Inspector / Development Engineering Inspector Signature: \_\_\_\_\_



## INDEX

### **.01 CONCRETE PIPE**

- .01 General
- .02 Classes of Pipe
- .03 Inspection and Testing

### **.02 CLAY PIPE**

- .01 General
- .02 Classes of Pipe
- .03 Inspection and Testing

### **.03 POLYVINYL CHLORIDE (PVC) PIPE**

- .01 General
- .02 Classes of Pipe
- .03 Inspection and Testing
  - .03.01 Pipe Stiffness
  - .03.02 Internal Hydrostatic Pressure
  - .03.03 Internal Vacuum

### **.04 CCTV SEWER INSPECTION**

- .01 CCTV Reports and submittals
- .02 Inspection Related Instructions
- .03 Occupational Health and Safety – Confined Space Entry
- .04 CCTV Inspection and Data Format
  - .04.01 Digital Video Format
  - .04.02 Camera
  - .04.03 Data Format

**.01 CONCRETE PIPE**

**.01.01 General**

This specification covers the material requirements for circular concrete pipe to be used for the conveyance of storm water and sewage. All pipe materials shall meet the requirements of OPSS 1820, this specification and be selected from the Approved Sewer Products List, latest edition.

All pipe supplied shall be from a plant listed as Prequalified under the Plant Prequalification Program by the Ontario Concrete Pipe Association.

**.01.02 Classes and Uses of Concrete Pipe**

The classes of concrete pipe specified for various construction applications are outlined as follows:

- i) Standard Strength Non-Reinforced Concrete Pipe:  
ASTM Designation C-14, or CSA A257.1
- ii) Reinforced Concrete Pipe:  
ASTM Designation C-76, Class III, or CSA A257.2, 65-D
- iii) Reinforced Concrete Pipe:  
ASTM Designation C-76, Class IV, or CSA A257.2, 100-D
- iv) Reinforced Concrete Pipe:  
ASTM Designation C-76, Class V, or CSA A257.2, 140-D

Reinforced concrete pipe shall be used for the construction of storm sewers, manhole channels, and inlet chamber drains which require pipe with an internal diameter of 300 mm and larger.

**.01.03 Inspection and Testing**

Pipe manufacturers shall provide the City all reasonable facilities to permit the City representative to verify that the pipe conforms to the City's specification. The pipe manufacturer shall provide the required test specimens, labour and testing equipment required to satisfy the City that the proposed pipe materials needed.

The costs of all testing shall be at the expense of the pipe supplier and/or manufacturer.

**.02 CLAY PIPE**

**.02.01 General**

This specification covers the material requirements for circular clay pipe to be used for the conveyance of storm water, sewage, and industrial waste.

**.02.02 Classes and Uses of Clay Pipe**

Extra strength clay pipe shall be used for the construction of the following installations:

- a) Storm sewers, sanitary sewers and manhole channels up to and including pipe with an internal diameter of 600 mm.
- b) Inlet chamber drains up to and including pipe with an internal diameter of 600 mm, and inlet chamber drain risers up to and including pipe with an internal diameter of 250 mm.
- c) Private sanitary drains and private sanitary drain risers for pipe with an internal diameter up to and including 250 mm.
- d) Catch basin drains, catch basin drain risers, and manhole drop pipes for pipe up to and including an internal diameter of 250 mm.

**.02.03 Inspection and Testing**

Pipe manufacturers shall provide the City all reasonable facilities to permit the City's representative to verify that the pipe conforms to the City's specification. The pipe manufacturer shall provide the required test specimens, labour, and testing equipment and machine to meet the quality assurance conditions of the City.

The costs of all testing shall be at the expense of the pipe supplier and/or manufacturer.



**.03 PVC PIPE**

**.03.01 GENERAL**

This specification covers the material requirements for circular PVC pipe to be used for the conveyance of storm water and sewage. All pipe materials shall meet the requirements of OPSS 1841, this specification and be selected from the Approved Sewer Products List, latest edition.

**.03.02 CLASSES AND USES OF PVC PIPE**

The Standard Dimension Ratio (SDR) is the ratio of the average pipe diameter to the minimum wall thickness. The specified SDR values for main sewers and private drain laterals are as follows:

- a) SDR shall be 35, or as specified for main sewer installations with a pipe diameter of 200 mm up to and including 375 mm.
- b) SDR shall be 28, or as specified, for private drains and laterals.
- c) Profile or Ribbed pipe is not accepted.

**.03.03 INSPECTION AND TESTING**

Pipe manufacturers shall provide the City all reasonable facilities to permit the City's representative to verify that the pipe conforms to the City's specification. The pipe manufacturer shall provide the required test specimens, labour, and testing equipment and machine to meet the quality assurance conditions of the City.

The costs of all testing shall be at the expense of the pipe supplier and/or manufacturer.

**.03.03.01 Pipe Stiffness**

The pipe stiffness shall be determined at 5 percent deflection according to ASTM D2412. The minimum pipe stiffness requirements for SDR values of 35 and 28 shall be 50, and 100 respectively.

**.03.03.02 Internal Hydrostatic Pressure**

A typical joint assembly shall be subjected to an internal pressure of 74 kPa for 10 minutes without leakage.

**.03.03.03 Internal Vacuum**

A typical joint assembly shall be subjected to an internal vacuum of 74 kPa for 10 minutes without leakage.

**.03.04 APPROVED SEWER PIPE MATERIALS**

The following chart is a summary of the acceptable sewer pipe materials. This chart is for information purposes only and the use of any pipe material is subject to the approval by the City prior to installation.

<b>SEWER PIPE SIZE</b>													
Type and Application	150 mm	200 mm	250 mm	300 mm	375 mm	450 mm	525 mm	600 mm	675 mm	750 mm	825 mm	900 mm	>900 mm
<b>PVC SDR 28</b>													
SANITARY	X												
STORM	X												
<b>PVC SDR 35</b>													
SANITARY		X	X	X	X								
STORM		X	X	X	X								
<b>VITRIFIED CLAY E.S.</b>													
SANITARY	X	X	X	X	X	X	X	X					
STORM	X	X	X	X	X	X	X	X					
<b>CONCRETE</b>													
SANITARY	X	(1)	(1)	X	X	X	X	X	X	X	X	X	X
STORM	X	(1)	(1)	X	X	X	X	X	X	X	X	X	X

**NOTES:**

(1) 200 AND 250 DIAMETER NOT PERMITTED DUE TO PROBLEMS WITH JOINTS

**.04 CCTV SEWER INSPECTION**

All works shall be in accordance with these Special Provisions and OPSS 409, with precedents being these Special Provisions.

The Contractor shall ensure that all sewers are completely clean and free of debris and ready for CCTV inspection

All inspectors shall be NAAPI qualified for CCTV operations.

All CCTV video inspections of sewers must be in colour and must conform completely with Appendix "A" and the following:

The Contractor will be required to inspect and record sewer pipe and assess the condition of the pipe according to WRc defect coding standards including but not limited to:

- a) Structural condition of pipe walls. Length, size, material type, and depth of each pipe (all depths shall be referenced from the top of the manhole frame to the invert of the pipe being inspected.
- b) Any blockage or obstructions located within the pipe.
- c) Condition of pipe joints, and lateral connections.
- d) Any change in pipe diameter or pipe materials encountered in any section between two manholes.
- e) Report on grade of pipe as to whether it is uniform or whether there appears to be sectional settlement or grade changes.
- f) Infiltration.
- g) Explanations for water level fluctuations.
- h) Location and condition of connection of sewer laterals, **including pan and tilt of all junctions/connections** unless otherwise specified by City staff.
- l) Still capture pictures shall be taken of all significant structural and/or operational deficiencies.

The operator shall utilize the pan and tilt capability of the camera at the time of inspection to obtain still pictures of the defect that represent the extent of the defect and any other pertinent features related to the defect.

Special problems and conditions, such as sources of inflow, overflows, bypasses, and manholes located in natural ponding areas etc.

All measuring equipment shall be calibrated for accuracy before the work starts and maintained throughout the work.

The CCTV camera and illumination system shall be capable of providing a clean, accurate colour and in-focus record of the sewers internal condition.

The video inspection equipment and methods used shall be such that a clear pictorial record of the entire sewer line is obtained with digital readout of all titles for each sewer line and running chainage displayed.

The C.C.T.V. monitor shall also display a full description at the beginning of each survey stating date, time, job location, street name, pipe diameter, start M.H. No., and end M.H. No.

At all significant pipe defects observed during an inspection, the operator shall record a still capture picture of the defect, the description of the defect, the chainage in meters from the manhole, and the CD counter location. Flow and camera direction, type of pipe, pipe condition, weather conditions, other specified information will also be documented as directed by the Project Manager.

**.04.01 CCTV Reports and submittals**

The Contractor shall submit the following deliverables once all video inspections are complete:

- a) video inspection data including defect coding data recorded on CD
- b) CD data to be formatted to enable direct upload of the defect coding data into the City's Hansen database
- c) still capture pictures of all defects

Data shall be configured according to the definitions and database structures included in this specification. Video must be able to be viewed using Windows Media Player 9 Series and have the ability to use all features of the video player including fast forward capability. **CD's must be in the specified format to download directly into Hansen or the entire report will be returned to the Contractor and no payment will be made.**

Each CD will be permanently labelled with the following information.

Job/Work Order No.: \_\_\_\_\_ Contractor Name: \_\_\_\_\_

CD No.: \_\_\_\_\_ Date Televised: \_\_\_\_\_ Date Submitted: \_\_\_\_\_

Street/Easement (Location): \_\_\_\_\_

From: \_\_\_\_\_ To: \_\_\_\_\_ (Hansen ID's required)

These CD's will become the property of the City. If these CD's are of such poor quality that the Project Manager is unable to evaluate the condition of the sewer/lateral, the Contractor shall be required to re-CCTV the sewer and provide a CD of good quality at no additional cost to the City. **No payment will be made for poor or unacceptable quality CD's, or for portions of sewer mains not televised for any reason.**

The successful Contractor will be required keep a record of their reports and compact disk for the duration of the maintenance period.

**.04.02 Inspection Related Instructions**

The Contractor will be held responsible for damage to street surfaces, curbs, gutters, existing utilities, etc. that result from their negligence during any inspection. The

Contractor shall repair, at their cost, any damage resulting there from, which shall be subject to approval, by the City.

The Contractor will be required to inspect all sewers without disturbing the existing condition of the sewer. Should the contractor decide to use a stringing method to inspect the sewer, the stringing lines shall not be left in the sewer for more than five days or without consent of the Project Manager.

All obstructions, cracks, irregularities must be fully inspected and documented. The Contractor must inform the City's representative immediately of any obstruction encountered, locations of hazardous atmosphere, or sewers that are in immediate danger of structural failure while the inspection is still in progress. Where possible, the survey shall be reversed so that the extent of the blockage can be assessed.

The Contractor, under the supervision of the Project Manager, or their representative, may install plugs in the sewers to prevent the flow of sewage during inspection for a period of no longer than 10 minutes. The plugs must then be removed for a minimum of 10 minutes after which time they may be installed again for the period stated above. Plugs shall only be installed when and for the time period directed by the Project Manager where the existing flow hinders a proper inspection.

#### **.04.03 Occupational Health and Safety – Confined Space Entry**

The Contractor shall ensure that all aspects of the required work are, at all times, in full and complete compliance with the Occupational Health and Safety Act, as amended.

The Contractor shall provide approved equipment and training to personnel who enter confined spaces as may be required on this project. The procedures the contractor follows for Confined Space Entry must meet or exceed the requirements outlined by the Occupational Health and Safety Act.

#### **.04.04 CCTV Sewer Inspection and Data Format**

- a) Inspect sewers and code all observations in accordance to WRc "Manual of Sewer Condition Classification" Third Edition.
- b) CCTV inspection shall only be carried out by NAAPI certified operators or operators trained by other means to inspect and code as per the WRc "Manual of Sewer Condition Classification" Third Edition. Proof of such training must be submitted to the City for approval upon request.
- c) Pan and tilt camera to observe both start and finish Manhole structures and observe connection of pipe to manhole structure.
- d) Pan and tilt in pipe to observe defects and other features only when the camera has fully stopped travelling.
- e) Camera speed shall not exceed 9 meters/minute.
- f) Ensure distance measurement within the sewer is accurate to within 0.5% of the above ground measurement.

- g) Upstream and downstream pipe invert depths (manhole lid to pipe invert) must be accurately measured and recorded when access is possible. Do not provide a value if measurements were not accurately taken.
- h) The camera lens must be positioned to view along the central axis of the pipe +/- 10% in circular shaped pipes, and 2/3 of the vertical dimension of the pipe in irregular shaped pipes.
- i) Ensure picture quality and clarity is maintained during entire inspection. Lighting and focus should be adjusted to sufficiently illuminate and observe the entire circumference of the pipe during inspection.
- j) At the start of each survey use a video overlay system to clearly display the inspection header information for 5 seconds.
- k) During the inspection clearly display 'From' and 'To' Manhole IDs and travel distance in meters on the periphery of the screen. Arrange the information to minimize interference with the inspection image. Defect code and description should appear on the screen while 'coding' for at least 5 seconds.
- l) CCTV inspection while cleaning operations are underway will not be accepted by the City unless previously authorized by the Project Manager or designate. If pipe segment to be inspected was just cleaned, wait 5 minutes for water levels to stabilize before starting inspection.
- m) Inspect sewers from the upstream manhole (travel with flow) when possible.

#### **.04.04.01 Digital Video Format**

##### Minimum Digital Video Standard

- a) Capture in colour from the live video source directly to the recording equipment in digital format
- b) MPEG-1
- c) Picture Size: 320 x 240
- d) Minimum Data/Bit Rate: 1,800 kilobits per second
- e) Minimum Frame rate: 29.97 frames per second

#### **.04.4.02 Camera**

The camera must provide at least 400 H lines of resolution and have the capability to pan at least 360° and tilt at least 275° to ensure complete inspections and view of all laterals and deficiencies.

#### **.04.04.03 Data Format**

The following describes the database format and data deliverable requirements.

**Since Inspection Numbers and Hansen Manhole IDs are the only means of identifying pipe segments, care should be taken to obtain and input these IDs correctly.**

- a) All electronic deliverables shall be delivered in CD/DVD/portable hard drive. Depending on the size of the work package, more than one CD/DVD might be required. The first CD/DVD shall contain the **WRc.mdb** database file containing all inspection data related to the contract.
- b) The Database file (mdb and all video files (mpg) on all deliverables shall be in the root directory (no folders) of CD/DVD.
- c) The database file must be named WRc.mdb
- d) Inspections done prior to reaming, cleaning etc. must be excluded from the database. Only final video inspections to be included.
- e) Video files can be named under any convention but **MUST** start with the Job number that has been provided by the City for each sewer segment. Good practice is to also include the Manhole to Manhole IDs.
- f) Required fields are mandatory for successful data transfer.
- g) Some non-required fields depend on whether the information needs to be provided i.e. photograph number, etc. Other non-required fields should be included to maintain inspection quality.
- h) All preceding and trailing spaces must be removed from all fields.
- i) Not populated fields shall be NULL (empty).

### HEADER Table Details

COLUMN	TYPE	REQUIRED	NOTES
ID	LONG	YES	PRIMARY KEY
SURVEYEDBY	CHAR(12)	YES	COMPANY NAME AND INSPECTOR'S INITIALS (XYZ HK)
CONTRACTNUMBER	CHAR(8)	YES	CONTRACT NUMBER PROVIDED BY CITY
JOBNUMBER	CHAR(10)	YES	PROVIDED BY THE CITY
DATE	DATETIME	YES	DATE OF INSPECTION
TIME	DATETIME	YES	TIME OF INSPECTION
LOCATION	CHAR(30)		STREET NAME
STARTMANHOLE	CHAR(10)	YES	START MANHOLE
SDEPTH	DOUBLE		DEPTH OF START MANHOLE
FINISHMANHOLE	CHAR(10)	YES	FINISH MANHOLE
FDEPTH	DOUBLE		DEPTH OF FINISH MANHOLE
DIRECTION	CHAR(1)	YES	DIRECTION OF INSPECTION (U OR D)
SIZE1	INTEGER	YES	DIAMETER OR WIDTH
SIZE2	INTEGER		HEIGHT
SHAPE	CHAR(1)		SHAPE CODE
MATERIAL	CHAR(5)		MATERIAL CODE
PIPELENGTH	INTEGER		PIPE SEGMENT LENGTH (JOINT TO JOINT DISTANCE)
TOTALLENGTH	DOUBLE	YES	TOTAL LENGTH OF PIPE FROM MH TO MH
VIDEONUMBER	CHAR(5)		NOT REQUIRED
COMMENTS	CHAR(50)		COMMENTS
PURPOSE	CHAR(1)		NOT REQUIRED
SEWERCATEGORY	CHAR(1)		NOT REQUIRED
PRECLEANING	CHAR(1)		INDICATE IF PIPE WAS CLEANED BEFORE INSPECTION Y OR N
WEATHER	CHAR(1)		WEATHER CODE (1 TO 5)
FURTHERDETAILS	CHAR(48)		COMMENTS (AVOID USE OF " ' \ \ CHARACTERS)

### CONDDetails Table Details

COLUMN	TYPE	REQUIRED	NOTES
ID	LONG	YES	PRIMARY KEY
VIDEONUMBER	INTEGER		ELAPSED TIME
PHOTOGRAPHNUMBER	INTEGER		PHOTOGRAPH NUMBER (1,2,3)
DISTANCE	DOUBLE	YES	CHAINAGE (4.2)
CONTINUOSDEFECT	CHAR(2)		CONTINUOUS DEFECT CODE (F1, F2, S1,S2)
CODE	CHAR(4)	YES	WRc OBSERVATION CODE
DIAMETER_DIMENSION	INTEGER		DIAMETER_DIMENSION OF OBSERVATION
CLOCKFROM	CHAR(2)		CLOCK FROM OBSERVATION POSITION (01,06,11,12)
CLOCKTO	CHAR(2)		CLOCK TO OBSERVATION POSITION (01,06,11,12)
PERCENTAGE	INTEGER		PERCENTAGE OF OBSERVATION (5,10,50)
INTRUSION	INTEGER		INTRUSION OF OBSERVATION
REMARKS	CHAR(34)		REMARKS FOR OBSERVATION (AVOID USE OF " ' \ \ CHARACTERS)
JOBNUMBER	CHAR(10)	YES	PROVIDED BY THE CITY
HEADERID	LONG	YES	FOREIGN KEY LINKING THIS RECORD TO HEADER TABLE



These amendments apply to and are to be read in conjunction with the latest version of OPSS and O.P.S.D. These specifications will be adopted in their entirety. Each contract will have its specifications adapted to suit its design requirements as necessary.

**VOLUME 1      GENERAL CONDITIONS OF CONTRACT AND SPECIFICATIONS FOR CONSTRUCTION**

**Division 1      General Specifications**

No amendments.

**Division 2      General Grading**

**206              Construction Specification for Close Cut Clearing, Grubbing and Removal of Surface and Piled Boulders**

206.07.01.07      Grading tolerances to "match existing line and grade", or as specified in the contract documents.

206.09              "Measurement For Payment" shall not apply. Excavation and/or break out limits shall be as defined by the Measurement For Payment Drawings RD-119.01 to RD-119.04 inclusive or as specified in the contract documents.

**Division 3      Pavement (Flexible and Rigid)**

**310              Construction Specification for Hot Mix Asphalt**

310                  Hot mix asphalt requirements shall comply with OPSS 310 except where superseded by contract special provisions – refer to contract documents.

**Division 4      Drainage, Watermains and Utility**

**401              Construction Specification for Trenching Backfilling and Compacting**

401.05.01          Approved unshrinkable concrete fill (OPSS 1350) is also acceptable.

401.07.13          Superseded by Form 300.22.01 and contract documents

**403              Construction Specification for Rock Excavation for Pipelines, Utilities and Associated Structures in Open Cut**

403.07.02          Superseded by City Blasting and Use of Explosives Form 300.35

**407              Construction Specification for Maintenance Hole, Catch Basin, Ditch Inlet and Valve Chamber Installation**

407.05.05          Precast concrete collars are permitted for temporary adjustments only. Rubber and HDPE adjustment units are not permitted. Frames to be set in concrete.

407.07.16          All permanent adjustments are to be poured in place.

407.07.19 New manholes - 1st step to be 450 mm ( $\pm$  40 mm) from finished road grade, however existing rebuilds to be 450 mm ( $\pm$  150 mm) from finished road grade.

407.07.21 To conform to City Specifications and/or contract documents.

407.07.22

407.07.23

**410 Construction Specification for Pipe Sewer Installation in Open Cut**

Acceptable, payments for dual sewer will be used when applicable.

**412 Construction Specification for Sewage Forcemain Installation in Open Cut**

412.05 Acceptable materials shall be identified by the contract documents.

412.05.04 Polyvinyl chloride pressure pipe only permitted where specified in contract documents.

412.05.05 Polyethylene plastic pressure pipe only permitted where specified in contract documents.

412.05.06 Steel pipe not acceptable.

412.05.07 Valve type to be selected from the Approved Products List or as specified in the contract documents. Valve operators - conform to City Standard and operating torque specifications.

412.05.07.04 Knife Gate Valves acceptable where specified in the contract documents.

412.05.07.05 Air and Vacuum valves - conform to City Specifications, double acting kinetic valves only selected from Approved Sewer Products List.

412.07.10 Pipe bedding and backfill to conform to City Specifications, OPS not acceptable.

412.07.12.06 Steel pipe - not acceptable.

412.07.14.01 Superseded by the following:

Wherever it is required to deflect mechanical - joint pipe, the maximum amount of deflection in a joint in any direction, shall not exceed the limits shown on Table 4.1.

**TABLE 4.1  
PERMISSIBLE DEFLECTION IN MECHANICAL-JOINT PIPE**

NOMINAL PIPE SIZE (mm)	MAXIMUM PERMISSIBLE BEND ANGLE PER JOINT (Degrees)	MAXIMUM PERMISSIBLE DEFLECTION PER METRE OF PIPE (mm)
100	5	87
150	4	70
200	3	52
250	3	52
300	3	52
350	2	35
400	2	35

**Permissible Deflection in Tyton-Joint Pipe**

Wherever it is required to deflect Tyton-Joint pipe, the maximum amount of deflection in a joint in any direction, shall not exceed the limits shown on the following table:

**TABLE 4.2  
PERMISSIBLE DEFLECTION IN TYTON-JOINT PIPE**

NOMINAL PIPE SIZE (mm)	MAXIMUM PERMISSIBLE BEND ANGLE PER JOINT (Degrees)	MAXIMUM PERMISSIBLE DEFLECTION PER 5.49m LENGTH OF PIPE (mm)	MINIMUM PERMISSIBLE RADIUS OF CURVE (m)
100	3	290	103
150	3	290	103
200	3	290	103
250	3	290	103
300	3	290	103
350	2.5	240	125
400	2.5	240	125

- 412.07.14.03 PVC & PE pipe deflections to be 1/2 of manufacturer's recommendations.  
412.07.14.05 Steel pipe not acceptable.

412.07.17	Hydrostatic Testing
412.07.17.01	All flushing, cleaning, swabbing and hydrostatic Leakage testing shall be in accordance with Form 400, Appendix A and contract documents.
<b>416</b>	<b>Construction Specification for Pipeline and Utility Installation by Jacking and Boring</b>
416.07.05	Pipe Installation as per design requirements. Space between pipe and wall to be filled with slurry, sand or grout, as specified in contract documents. Hardwood skids to be steel strapped prior to jacking.
416.07.07	Cathodic protection shall be provided on the casing pipe where specified in the contract documents.
<b>441</b>	<b>Construction Specification for Watermain Installation in Open Cut</b>
	For all amendments to OPSS 441, refer to Form 400 - Specification for the Installation of Watermains and Appendix A.
<b>Division 5</b>	<b>Miscellaneous</b> – No amendments.
<b>Division 6</b>	<b>Electrical</b> - This entire section will be adapted to suit contract requirements.
<b>603</b>	<b>Construction Specification for the Installation of Ducts</b>
<b>616</b>	<b>Construction Specification for Footings and Pads for Electrical Equipment</b>
	Specification acceptable, shall be superseded by City of Hamilton Traffic Department Drawing No. DT:0111-01 and contract documents where applicable.
<b>Division 7</b>	<b>Traffic Safety</b> – No amendments.
<b>Division 8</b>	<b>Environmental and Landscape</b> – No amendments
<b>801</b>	<b>Construction Specification for the Protection of Trees</b>
801	Acceptable with amendments by City of Hamilton Tree By-Law and contract documents.
<b>Division 9</b>	<b>Structural</b> - No amendments.
<b>VOLUME 2</b>	<b>MATERIAL SPECIFICATIONS</b>
	For revisions to OPSS materials specifications, refer to the contract documents and the following:
	Form 600 - Specification for Granular Fill Materials
	Form 700 - Specification for Portland Cement Concrete
	Form 800 – Specification for Hot Mix Asphalt
	Form 900 – Specification for Standard Compaction Requirements

<b>VOLUME 3</b>	<b>DRAWINGS FOR ROADS, DRAINAGE, SANITARY SEWERS, WATERMANS AND STRUCTURES (OPSD)</b>
<b>Division 100</b>	<b>Abbreviations</b> Abbreviations and legends will be a combination of OPSS, OPSD and City Specifications used and denoted as required.
<b>Division 200</b>	<b>Grading</b> Delete OPSD 201.010, 201.020, 207.010, 207.020, 207.030, 209.020, 216.020 and 217.030
<b>Division 300</b>	<b>Entrances</b> Delete expansion joint material in OPSD 310.010, 310.020, 310.04 and 310.050 except as directed by the City.  OPSD 310.030 - Refer to RD-102.
<b>Division 400</b>	<b>Frames and Grates</b> Frames and Grates shall be as listed in the applicable Approved Product List(s) or contract documents.
<b>Division 500</b>	<b>Paving</b> 509.010 shall be read in conjunction with RD-100.01 and RD-100.02
<b>Division 600</b>	<b>Curbs and Gutters</b> Curbs and gutter shall be as specified in contract documents.
<b>Division 700</b>	<b>Catch Basins and Manholes</b> OPSD 701.010, 701.011, 701.012, 701.013, 701.014, 705.015, 705.010 and 705.020 are all acceptable with a goss trap (SEW-304)  Delete OPSD 708.01
<b>Division 800</b>	<b>Culverts and Drains</b> Delete: all 802 series and 805.01, 805.02, 806.02, 806.04, 806.06, 807.03, 807.04 and 807.05
<b>Division 900</b>	<b>Fencing, Guide Rails</b> All acceptable.
<b>Division 1000</b>	<b>Sanitary Sewers</b> OPSD 1003.010 permitted OPSD 1003.020, 1003.030, 1003.031, 1006.010 and 1006.020 not permitted.
<b>Division 1100</b>	<b>Watermains</b> OPSD 1104.02 and 1109.011 permitted Remaining 1100 drawings are superceded by Hamilton Standard Watermain Drawings (WM Series).

<b>VOLUME 4</b>	<b>DRAWINGS FOR ELECTRICAL WORK</b>
	All specifications and drawings for electrical works shall be in accordance with the contract documents.
<b>VOLUME 5</b>	Not applicable.
<b>VOLUME 6</b>	Not applicable.
<b>VOLUME 7</b>	<b>MUNICIPAL-ORIENTED OPS GENERAL CONDITIONS OF CONTRACT AND CONSTRUCTION SPECIFICATIONS</b>
<b>OPSS.MUNI 100</b>	<b>General Conditions of Contract</b> Not applicable, refer to contract documents.
<b>VOLUME 8</b>	<b>MUNICIPAL-ORIENTED MATERIAL SPECIFICATIONS</b>
<b>OPSS.MUNI 1101</b>	<b>Performance Graded Asphalt Cement</b> As modified by contract documents.
<b>OPSS.MUNI 1151</b>	<b>Superpave and Stone Mastic Asphalt Mixtures</b> As modified by contract documents.

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Backflow Preventers</b>		Watts	009 (16mm to 50mm) 909 (75mm to 200mm)
<b>Backwater Valve</b>		Bibby-Ste-Croix	69060
<b>Corrosion Protection</b>	Zinc Anodes: 5.4 Kg and 10.5 Kg ASTM B-418, Type 2  Magnesium Anodes: 14.5 Kg - B-107, ASTM 843, Type M1 OPSS 442		
	Protective coatings for metal fittings	Denso North America	Denso Wrap (primer, mastic and tape)
		Trenton	No. 1 Wax Tape  Tack Tape
	Polyethylene encasement for ductile iron watermain pipe and fittings  ANSI/AWWA C105 A21.5-99 - 8 mil low density Poly-Tube with overlap		
<b>Couplings</b>	Water Service Couplings 19mm to 50mm AWWA C800 compression fit copper to copper connections	Cambridge Brass	119 Series 19mm to 25mm with stop 38mm to 50mm no stop
		Ford Meter Box Co.	C44, – Q type 19mm to 25mm with stop 38mm to 50mm no stop
		Mueller	H-15403 19mm to 25mm with stop 38mm to 50mm no stop
	Water Service Couplings 19mm to 50mm AWWA C800 copper to lead or alloy connection	Ford Meter Box Co.	Q14 Series, Q24 Series and Q34 Series

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Couplings Cont'd...</b>	Watermain Pipe Couplings AWWA C219-06 epoxy coated with stainless steel straps, nuts and bolts	Ford	FC1 and FC2 100mm to 300mm DI and PVC
		Mueller (Viking Johnson)	Maxi-Fit (100mm to 1200mm)
		Robar Industries	1506 (4 or 5 bolt model) 100mm to 400mm DI and PVC
		Smith Blair	Omni 441 100mm to 400mm DI and PVC
		Tadco Manufacturing	Straub-Flex , non-restrained up to 1200mm (modified for use in Hamilton)
		Victaulic	Vic 31 400mm DI only
<b>Curb Stops</b>	19mm to 50mm AWWA C800 compression ends ball type, non-draining	Mueller	300 B-25209
		Cambridge Brass	202 Series
		Ford Meter Box Co.	B44 Series – Q Type
<b>Fittings</b>	Ductile Iron Up to 300mm Pressure Class 350, cement lined, AWWA C104, C110 / A21.10, C153/A2.53 OPSS 441	Bibby	
		Sigma	
		Star Pipe Products	
	Ductile Iron 400mm and larger Class 52, cement lined restrained mechanical joint AWWA C104 C110 / A21.10, OPSS 441.05.02	Bibby	
		Sigma	
		Star Pipe Products	
	PVC 100mm, 150mm and 200mm, injection molded AWWA C907, B137.3 OPSS 441	Ipex	Blue Brute
		Royal Pipe	Royal Seal



PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Fittings Cont'd...</b>	PVC 250 mm to 750mm CSA B137.3 250 mm and 300 mm shall use AWWA C900 and C905 PVC pipe, bonded together and over-wrapped with fiberglass-reinforced polyester	Ipex	Blue Brute, Big Brute
		Royal Pipe	Royal Seal
<b>Hydrants</b>	AWWA C502 3 way hydrants  CAN / ULC S-520-07 2-63.5 mm side ports, CSA standard thread, stainless steel nuts, bolts and studs  100mm "STORZ" pumper connection  25mm hydrant operating nut - open left (Counter clockwise)	American AVK	Style 2780
		Clow Canada Ltd.	Brigadier Series M -67
		Mueller Canada Inc.	Darling B-50-B
<b>Insulation</b>	Extruded polystyrene	Dow	Styrofoam Highload 100
		Owens Corning	Foamular 1000 (Pink)
<b>Joint Restraint</b>	Ductile Iron Pipe	Ebaa Iron	Mega-Lug Series 1100 Black epoxy coated wedges and nuts (100mm to 1200mm)
		Smith-Blair	Cam-Lock Series 120 (100mm to 600 mm)
		Sigma	One-Lok –SLD (100mm to 600mm)
		Star	Stargrip Series 3000 (100mm to 400mm)
	PVC Pipe ASTM F1674-05	Sigma	PV-Lok – SLC (100mm to 600mm)
		Star	Stargrip Series 4000 Top breakaway nut same size as the T-bolt (100mm to 750mm)
		Smith Blair	Cam-Lock Series 111 - Red epoxy coated wedges and nuts (100mm to 600 mm)

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Main Stops (Corporations)</b>	19mm to 50mm AWWA C800 compression end, ball Type non-draining	Cambridge Brass	301 Series A3H3, A4H4, A6H6, A7H7
		Ford Meter Box Co.	FB1000 Series, Q Type
		Mueller	300 B-25008
<b>Pipe</b>	Concrete Pressure Pipe 500mm and larger AWWA C300, C301, C302 and C303, OPSS 441 Plant must be pre-qualified by the Ontario Concrete Pipe Association	Hyprescon	
		Munro Concrete	
	Ductile Iron Pipe 100mm to 300mm Pressure Class 350, tyton joint, AWWA C104 / A21.3, C110 / A21.10, OPSS 441	Canada Pipe Company	Includes polyethylene encasement of pipe and fittings AWWA C105 / A21.5
	Ductile Iron Pipe 400mm to 1050mm tyton joint, Class 52 AWWA C104 / A21.3, C110 / A21.10, OPSS 441	Canada Pipe Company	Includes polyethylene encasement of pipe and fittings AWWA C105 / A21.5
	Polyvinyl Chloride (PVC) 100mm to 300mm AWWA C900 - DR18 OPSS 441	Ipex	Blue Brute
		Royal Pipe	Royal Seal
		National Pipe and Plastics	AWWA C900
	Molecularly Oriented Polyvinyl Chloride (PVCO) 100mm to 300mm AWWA C909 - DR18 PC150, OPSS 441	Ipex	Bionax
	Polyvinyl Chloride (PVC) 400mm AWWA C905 – DR18 OPSS 441	Ipex	Big Brute, Centurion
		Royal Pipe	Royal Seal
	Polyvinyl Chloride (PVC) 500mm to 750mm AWWA C905, OPSS 441	Ipex	Big Brute, Centurion
		Royal Pipe	Royal Seal
	Water Service Pipe 19mm to 50mm AWWA C800, OPSS 441, ASTM B88, Type K Soft Copper	Wolverine	

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Repair Clamps</b>	clamps to be supplied with conductivity strip	Robar Industries	5616, 5626, 5636
		Ford Meter Box Co.	Style FS1, Style FS2, Style FS3
<b>Service Boxes</b>	Slide adjustment type Stainless steel rods brass cotter pin	Mueller	H-10300 Series
		Clow	"D" Series
<b>Service Saddles</b>	DI, PVC Pipe Outlet size: 19mm to 50mm  stainless steel straps Denso protection at installation AWWA taper (cc)	Cambridge Brass	403 and 812 Series
		Ford	FS202
		Robar Industries	2506 DS, 2616
		Romac	202 BS (2 strap model)
	Smith Blair	317	
	Concrete Pressure Pipe Outlet size: 19mm to 50mm	Ayotte Enterprises	A-900 with A-571 thermoplastic coating (400 mm only)
<b>Tapping Sleeves</b>	Outlet size 100mm to 400mm  Sleeves will be permitted on the following branch and main sizes:  400mm branch off 400mm w/m 300mm branch off 300mm w/m 250mm branch off 250mm w/m 200mm branch off 200mm w/m 150mm branch off 150mm w/m 100mm branch off 100mm w/m  Protective coating shall be applied to all steel sleeves.	Ayotte Enterprises	A-600 with A-571 thermoplastic coating, stainless steel nuts and bolts - concrete pipe only
		JCM Industries	JCM 415 epoxy coated with stainless steel nuts and bolts, concrete pipe only
		Smith Blair (Steel)	#622 epoxy coated (up to 750mm) Ductile Iron and PVC
		Robar Industries (Steel)	6808 epoxy coated 6906 epoxy coated (100mm to 500mm) Ductile Iron, C900 PVC only
		Romac (Steel)	FTS420 epoxy coated Ductile Iron
<b>Tracer Wire</b>	Solid 12 gauge copper		TWU75 or RWU90XLPE

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Valves</b>	<p><b>Butterfly Valve 450mm to 600mm</b></p> <p>AWWA C504, Class 150B manual actuator - traveling nut type with external position indicator nuts, bolts, and bolt studs to be stainless steel</p> <p>Former City of Hamilton: 25mm operating nut, open right (clockwise)</p> <p>Former Municipalities: 50mm operating nut, open left (counter clockwise)</p>	Clow Canada	<p>M &amp; H 504 (450mm to 500mm)</p> <p>M &amp; H AWWA Large Diameter (600mm and larger)</p> <p>Valve seat adjustment to face spool piece side</p>
		Mueller	Lineaseal
	<p><b>Gate Valve* Resilient Wedge 100mm to 300mm</b></p> <p>AWWA C509, C515 nuts, bolts, and bolt studs to be stainless steel, bronze pin top adjustment not permitted</p> <p>Former City of Hamilton: 25mm operating nut, open right (clockwise)</p> <p>Former Municipalities: 50mm operating nut, open left (counter clockwise)</p> <p>*includes hydrant secondary valves</p>	Clow	F-6100, F-6102, F-6106,
		Mueller	A2360-6, A2360-19, A2360-23
		American AVK Co.	Series 45
	<p><b>Gate Valve Resilient Wedge 400mm</b></p> <p>AWWA C509, C515</p> <p>nuts, bolts, and bolt studs to be stainless steel</p> <p>Former City of Hamilton: 25mm operating nut, open right (clockwise)</p> <p>Former Municipalities: 50mm operating nut, open left (counter clockwise)</p>	Clow	F-6102
		Mueller	A2361-6

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Valves Cont'd...</b>	<b>Combination Air Release and Vacuum Breaker Valves</b> AWWA C512 with surge protection	A.R.I Flow Control Accessories	D-060 C HF NS
		Vent-O-Mat	Water RBX Series
	<b>Tapping Valves</b> 100mm to 300 mm AWWA C509	Clow	F-6106
		Mueller	A2360-19
	<b>Tapping Valves</b> 400mm to 600mm AWWA C509	Clow	F-6106BG
		Mueller	A-2361-19
<b>Valve Boxes</b>	Sliding Type with 6mm pre- drilled tracer wire hole and grommet in upper section	Bibby Ste. Croix	VB1000 Series
<b>Valve Chambers</b>	OPSS 407, 1351  Plant must be pre-qualified by the Ontario Concrete Pipe Association	Anchor	
		Con Cast	
		Hanson	
		M-Con	
		Munro Concrete	
		Wilkinson	
<b>Valve Chamber Frame and Cover</b>	OPSS 1850 OPSD 402.011 WM 212.01 WM 212.02 WM 212.03	Bibby	
		R.B. Agarwalla	
		Mueller	
		McCoy	
<b>Water Meter Reader Enclosure</b>		Hoffman Nema 4x, fiberglass	Includes internal mounting plate

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Catch Basins</b>	CSA A257.4 OPSS 407 OPSS 1351  Supplied from a plant listed as prequalified by the OCPA	Con Cast	
		Hanson	
		M-Con	
		Wilkinson	
<b>Catch Basin Frames &amp; Covers</b>	OPSD 400.100 ASTM A48 OPSS 1850	Bibby	
		Labco	
		McCoy Foundry	"All in one" cover
		Mueller Canada	
		R.B. Agarwalla	
<b>Couplings</b>	CSA B182.2 CSA B182.4 OPSS 1841	Fernco Connectors	
		Kwik Connectors	
		Mission Rubber Co.	
		Pipe Conx	
		Preper-PLS Tech	
<b>Culvert Pipe</b>	Corrugated Steel (CSP) Riveted or Spiral CSA G401 galvanized or aluminized (Type 2)  OPSS 1801 and 1841  up to 1000mm - 1.6 Gauge over 1000mm - 2.0 Gauge	Armtec	Hel-Cor, Ultra Flo
		Atlantic Industries	
		Canada Culvert	Steelcor
	HDPE and PVC OPSS 1840, ASTM F 894	Armtec	Big "O", Boss 2000
		Ideal Drain Tile Ltd.	Challenger 2000
<b>Goss Traps</b>	SEW-304	McCoy	
		Hanson	Poet
		CB Trap	
<b>Maintenance Holes</b>	CSA A257.4-M92 OPSS 1351 1200mm to 3000mm  Supplied from a plant listed as prequalified by the OCPA	Coldstream	
		Con Cast	
		Hanson	
		M-Con	
		Wilkinson	

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.	
<b>Maintenance Hole Frames &amp; Covers</b>	OPSD 401.010 Type A and B ASTM A48	Bibby		
		McCoy Foundry		
		Mueller Canada		
		R.B. Agarwalla		
<b>Sewer Pipe</b>	Vitrified Clay Pipe 150mm to 600mm CSA A60.1M-1976 Form 500	Logan	T-Tap (without flanges)	
		Concrete Pipe - Reinforced 300mm or greater  CSA A257.2 65-D, 100-D, 140-D and 150-D  Form 500 OPSS 1820  Supplied from a plant listed as prequalified by the OCPA	Con Cast Pipe	
			Hanson	Concrete Bell (mortared in)
	Hyprescon			
	M-Con			
	Munro			
	Polyvinyl Chloride Pipe (PVC) Smooth Wall DR-28 / DR-35 CSA B182.2 200mm to 375mm  Form 500 OPSS 1841	Ipex	Ring-Tite	
		Rehau Pipe	Duraloc	
		Royal Pipe Co.	Royal Seal	
	<b>Saddles / Connections</b>	CSA B182.2 CSA B182.4 100mm to 300mm	Ipex	Inserta – Tee Saddle Tee (2 straps) Saddle Wye (2 straps) Wing Adapter Universal Sewer Saddle 22 ½° to 45° bends
Fernco 100mm and 150mm			EZ Tap	
Specialty Products 2000 Inc. (150mm)			Core Bell Adaptor	
<b>Valves</b>	Combination Air / Vacuum Breaker AWWA C512	A.R.I	D-020 (stainless steel)	

<b>DRAWING No.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
<b>RD-100.01</b>	November 2005	Road Restoration Over Utility Cuts –Sheet 1of 2
<b>RD-100.02</b>	November 2005	Road Restoration Over Utility Cuts - Sheet 2 of 2
<b>RD-101</b>	November 2005	100 mm Dia. Perforated Drain Pipe Detail
<b>RD-102</b>	November 2005	Wheelchair Ramp Locations
<b>RD-103</b>	January 2011	Combined Concrete Walk and Curb and Independent Concrete Walk
<b>RD-104</b>	January 2011	Asphalt Sidewalk
<b>RD-105</b>	November 2005	Interlocking Paving Stone Sidewalk
<b>RD-106</b>	January 2011	Standard Approach
<b>RD-107</b>	November 2005	California Style Approach
<b>RD-108</b>	November 2005	Asphalt Driveway Approach
<b>RD-109</b>	November 2005	Concrete Apron Approach
<b>RD-110.01</b>	November 2005	Offset Curb & Gutter Detail at Single Catchbasin
<b>RD-110.02</b>	November 2005	Offset Curb & Gutter Detail at Double Catchbasin
<b>RD-111</b>	November 2005	Shoulder Paving for Manholes and Chambers in Shoulders
<b>RD-112</b>	November 2005	Concrete Alleyway
<b>RD-113.01</b>	November 2005	Typical Road Cross Section - Local Urban Residential (20.0 m Right-of-Way)
<b>RD-113.02</b>	November 2005	Typical Road Cross Section - Local Urban Residential (18.0 m Right-of-Way)
<b>RD-113.03</b>	November 2005	Typical Road Cross Section Local Urban Residential - Without Sidewalk For Cul De Sacs (18.0 m Right-of-Way)
<b>RD-113.04</b>	November 2005	Standard Road Section For Private Townhouses
<b>RD-113.05</b>	November 2005	Rural Cross Section
<b>RD-114</b>	November 2005	Unsignalized Industrial & Commercial Entrance - Urban Section
<b>RD-115</b>	November 2005	Hammerhead Turning Movement Diagram
<b>RD-116.01</b>	November 2005	Permanent Cul-De-Sac For Local Residential Streets – Symmetrical (18.0 m Right-of-Way)

Note: 24' x 36' size drawings are not bound in this document



<b>DRAWING No.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
<b>RD-116.02</b>	November 2005	Permanent Cul-De-Sac For Local Residential Streets – Offset Left (18.0 m Right-of-Way)
<b>RD-116.03</b>	November 2005	Cul-De-Sac For Industrial & Commercial Streets
<b>RD-116.04</b>	November 2005	Temporary Turning Circle (20.0 m R.O.W.)
<b>RD-117</b>	November 2005	Rural Residential Entrances
<b>RD-118</b>	November 2005	Rural Industrial & Commercial Entrances
<b>RD-119.01</b>	November 2005	Measurement for Payment Diagram – Road Reconstruction Only
<b>RD-119.02</b>	November 2005	Measurement for Payment Diagram – Road Reconstruction and Combined Walk and Curb Reconstruction
<b>RD-119.03</b>	January 2011	Measurement for Payment Diagram – Widening / Realignment /Narrowing
<b>RD-119.04</b>	November 2005	Measurement for Payment Diagram – Road and Independent Curb and Gutter Reconstruction
<b>RD-120</b>	November 2005	Typical Transit Shelter Pad for 1.2 m by 3.0 m Shelter
<b>RD-121</b>	November 2005	Rear Yard Swale Detail
<b>RD-122</b>	November 2005	Typical Toe of Excavation Swale & Berm Detail
<b>RD-123.01</b>	November 2005	Privacy Fence
<b>RD-123.02</b>	November 2005	Privacy Fence Details
<b>RD-124</b>	November 2005	Urban Braille Sidewalk – Typical Details (Size 24" x 36")
<b>RD-125.01</b>	November 2005	Heritage Poles and Details (Size 24" x 36")
<b>RD-125.02</b>	November 2005	Heritage Poles and Details (Size 24" x 36")
<b>RD-126</b>	November 2005	Irrigation – Typical Details (Size 24" x 36")
<b>DT:0111-01</b>	December 2008	Typical Installation of Underground Traffic Control Devices (Size 24" x 36")

Note: 24' x 36' size drawings are not bound in this document

<b>DRAWING No.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
<b>WM-200.01</b>	November 2005	Bedding & Backfill for Concrete & PVC Watermains and Water Services
<b>WM-200.02</b>	November 2005	Bedding & Backfill for Ductile Iron Watermains and Water Services
<b>WM-201.01</b>	November 2005	1200mm Dia. Precast Valve Chamber for 300mm Dia. Watermains & Smaller
<b>WM-201.02</b>	November 2005	Tapping Valve Installation for D.I. Watermain 300mm Dia. and Smaller
<b>WM-202</b>	November 2005	Valve Box Installation For 100mm to 300mm Dia. Watermains
<b>WM-203.01</b>	November 2005	Hydrant Installation
<b>WM-203.02</b>	November 2005	Hydrant Installation using Anchor Tee
<b>WM-203.03</b>	November 2005	Relocation of Ditches at Hydrants
<b>WM-203.04</b>	January 2011	Operating Nut Adaptor for Use on Open Right (Clockwise) Valves
<b>WM-204.01</b>	January 2011	Concrete Anchor Blocks For 300mm Dia. Watermains And Smaller
<b>WM-204.02</b>	January 2011	11-1/4° & 22-1/2° Angle Anchor Block Details for 400mm to 600mm Dia. D.I. Watermains
<b>WM-204.03</b>	January 2011	45° Angle Anchor Block Details for 400mm to 600mm Dia. D.I. Watermains
<b>WM-204.04</b>	January 2011	45° Angle Anchor Block with Leg for 400mm to 600mm Dia. D.I. Watermains
<b>WM-204.05</b>	January 2011	90° Angle Anchor Block Details for 400mm to 600mm Dia. D.I. Watermains
<b>WM-204.06</b>	January 2011	90° Angle Anchor Block with Leg for 400mm to 600mm Dia. DI Watermains
<b>WM-204.07</b>	January 2011	Tee Anchor Block Details for 400mm to 600mm Dia. D.I. Watermain Branches
<b>WM-204.08</b>	January 2011	Tee Anchor Block with Leg for 400mm to 600mm Dia. D.I. Branch Watermains
<b>WM-204.09</b>	January 2011	Concrete Thrust Block for 400mm to 600mm Dia. D.I. Watermains

Note: 24' x 36' size drawings are not bound in this document

<b>DRAWING No.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
<b>WM-204.10</b>	January 2011	Concrete Anchor Blocks for 100mm to 300mm Dia. D.I. Watermains at 11 <sup>1</sup> / <sub>4</sub> ° & 22 <sup>1</sup> / <sub>2</sub> ° Vertical Bends
<b>WM-204.11</b>	January 2011	Concrete Anchor Blocks for 100mm to 300mm Dia. D.I. Watermains at 45 ° Vertical Bend
<b>WM-204.12</b>	January 2011	Vertical Bend Anchor Block 7 <sup>1</sup> / <sub>2</sub> ° to 22 <sup>1</sup> / <sub>2</sub> ° for 400mm Dia.D.I. Watermain
<b>WM-204.13</b> ( 1 of 2 )	November 2005	Concrete Anchor Block for 100mm to 300mm Dia. Watermain Lowering
<b>WM-204.13</b> ( 2 of 2 )	January 2011	Concrete Anchor Block for 100mm to 300mm Dia. Watermain Lowering
<b>WM-205.01</b>	March 2008	50mm Dia. Watermain Looping in Cul De Sacs (20.0 m R.O.W.)
<b>WM-205.02</b>	March 2008	50mm Dia. Watermain Looping in Cul De Sacs (18.0 m R.O.W.)
<b>WM-206</b>	November 2005	50mm Dia. Dead End Blow-Off
<b>WM-207.01</b>	November 2005	Piping Arrangement for 19-25mm Dia. Water Service Connection and Yard Service
<b>WM-207.02</b>	November 2005	Piping Arrangement for 19-25mm Dia. Water Service Connections in a Common Trench
<b>WM-207.03</b>	November 2005	Insulation Details for Water Services at Gooseneck
<b>WM-207.04</b>	November 2005	Piping for 100mm to 300mm Dia. Water Service Connection & Yard Service to Meter with Cut in Tee & Sleeve
<b>WM-207.05</b>	November 2005	Piping for 100mm to 300mm Dia. Water Service Connection & Yard Service to Meter using Tapping Sleeve & Valve
<b>WM-208</b>	November 2005	Remote Receptacle Installation for Meter Chambers
<b>WM-209</b>	November 2005	Piping & Chamber for 16-50mm Dia. Meter Installation
<b>WM-210</b>	November 2005	Piping for 16-250mm Dia. Meter for Internal Installation
<b>WM-211.01</b>	November 2005	Standard Remote Installation for 16-25mm Dia. Meters
<b>WM-211.02</b>	November 2005	Alterations of Existing 16-25mm Dia. Piping Prior to Meter Installation

Note: 24' x 36' size drawings are not bound in this document

<b>DRAWING No.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
<b>WM-211.03</b>	November 2005	Single Family Residential Water Meter Installation for 16-25mm Dia. Services
<b>WM-211.04</b>	November 2005	Meter Pipe Spacer Installation
<b>WM-212.01</b>	November 2005	750mm Dia. Valve Chamber Frame & Cover
<b>WM-212.02</b>	November 2005	750mm Dia. Valve Chamber Cover Details
<b>WM-212.03</b>	November 2005	Valve Key Frame & Cover
<b>WM-213</b>	November 2005	Chamber End Plates for 100mm Dia. to 300mm Dia. Watermains
<b>WM-214</b>	November 2005	Removable Slab Lifting Hole Details & Lifting Hook Detail for Chambers
<b>WM-215.01</b>	November 2005	Valve Support
<b>WM-215.02</b>	November 2005	Pipe & Valve Support
<b>WM-216</b>	November 2005	Blow-Off Connection at Access Chamber
<b>WM-217</b>	November 2005	Pitometer Connection for Steel & Concrete Pipe
<b>WM-230</b>	January 2011	2400mm Precast Valve chamber for 400mm Dia. Concrete or Ductile Iron Pipe with 50mm Air Valve & 100mm Blow-Off (Size 24" x 36")
<b>WM-231</b>	January 2011	1800mm x 2400mm Precast Valve Chamber for 450mm Dia. or 500mm Dia. Concrete or Ductile Iron Pipe (Size 24" x 36")
<b>WM-232</b>	January 2011	1800mm Precast Valve Chamber for 400mm to 500mm Dia. Concrete or Ductile Iron Pipe with 50mm Air Valve & 100mm Blow-Off (Size 24" x 36")
<b>WM-233</b>	January 2011	1800mm x 3000mm Precast Valve Chamber for 400mm Dia. Concrete or Ductile Iron Pipe with 100mm Dia. to 300mm Dia. Branch (Size 24" x 36")
<b>WM-234</b>	November 2005	1800mm x 2400mm and 1800mm x 3000mm Precast Meter Chambers for 100mm Dia. To 250 mm Dia. Water Services (Size 24" x 36")
<b>WM-235</b>	November 2005	1800mm x 2400mm Precast Tapping Valve Chamber for 100mm to 300mm Dia. D.I. Pipe Tapping off 400mm to 600mm Dia. Watermain (Size 24" x 36")

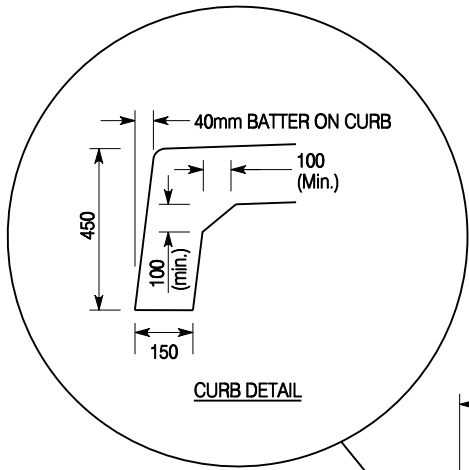
Note: 24' x 36' size drawings are not bound in this document



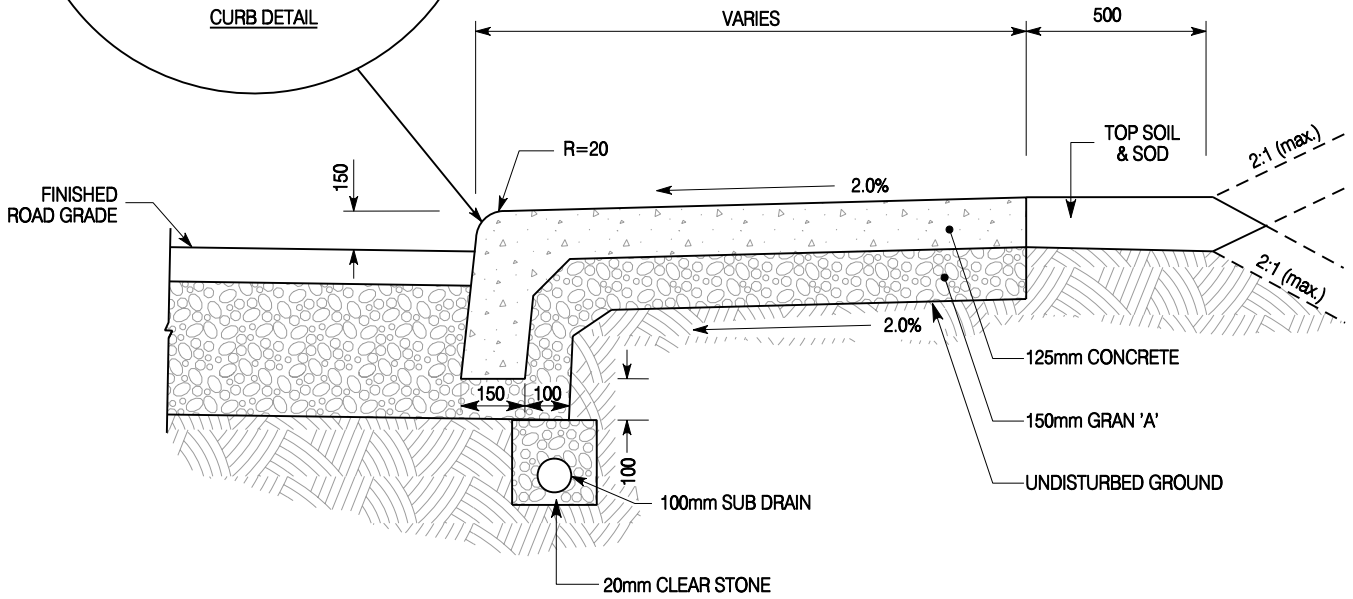
STANDARD SEWER DRAWING  
INDEX

Page 1 of 1  
January 2011

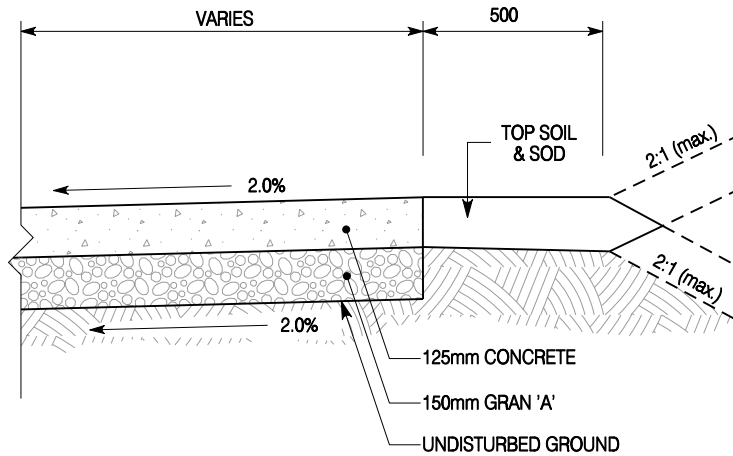
<b>DRAWING No.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
<b>SEW-300</b>	November 2005	Sewer Bedding and Riser Details
<b>SEW-301</b>	November 2005	Sewer Bedding Details in a Dual Trench
<b>SEW-302</b>	November 2005	Bedding Details for Private Drains
<b>SEW-303</b>	November 2005	Dual Private Drain Connection to a Combined Sewer
<b>SEW-304</b>	November 2005	Goss Trap Details



CURB DETAIL



**COMBINED CONCRETE WALK AND CURB**



**INDEPENDENT CONCRETE WALK**

DENOTES UNDISTURBED GROUND.

City of Hamilton  
Public Works Department

**COMBINED CONCRETE WALK AND CURB &  
INDEPENDENT CONCRETE WALK**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

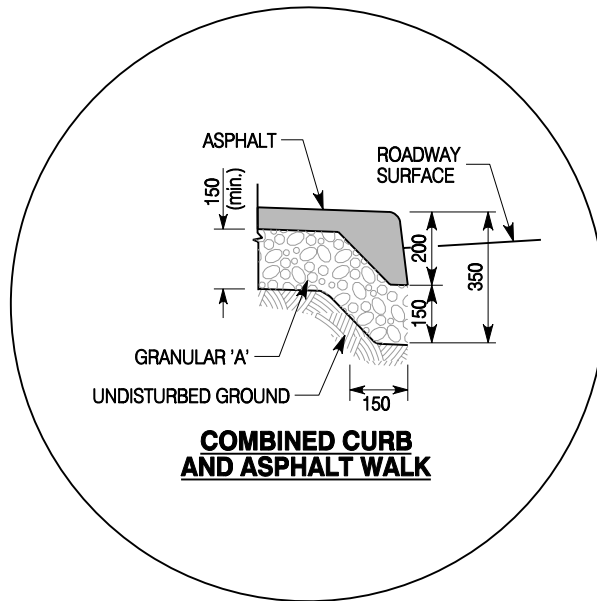
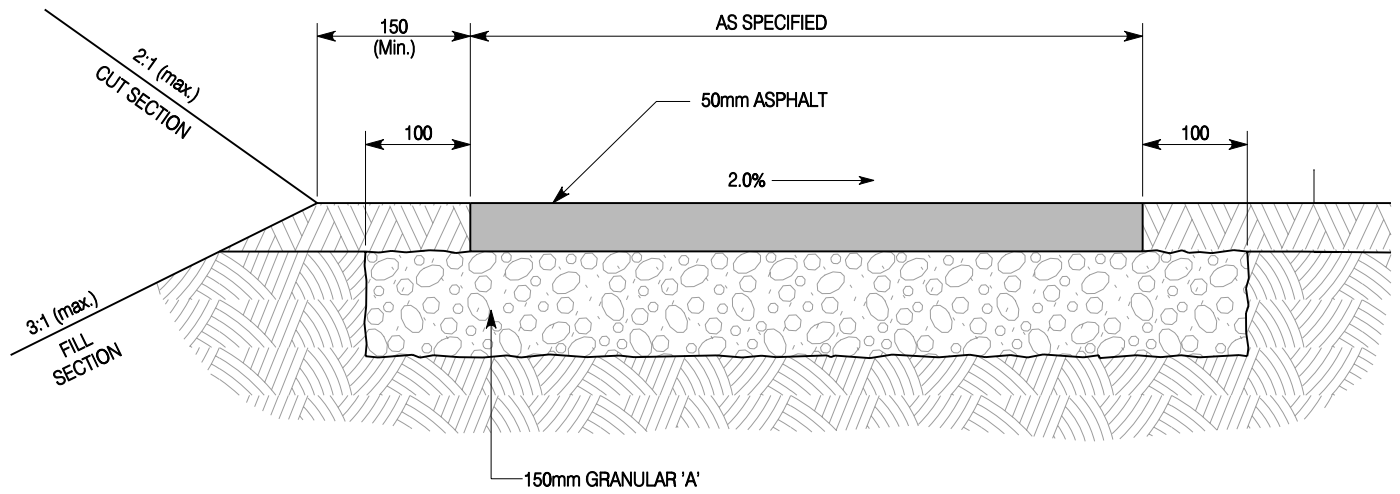
DATE  
January 2011

REV No  
1

FORMERLY: RHS-303

HAMILTON STD No

RD-103



**NOTES:**

1. RESTORATION TO BE TOPSOIL AND SOD UNLESS OTHERWISE NOTED.
2. ALL EDGES TO BE HAND TAMPED WHERE REQUIRED.

City of Hamilton  
Public Works Department

**ASPHALT SIDEWALK**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

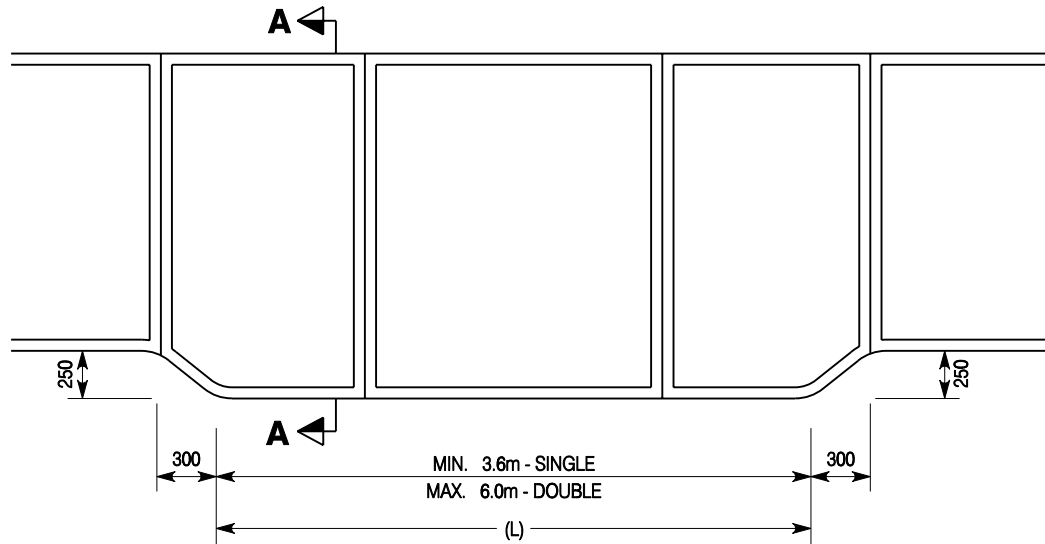
DATE  
January 2011

REV No  
1

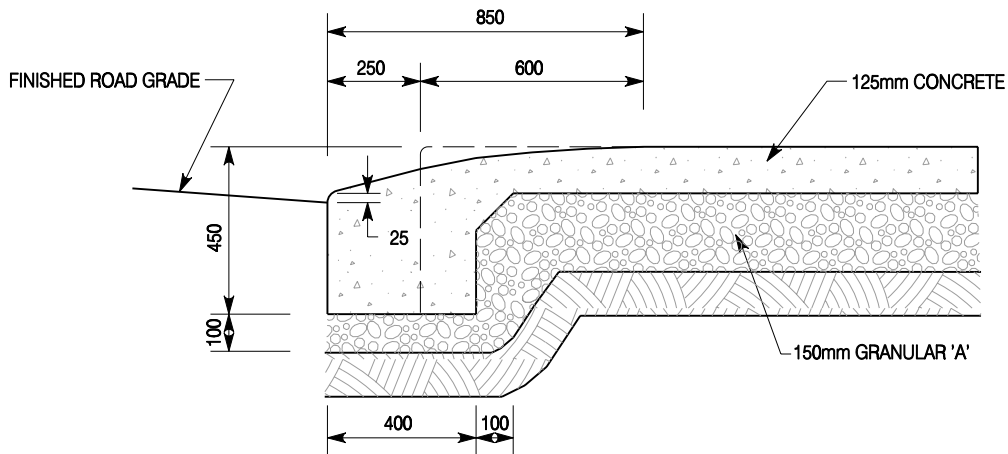
FORMERLY: RHS-302

HAMILTON STD No

**RD-104**



**PLAN**



**SECTION A-A**

**NOTES:**

1. ALL COMMERCIAL AND INDUSTRIAL APPROACHES & SIDEWALK THICKNESSES TO BE 200mm
2. METHOD OF FINAL PAYMENT MEASURED AS L (LENGTH OF APPROACH)

City of Hamilton  
Public Works Department

**STANDARD APPROACH**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

DATE  
January 2011

REV No  
1

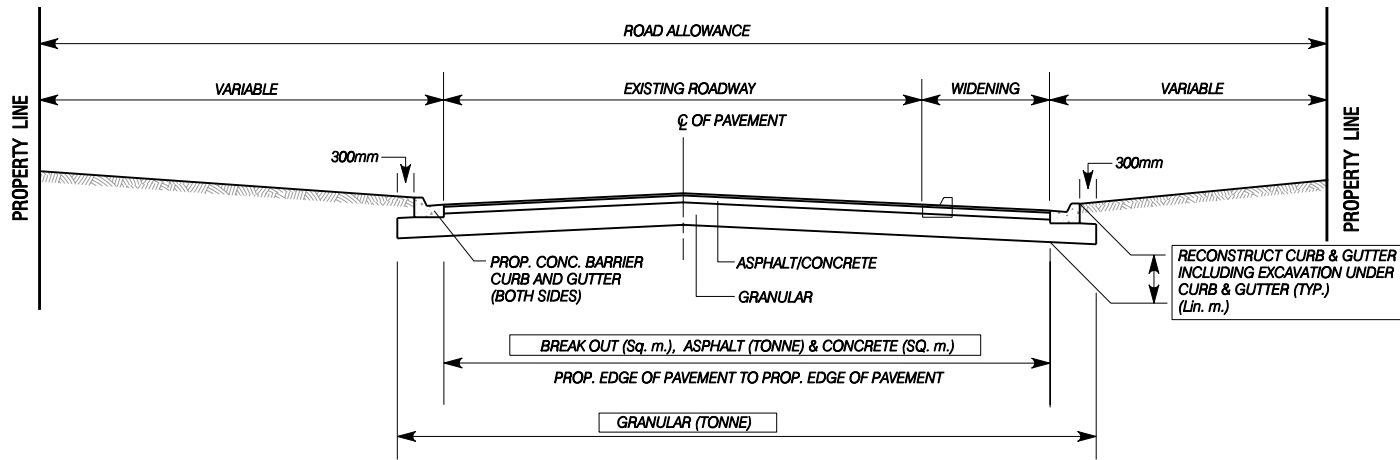
FORMERLY: RHS-400

HAMILTON STD No

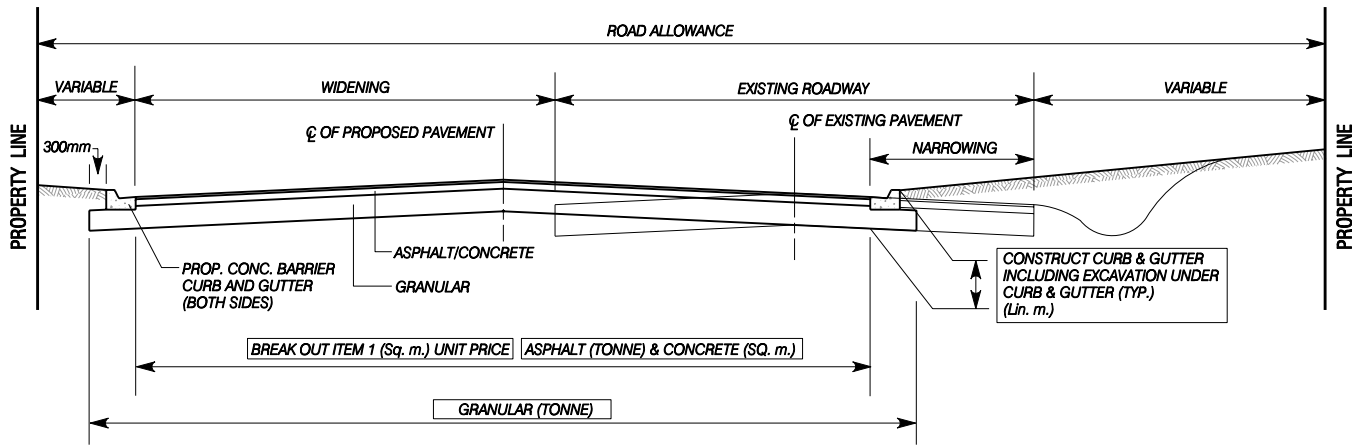
**RD-106**



**MEASUREMENT FOR PAYMENT (WIDENING)**



**MEASUREMENT FOR PAYMENT (REALIGNMENT/WIDENING/NARROWING)**



City of Hamilton  
Public Works Department

**MEASUREMENT FOR PAYMENT DIAGRAM  
REALIGNMENT/WIDENING/NARROWING**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED

DATE  
January 2011

REV No  
1

HAMILTON STD No

**RD- 119.03**

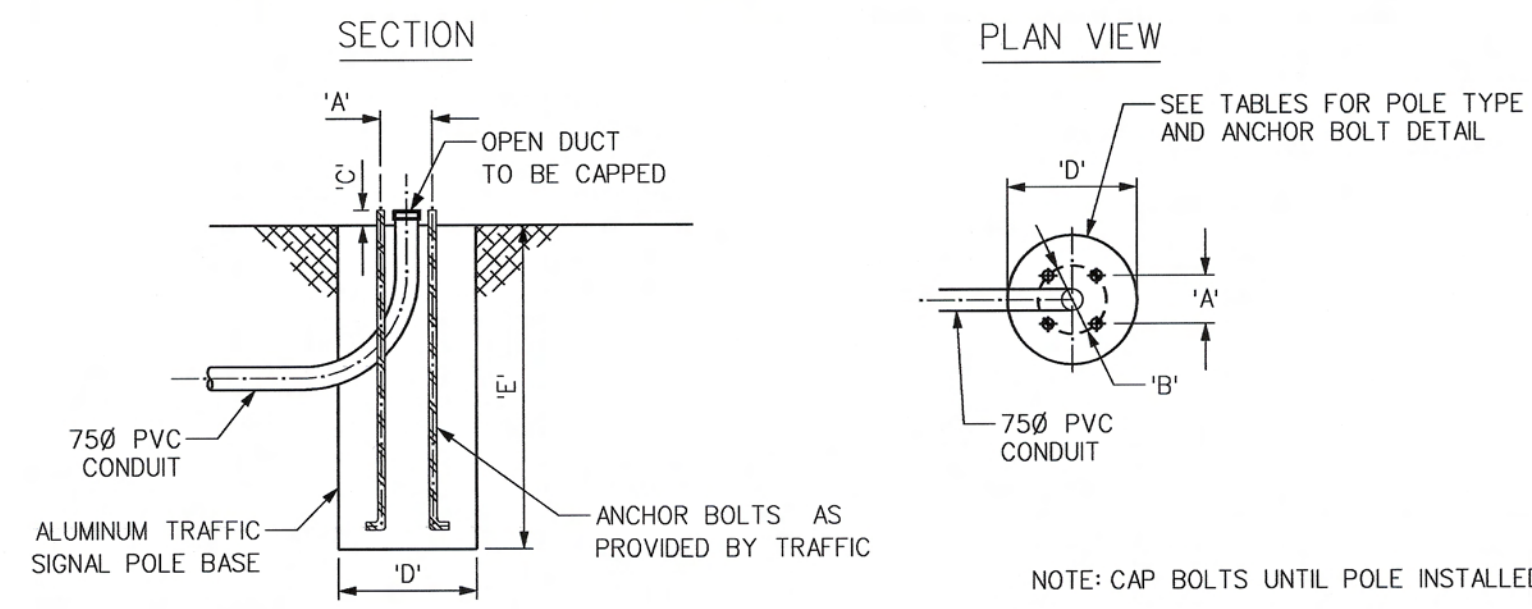
POLE TYPE & ANCHOR BOLT TABLES

ALUMINUM SIGNAL UTILITY POLES		
POLE SIZE	POLE No.	BASE TYPE
SU4.BT	TP-6415-AB	1
SU5.BT	TP-8619-AB	2
SU5.BT HEAVY DUTY	TP-10819H-AB	3

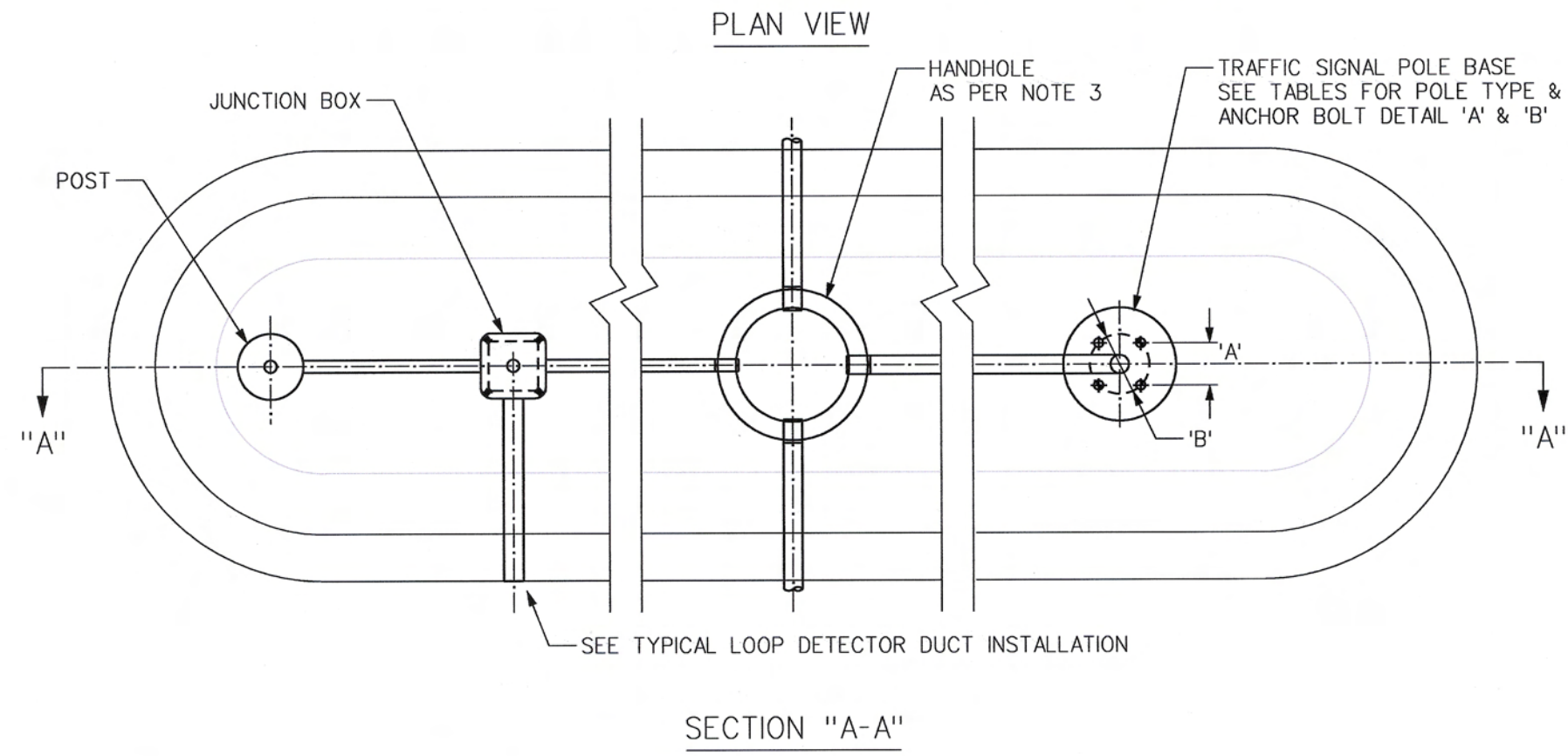
DIMENSION	TABLE OF ANCHOR BASE DETAILS		
	BASE TYPE 1	BASE TYPE 2	BASE TYPE 3
'A' BOLT SPACING	171 (6 3/4")	206 (8 1/8")	287 (11 3/8")
'B' BOLT CENTRE DIAMETER	241 (9 1/2")	292 (11 1/2")	406 (16")
* 'C' BOLT PROJECTION	100	100	100
'D' SONOTUBE DIAMETER	450	760	760
'E' SONOTUBE DEPTH	1200	1200	1200
ANCHOR BOLT SIZE	19 x 610 (3/4" x 24")	25 x 762 (1" x 30")	32 x 1219 (1 1/4" x 48")

\* ABOVE FINISHED GRADE

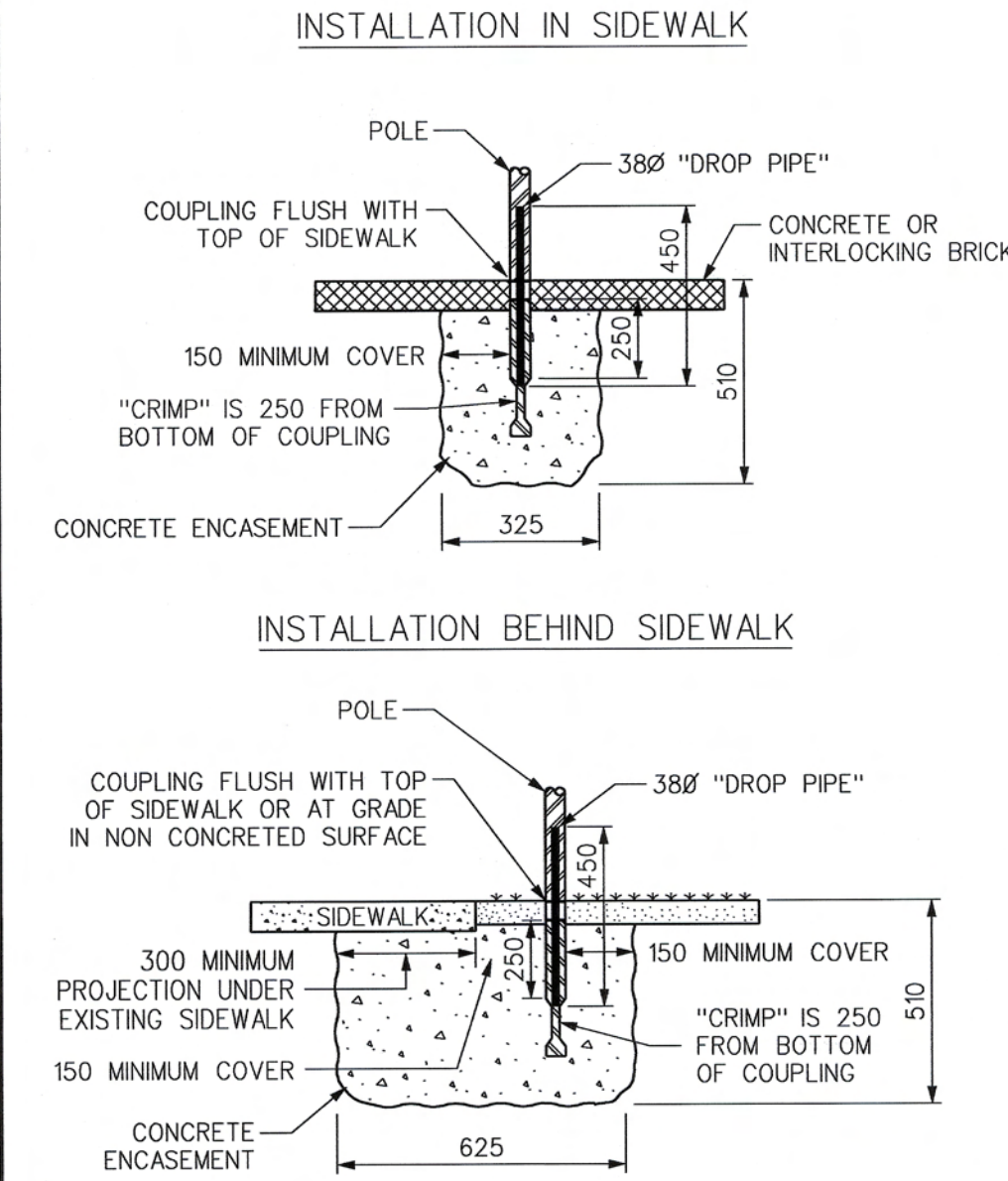
ALUMINUM SIGNAL UTILITY POLE - BASE INSTALLATION



TYPICAL INSTALLATION IN TRAFFIC ISLAND



500 ROUND POLE & INSERT



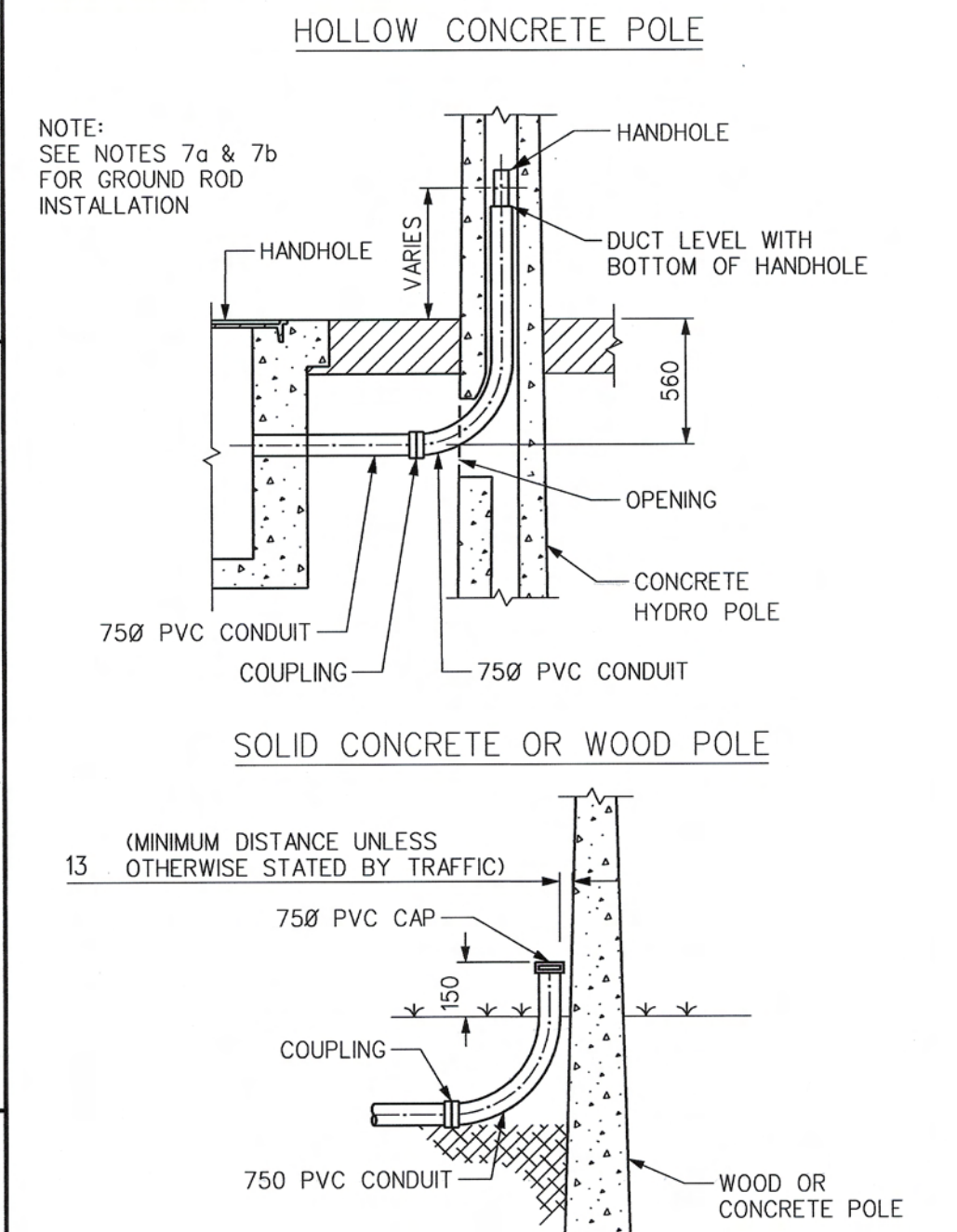
STANDARD PRACTICES, UNLESS NOTED

DIMENSIONS WITH DECIMAL PLACES ARE METRES, DIMENSIONS IN WHOLE NUMBERS ARE MILLIMETRES, UNLESS NOTED

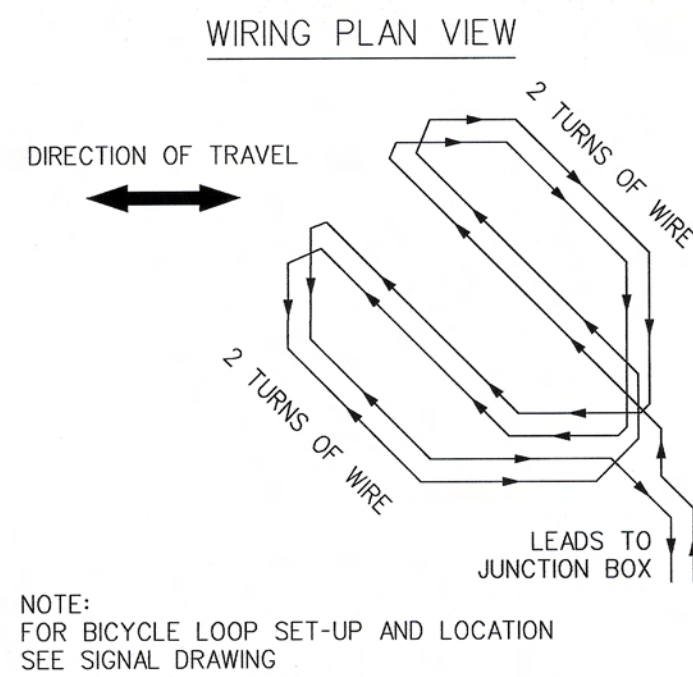
NOTES

- PVC CONDUIT & FITTINGS ARE TO BE HEAVY DUTY, NEMA STANDARD TC-2 SCHEDULE 80 OR EQUIVALENT (SUPPLIED BY CONTRACTOR), CSA APPROVED, NO CONCRETE ENCASEMENT.
- 600 MINIMUM RADIUS ON ALL 500 AND 750 PVC CONDUIT, 90 DEGREE BEND.
- ALL JOINTS FOR PVC DUCT TO BE CEMENTED USING APPROVED JOINT CEMENT.
- NYLON CORD "FISH" (SUPPLIED BY CONTRACTOR) SHALL BE PULLED INTO ALL INSTALLED DUCTS, HANDHOLE TO HANDHOLE TO ALLOW FOR CONFIRMATION OF DUCT INTEGRITY AND TO REMAIN FOR CABLE INSTALLATION. ALL DUCT OPENINGS SHALL BE CAPPED (SUPPLIED BY CONTRACTOR) TO ALLOW FOR CABLE INSTALLATION.
- MINIMUM DIMENSION FACE OF CURB TO FACE OF POLE IS TO BE 230.
- HANDHOLE, COVER & FRAME (SUPPLIED BY CONTRACTOR) TO MEET OPSD SPEC. 2112.01 & 2112.02. LARGE POLYMER HANDHOLE (SUPPLIED BY CONTRACTOR) TO BE USED CLOSEST TO CONTROLLER, TYPE III - LARGE, RECTANGULAR HOLEHOLE 850 x 550 x 660 TO MEET OPSD 2113.010
- CONCRETE (SUPPLIED BY CONTRACTOR) FOR ALL TRAFFIC WORK TO BE CLASS 'A' CONCRETE AS PER RHW FORM 1200.
- ISLAND PROTECTION DEVICE, JUNCTION BOXES AND 500 CONDUIT IN ISLAND TO BE INSTALLED AS PER CONSTRUCTION DRAWING.
- JUNCTION BOX TO BE HEAVY DUTY PVC - 200 x 200 x 175. JUNCTION BOXES SHALL BE DRILLED TO MATCH DUCT CONNECTIONS SHOWN ON DRAWING.
- AT LOCATIONS WHERE SPECIFIED ON CONSTRUCTION DRAWINGS GROUND RODS (SUPPLIED BY CONTRACTOR) SHALL BE 20 x 3000 COPPER CLAD STEEL. GROUND RODS ARE TO BE INSTALLED IN NATIVE MATERIAL, NOT CONCRETE OR STONE FILL. GROUND RODS SHALL BE INSTALLED VERTICALLY, DRIVEN TO 150 BELOW FINISHED GRADE, IF SITE CONDITIONS PROHIBIT INSTALLATIONS AS DESCRIBED CONTACT TRAFFIC.
- CONTRACTOR SHALL LEAVE THE TOP 200 OF THE GROUND ROD EXPOSED AND PROVIDE A MINIMUM 200 DEEP OPEN TRENCH FROM THE GROUND ROD TO AN OPENING IN THE NEAREST HANDHOLE.
- SAW-CUT TO MEET OPSD SPEC. 2521.02

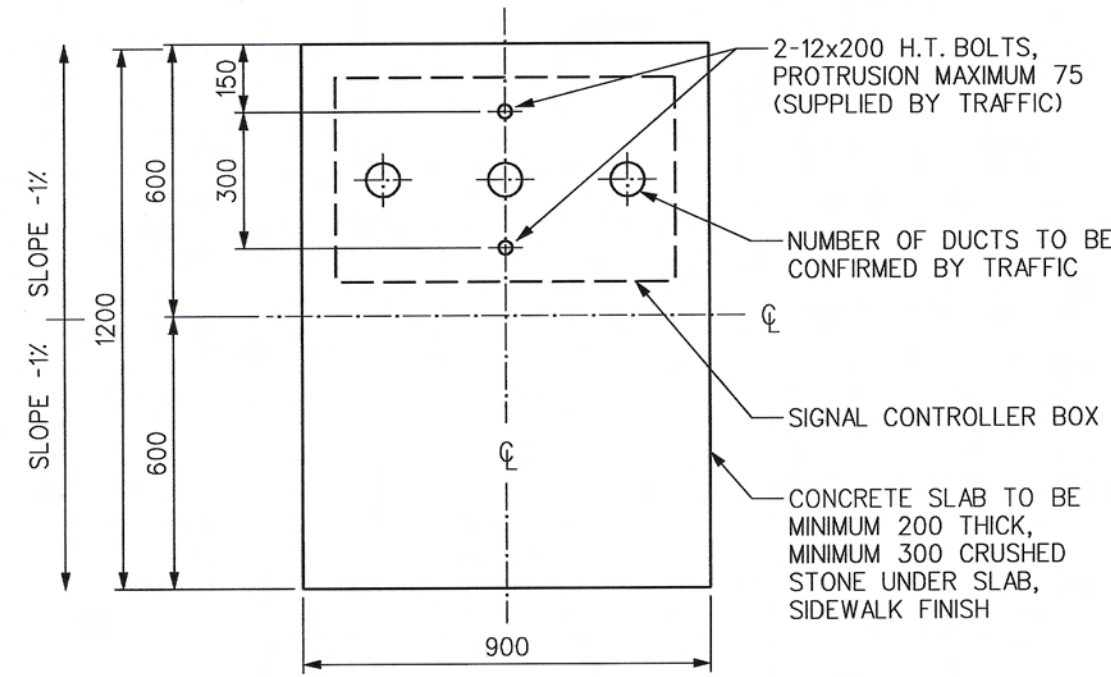
DUCT CONNECTION TO EXISTING POLES



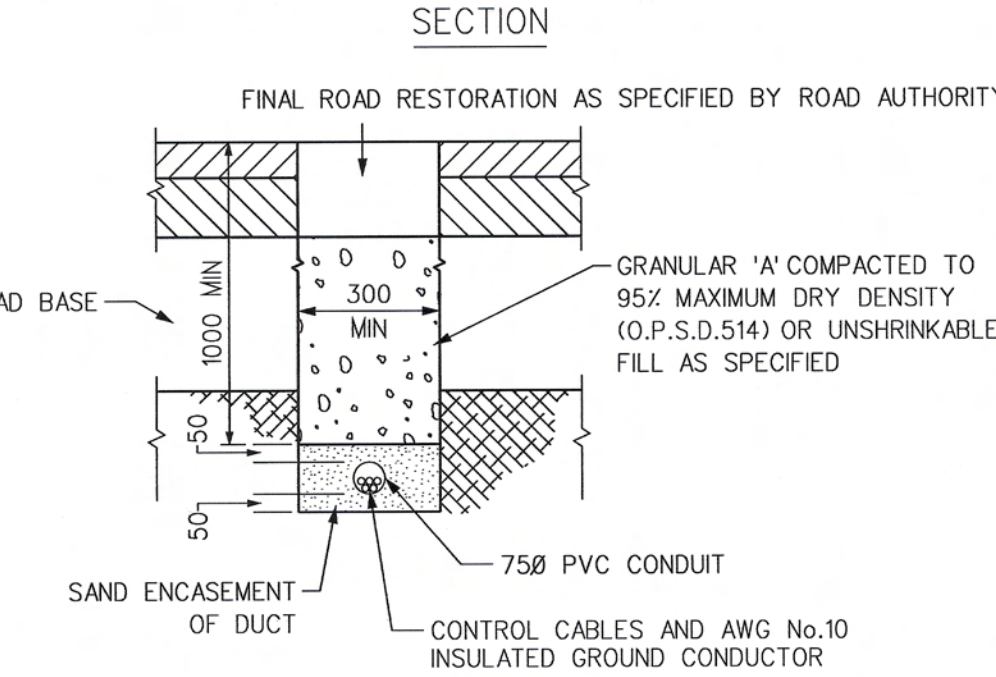
BICYCLE LOOP DETECTOR



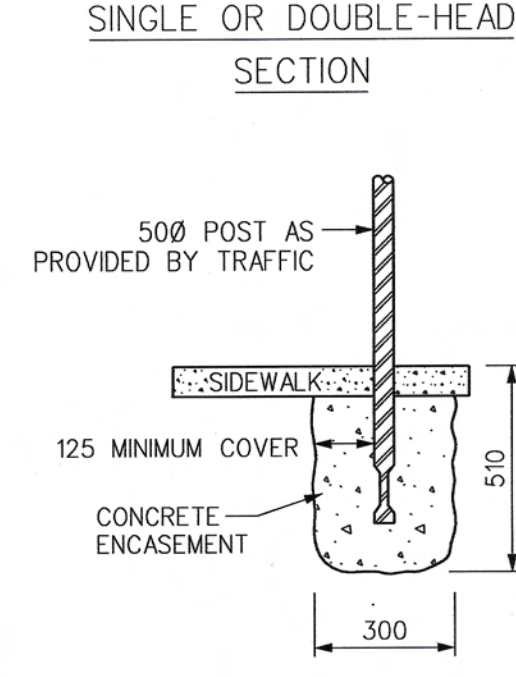
CONTROLLER PAD



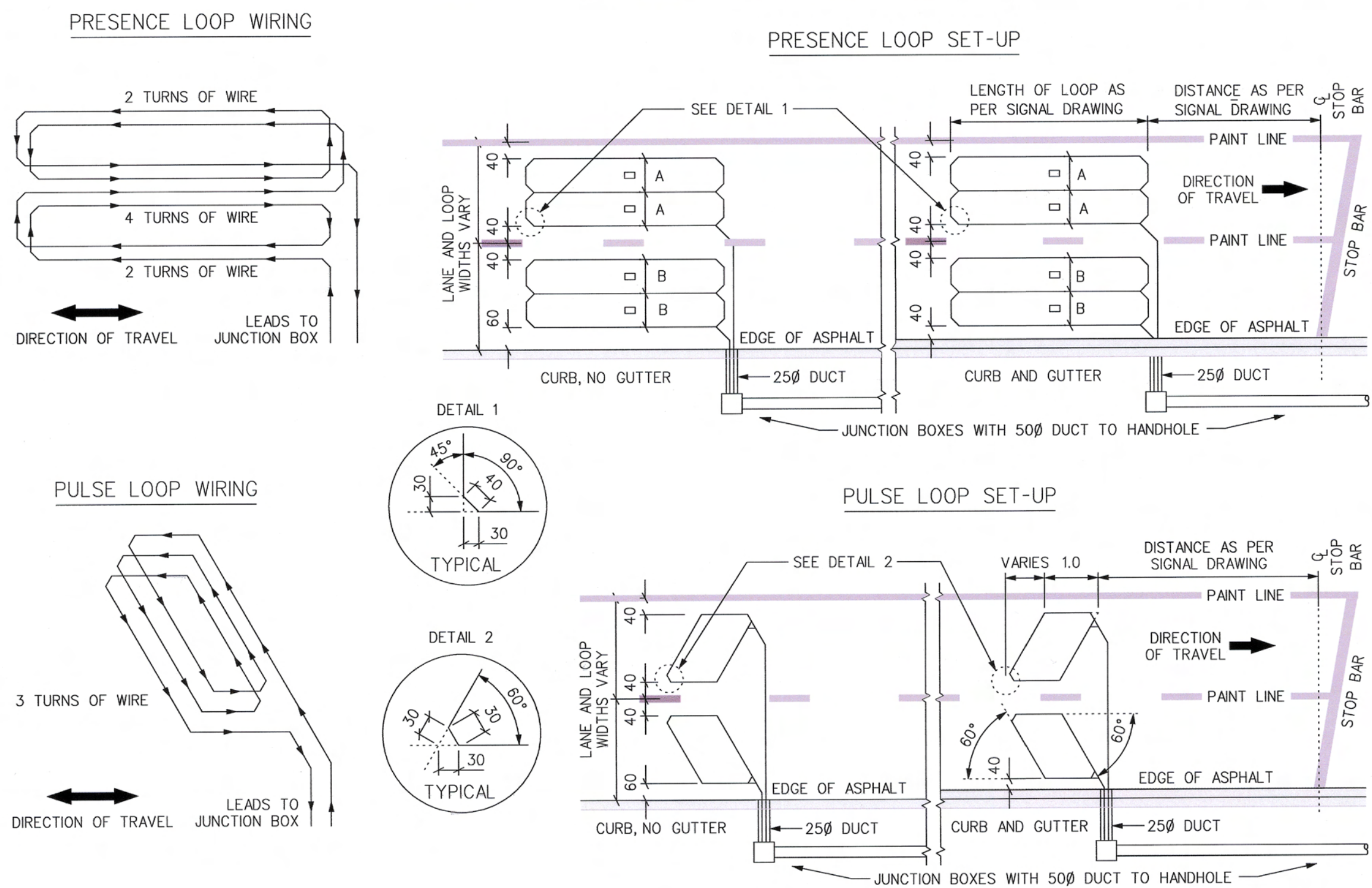
ROAD CROSSING DUCT INSTALLATION



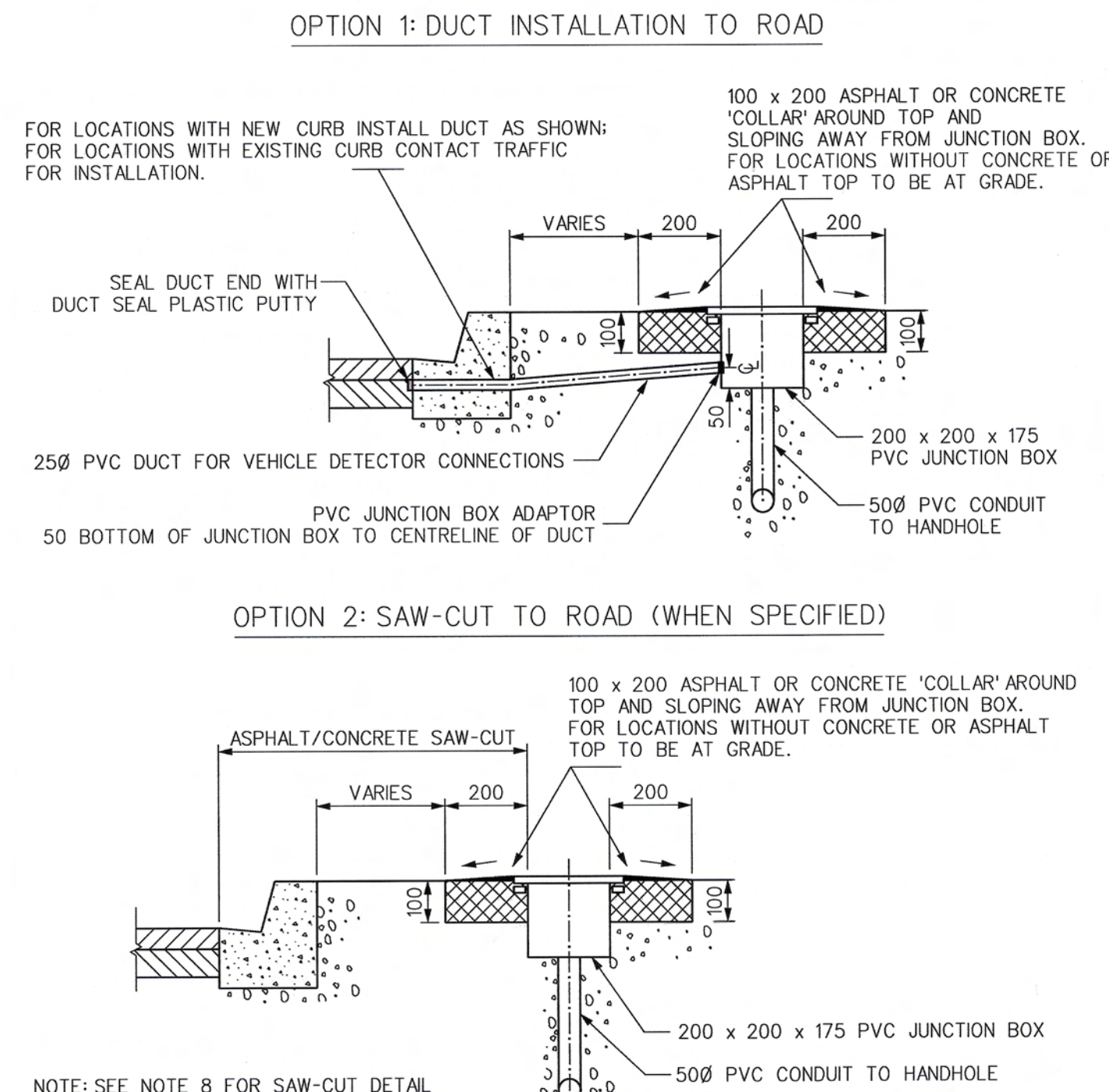
METER POST



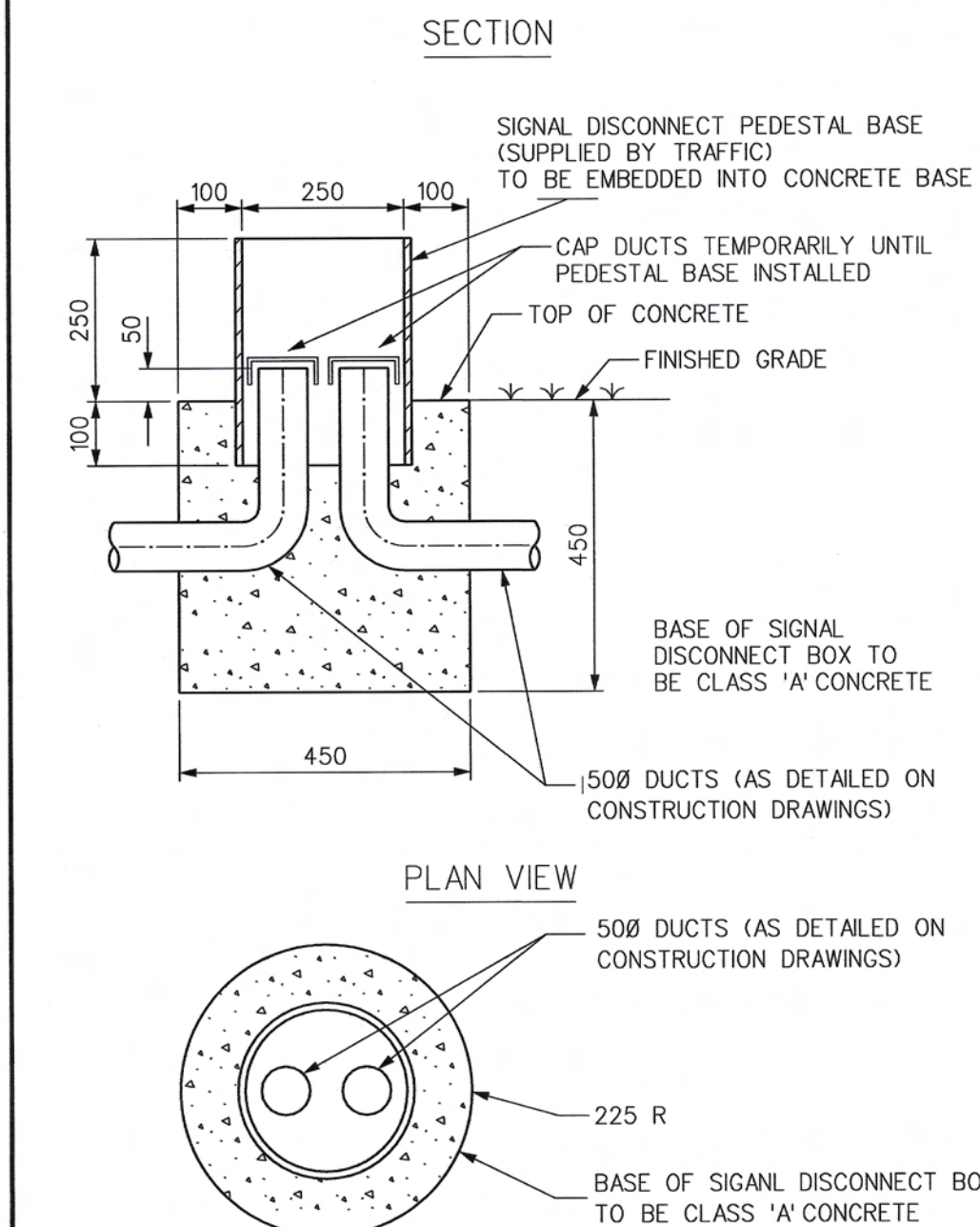
DETECTOR LOOP WIRING AND SET-UP



TYPICAL LOOP DETECTOR DUCT INSTALLATION: FOR INSTALLATION OPTION CONTACT TRAFFIC

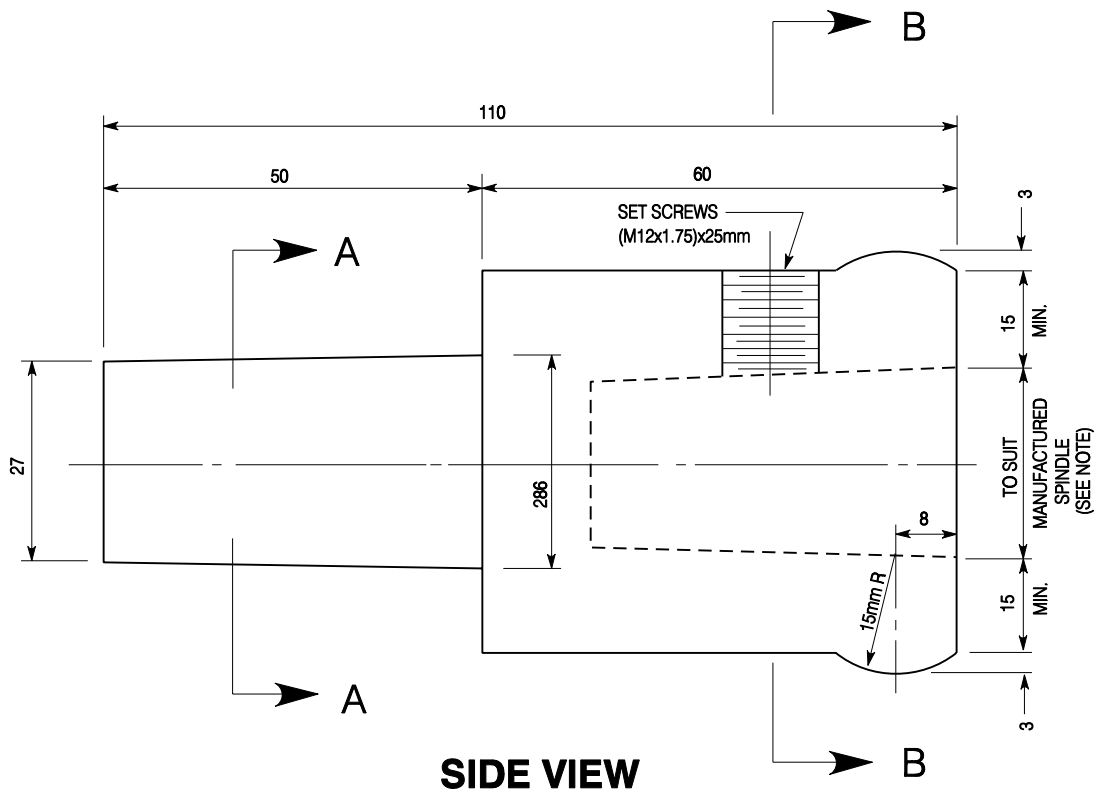


SIGNAL DISCONNECT - PEDESTAL BASE



07	2008.11	EZ	REMOVED 'SECTIONAL STEEL POLE - BASE DESIGN' SECTION, SUPERSEDES DT0111-01, REVISION 06, DATED 2006.10
No.	DATE	DRAWN	REVISION DETAILS
SCALE: NTS			
DRAWN: SAL			
CHECKED: [Signature]			
DRAWING DATE: 1996.02.14			
Plotted: 07/11/2008			
DRAWING No.: DT:0111-01			PREPARED BY THE CITY OF HAMILTON TRAFFIC ENGINEERING AND OPERATIONS, OPERATIONS AND MAINTENANCE DIVISION PUBLIC WORKS DEPARTMENT
APPROVALS			

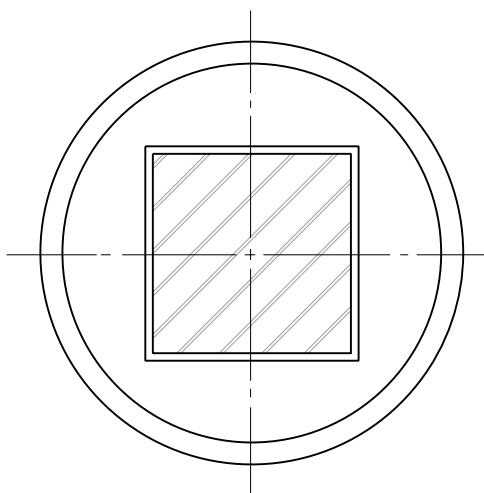
2008/12/10  
 SENIOR PROJECT MANAGER, SIGNAL AND SYSTEMS  
 MANAGER, TRAFFIC ENGINEERING & OPERATIONS



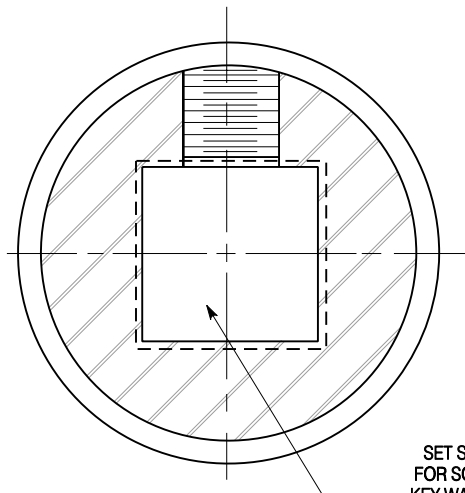
**SIDE VIEW**

NOTE:

INTERNAL SPINDLE DIMENSIONS  
 a) 21.3mm x 21.23mm  
 b) 24.6mm x 24.6mm  
 c) 33.3mm x 33.3mm



**SECTION A-A**



**SECTION B-B**

SPINDLE RECESS  
 SET SCREWS TO BE PROVIDED  
 FOR SQUARE VALVE SPINDLES.  
 KEYWAYS ARE TO BE PROVIDED  
 FOR ROUND VALVE SPINDLES.

City of Hamilton  
 Public Works Department

**OPERATING NUT ADAPTOR  
 FOR USE ON OPEN CLOCKWISE (RIGHT) VALVES**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
 UNLESS OTHERWISE NOTED (N.T.S.)

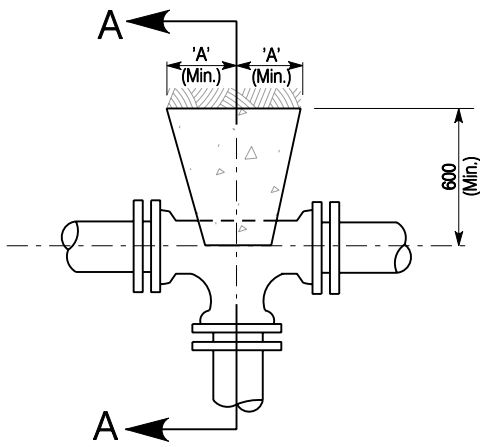
DATE  
 January 2011

REV No  
 1

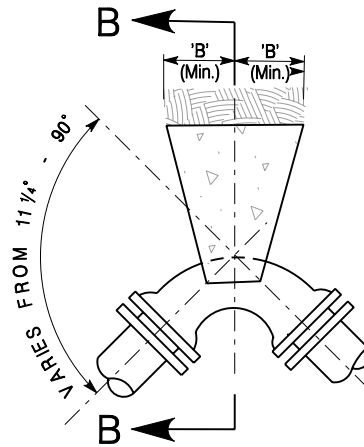
FORMERLY: RWS 601

HAMILTON STD No

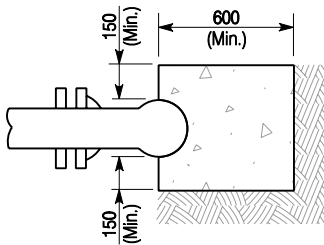
**WM-203.04**



**PLAN VIEW**

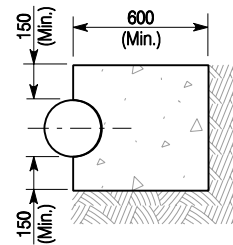


**PLAN VIEW**



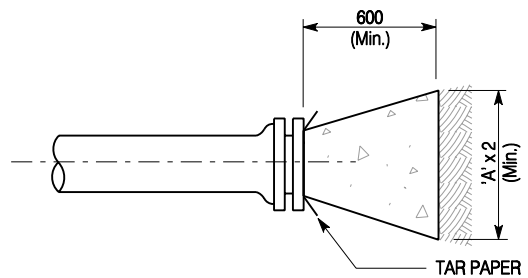
**TEES SECTION A-A**

**11 1/4° - 22 1/2° - 45° & 90° BENDS SECTION B-B**



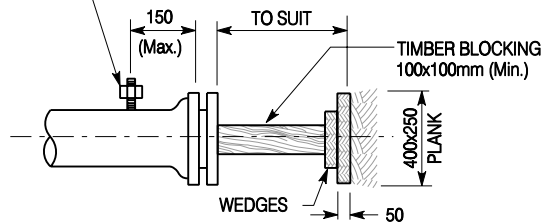
DIMENSION 'A'	
100 TO 200 DIA.	250 TO 300 DIA.
300	450

DIMENSION 'B'		
	100 - 200 DIA.	250 - 300 DIA.
90° & 45°	300	600
22 1/2° & 11 1/4°	300	300

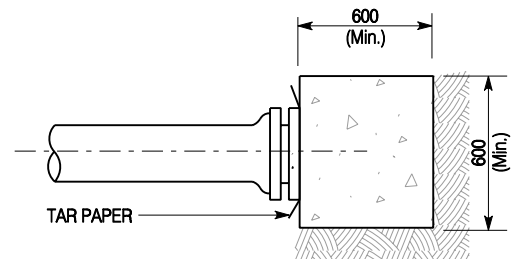


**PLAN VIEW**

INSTALL 20mm MAIN STOP WHERE SPECIFIED




**PLUGS - TEMPORARY SIDE VIEW**



**PLUGS - PERMANENT SIDE VIEW**

**NOTES:**

1. ABOVE ANCHOR BLOCKS TO BE USED ON MECHANICAL JOINT AND TYTON JOINT FITTINGS.
2.  DENOTES UNDISTURBED GROUND.
3. ALL CONCRETE TO BE 30 MPa.

City of Hamilton  
Public Works Department

**CONCRETE ANCHOR BLOCKS FOR  
300mm DIA. WATERMANS AND SMALLER**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

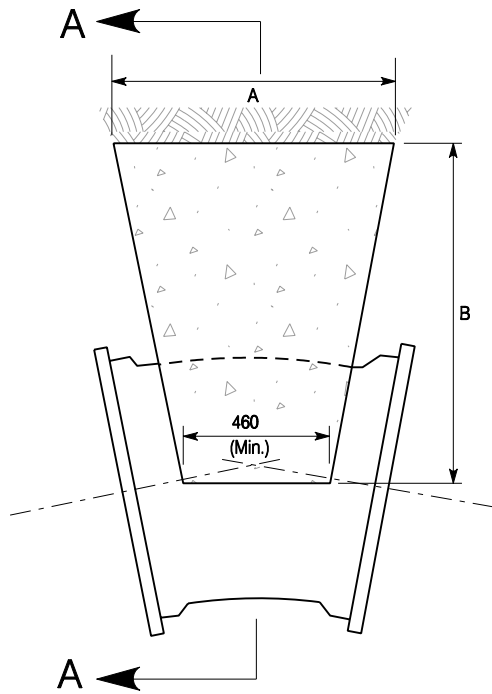
DATE  
January 2011

REV No  
1

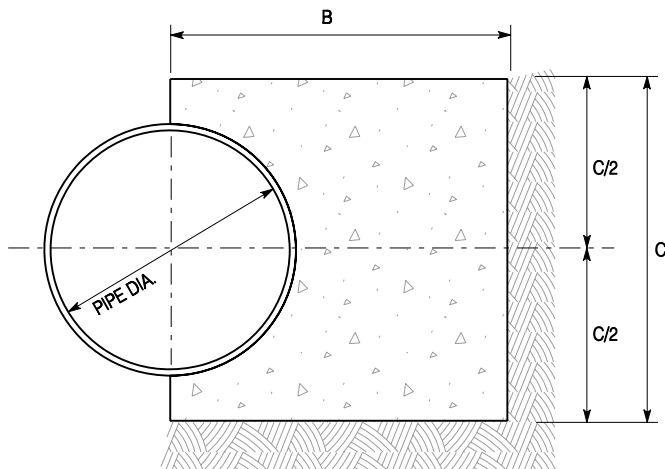
FORMERLY: RWS-400

HAMILTON STD No

**WM-204.01**



**PLAN VIEW**



**SECTION A-A**

**NOTES:**

1. DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.

		PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIMENSION (mm)	A	700	700	750	750	900	1200
	B	750	750	900	900	1050	1200
	C	750	750	900	900	1200	1200

City of Hamilton  
Public Works Department

**11-¼° & 22-½° ANGLE ANCHOR BLOCK DETAILS  
FOR 400mm TO 900mm DIA. D.I. WATERMAINS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

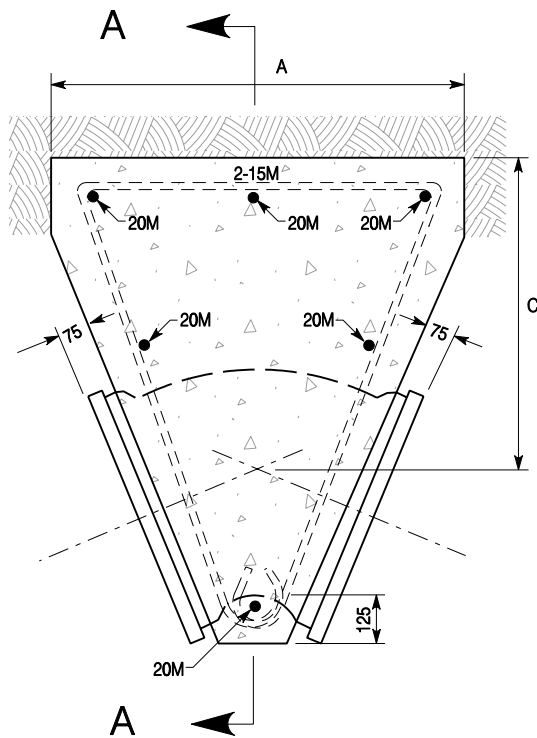
DATE  
January 2011

REV No  
1

FORMERLY: RWS-401

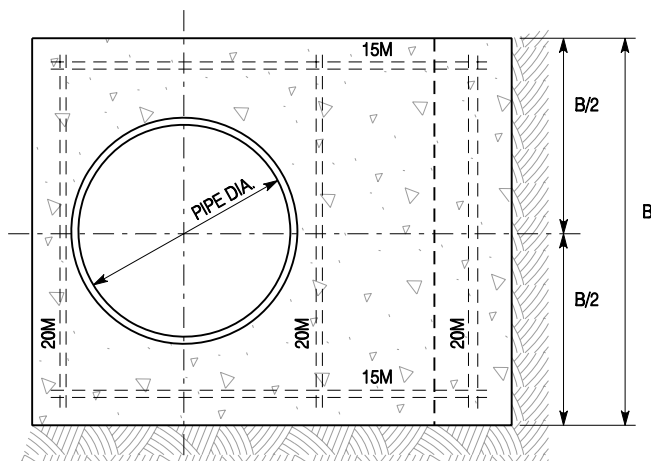
HAMILTON STD No

**WM-204.02**




**PLAN VIEW**

		PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIMENSION (mm)	A	900	1000	1150	1200	1700	2000
	B	700	750	840	1150	1200	1500
	C	725	750	750	900	1050	1200



**SECTION A-A**

**NOTES:**

1.  DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. JOINT BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

City of Hamilton  
Public Works Department

**45° ANGLE ANCHOR BLOCK DETAILS FOR  
400mm TO 900mm DIA. D.I. WATERMAINS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

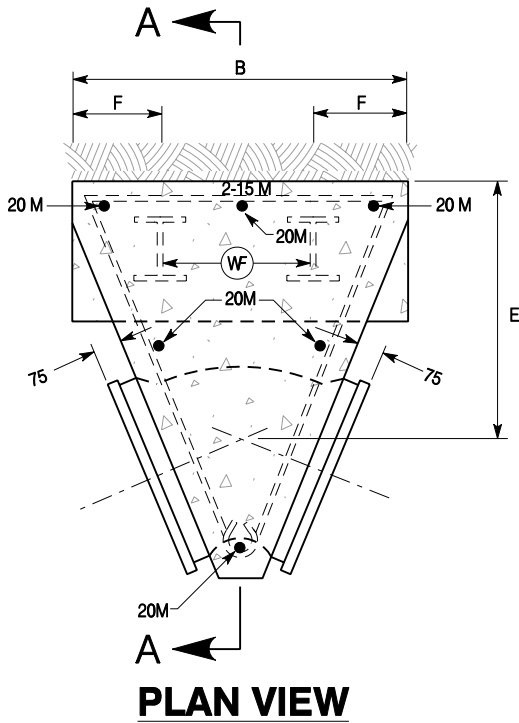
DATE  
January 2011

REV No  
1

FORMERLY: RWS-402

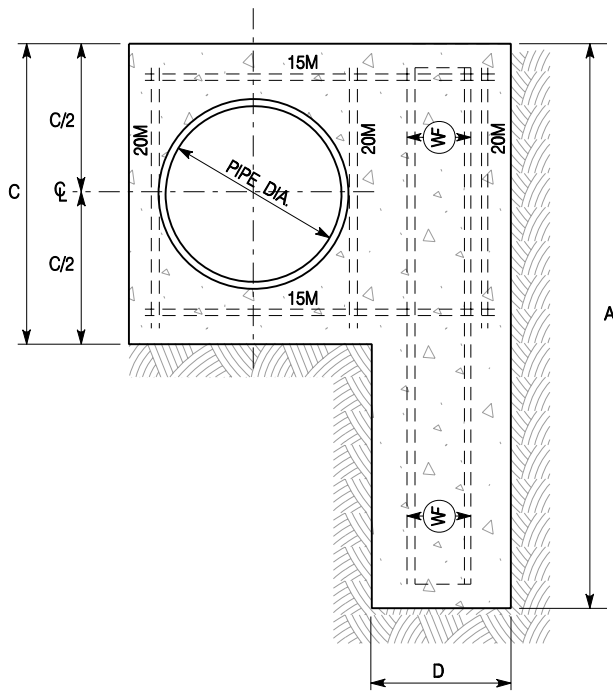
HAMILTON STD No

**WM-204.03**




**PLAN VIEW**

		PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIMENSION (mm)	A	1700	1750	1800	1800	2100	2100
	B	850	850	1050	1050	1200	1500
	C	750	900	900	900	1050	1200
	D	400	450	450	450	500	500
	E	650	700	750	850	1050	1200
	F	225	300	300	300	400	400
	WF		W 200x46	W 200x46	W 200x46	W 200x46	W 250x68



**SECTION A-A**

**NOTES:**

1.  DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. JOINT BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

City of Hamilton  
Public Works Department

**45° ANGLE ANCHOR BLOCK WITH LEG FOR  
400mm TO 900mm DIA. D.I. WATERMAINS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

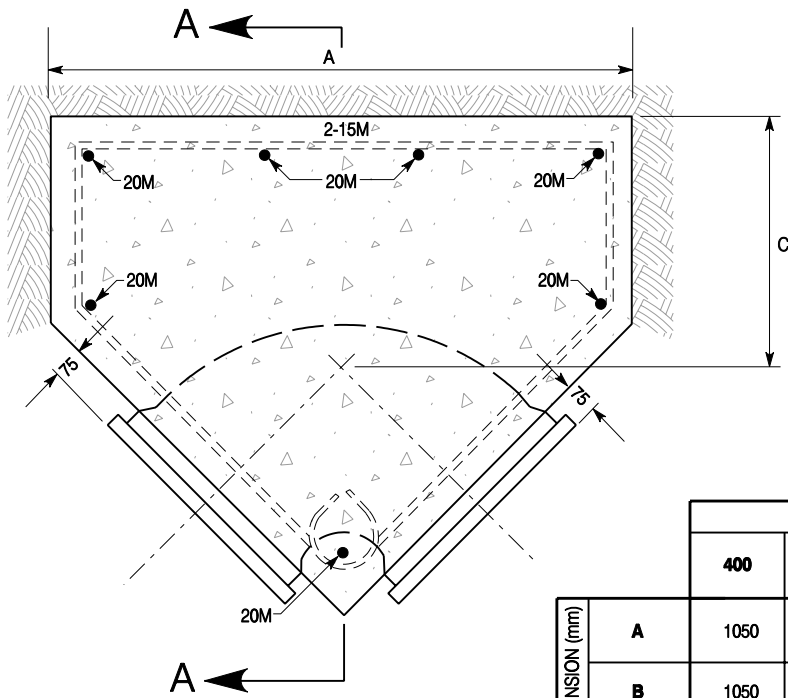
DATE  
January 2011

REV No  
1

FORMERLY: RWS-405

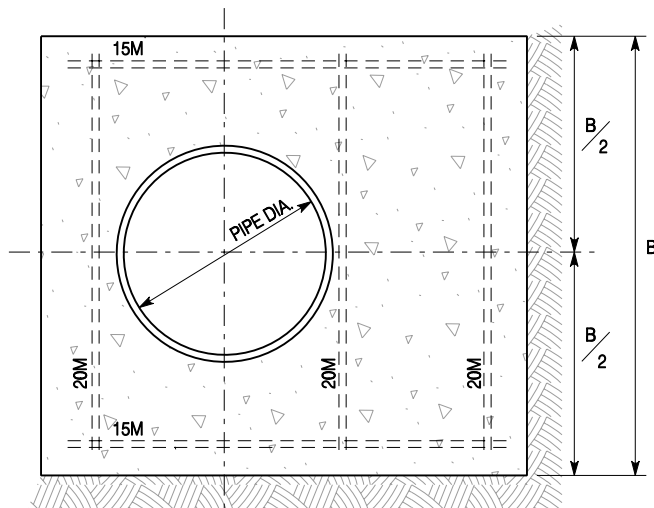
HAMILTON STD No

**WM-204.04**




**PLAN VIEW**

		PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIMENSION (mm)	A	1050	1200	1400	1800	2500	3000
	B	1050	1150	1300	1400	1500	1800
	C	600	650	700	750	900	1050



**SECTION A-A**

**NOTES:**

1.  DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm.
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. JOINT BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

City of Hamilton  
Public Works Department

**90° ANGLE ANCHOR BLOCK DETAILS FOR  
400mm TO 900mm DIA. D.I. WATERMAINS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

DATE  
January 2011

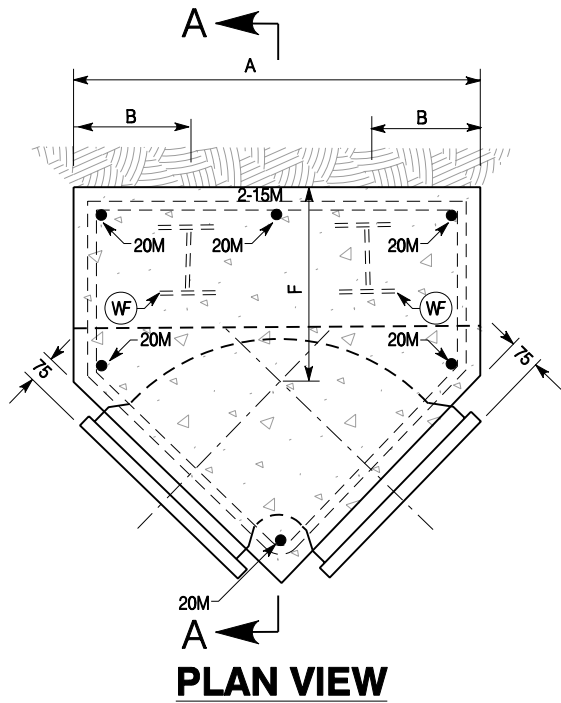
REV No  
1

FORMERLY: RWS-403

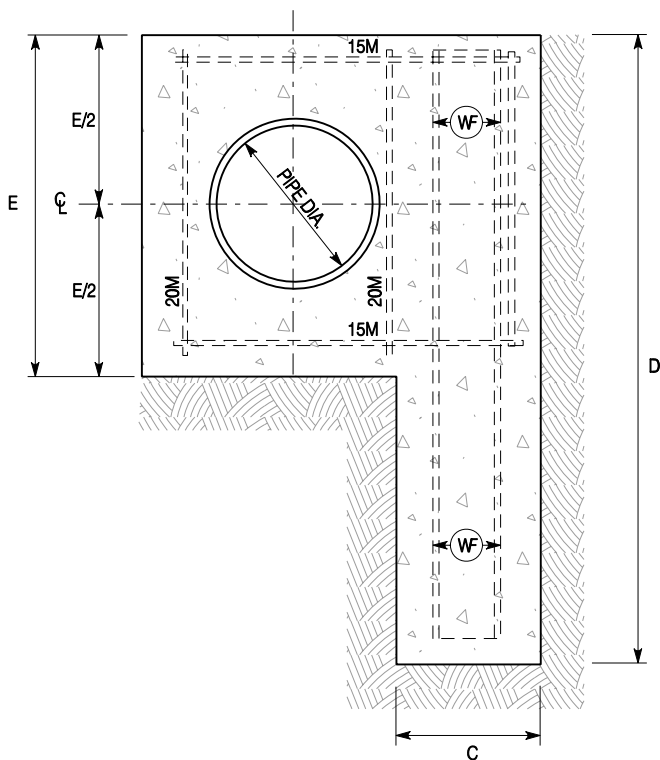
HAMILTON STD No

**WM-204.05**






		PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIMENSION (mm)	A	1050	1200	1300	1300	1600	1900
	B	300	300	350	350	400	450
	C	400	400	450	450	500	600
	D	2000	2000	2300	2300	2400	3000
	E	900	1100	1400	1400	1500	1800
	F	600	650	700	750	900	1200
	WF	W200x46	W200x46	W200x46	W250x115	W250x115	W300x128



**NOTES:**

1.  DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. JOINT BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

City of Hamilton  
Public Works Department

**90° ANGLE ANCHOR BLOCK WITH LEG FOR  
400mm TO 900mm DIA. D.I. WATERMAINS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

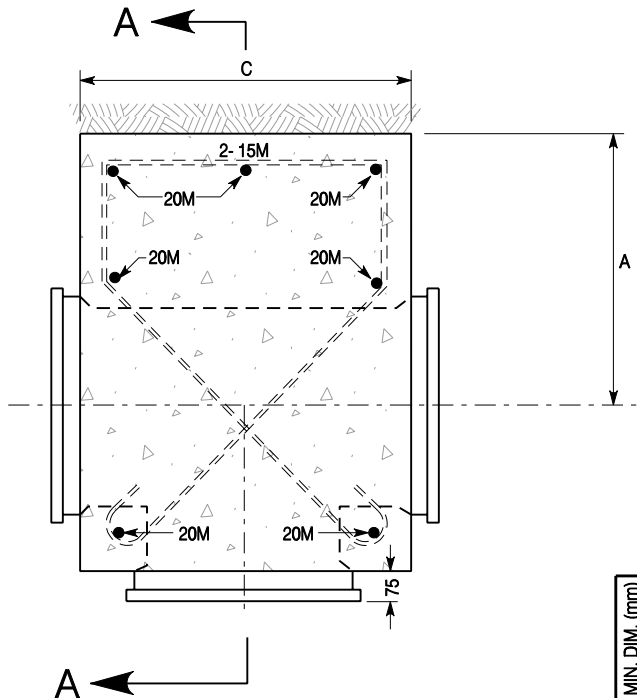
DATE  
January 2011

REV No  
1

FORMERLY: RWS-406

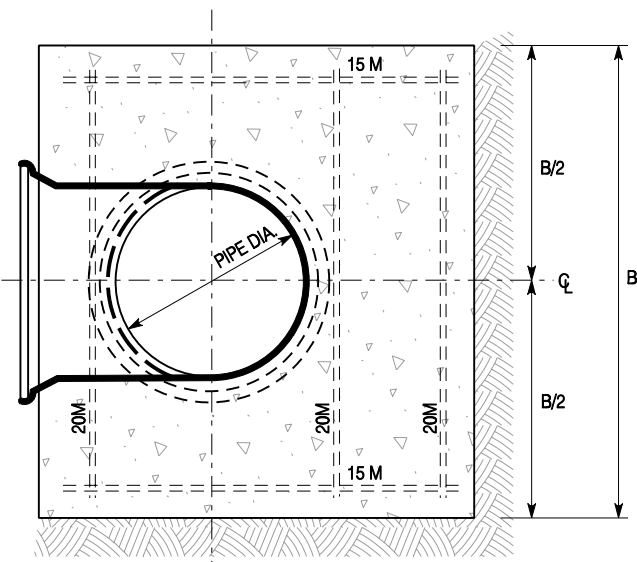
HAMILTON STD No

**WM-204.06**



**PLAN VIEW**

		BRANCH PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIM. (mm)	A	800	850	900	900	1050	1200
	B	1050	1200	1400	1600	2300	2800
	C	750	850	900	1100	1200	1400



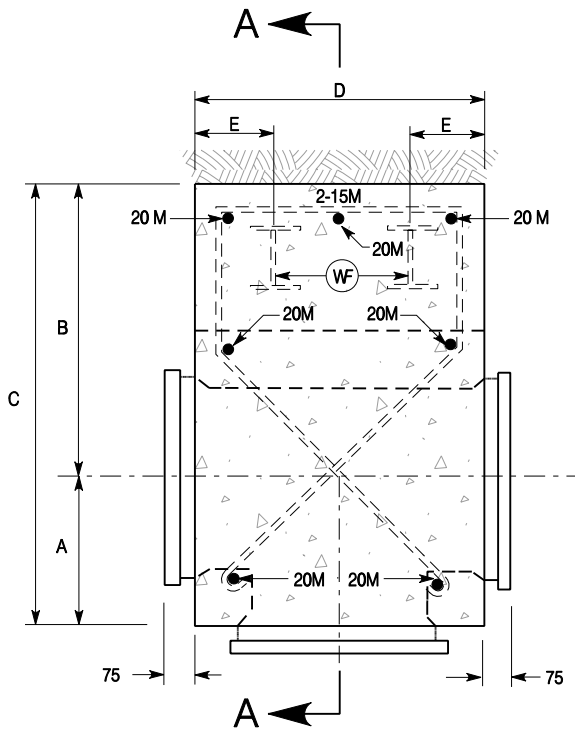
**SECTION A-A**

**NOTES:**

1. DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm.
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. JOINT BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

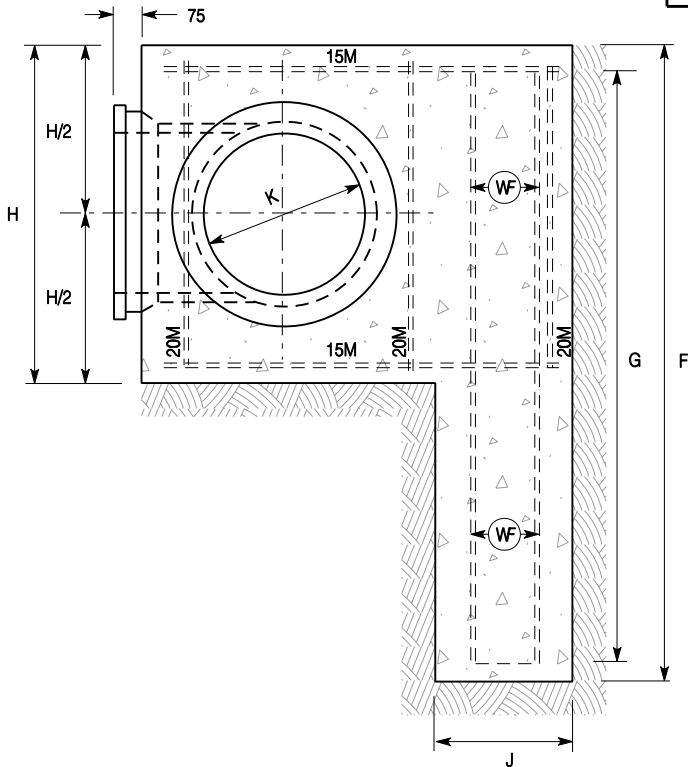
City of Hamilton  
Public Works Department

**TEE ANCHOR BLOCK DETAILS FOR  
400mm TO 900mm DIA D.I. WATERMAIN BRANCHES**




**PLAN VIEW**

		BRANCH PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIMENSION (mm)	A	380	430	460	560	600	650
	B	800	850	900	900	1000	1200
	C	1180	1280	1360	1460	1600	1850
	D	750	850	900	1100	1200	1400
	E	225	225	225	325	350	350
	F	2000	2000	2300	2300	2500	2700
	G	1850	1850	2150	2150	2350	2550
	H	900	950	1050	1200	1300	1500
	J	450	450	450	450	500	600
	K	400	450	500	600	750	900
	WF	W200x46	W200x46	W200x46	W250x115	W250x115	W300x128



**SECTION A-A**

**NOTES:**

1.  DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75MM.
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. JOINT BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

City of Hamilton  
Public Works Department

**TEE ANCHOR BLOCK WITH LEG FOR  
400mm TO 900mm DIA. D.I. BRANCH WATERMAINS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

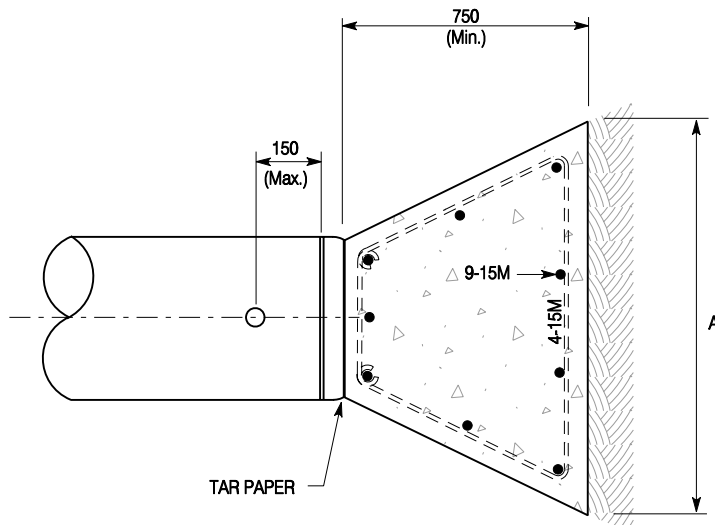
DATE  
January 2011

REV No  
1

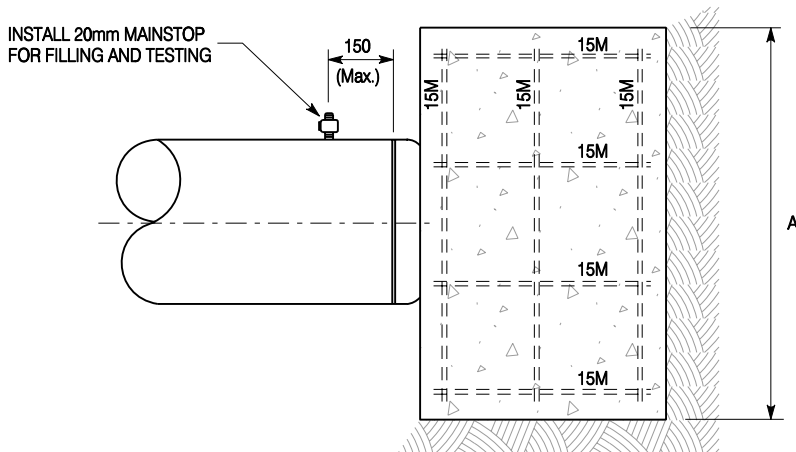
FORMERLY: RWS-407

HAMILTON STD No

**WM-204.08**



**PLAN VIEW**



**SIDE ELEVATION**

**NOTES:**

1. DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm.
4. ALL REINFORCING STEEL TO BE GRADE 400.

		PIPE DIA. (mm)					
		400	450	500	600	750	900
MIN. DIM. (mm)	A	900	1000	1150	1400	1650	2000

City of Hamilton  
Public Works Department

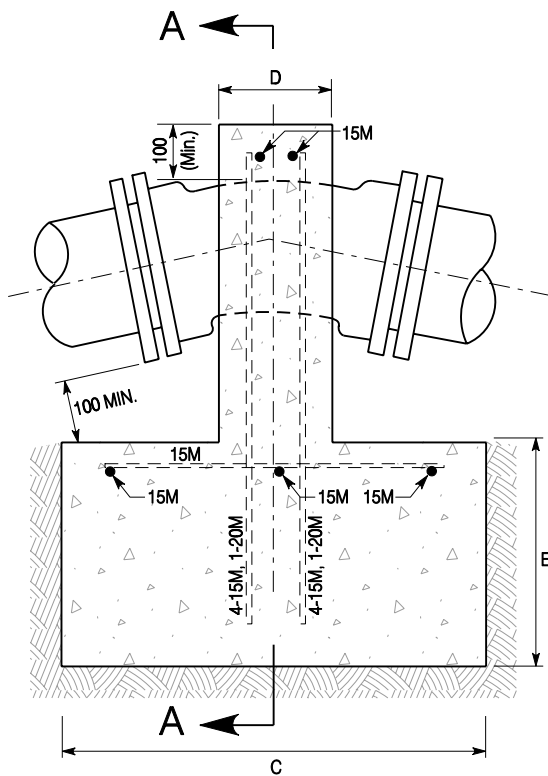
**CONCRETE THRUST BLOCK  
FOR 400mm TO 900mm DIA. D.I. WATERMAINS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

DATE  
January 2011

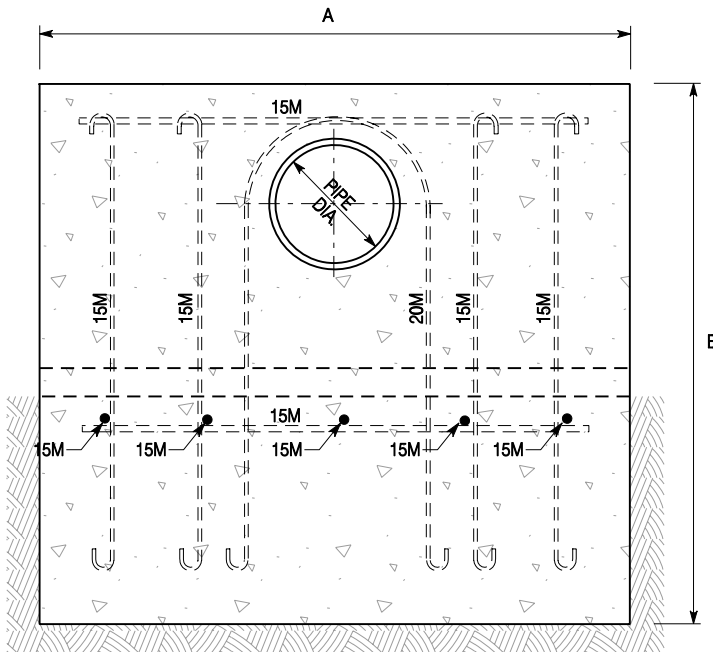
REV No  
1  
FORMERLY: RWS-411

HAMILTON STD No  
**WM-204.09**



**SIDE ELEVATION**

		PIPE DIA. (mm)				
		100	150	200	250	300
MIN. DIMENSION (mm)	A	900	900	1050	1200	1450
	B	800	850	1000	1200	1350
	C	550	600	750	750	1050
	D	150	150	200	200	300
	E	300	300	400	550	600



**SECTION A-A**

**NOTES:**

1. DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm.
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. FLANGE BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

City of Hamilton  
Public Works Department

**CONCRETE ANCHOR BLOCK FOR  
100mm TO 300mm DIA. D.I. WATERMAIN @ 11-¼° & 22-½° VERTICAL BENDS**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

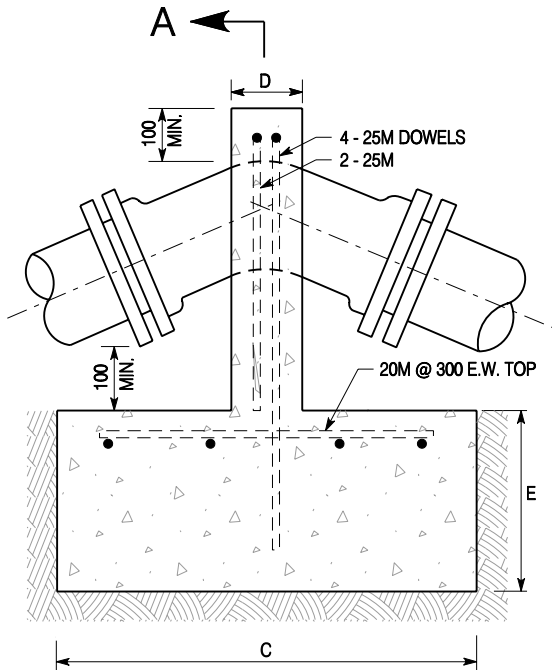
DATE  
January 2011

REV No  
1

FORMERLY: RWS-408

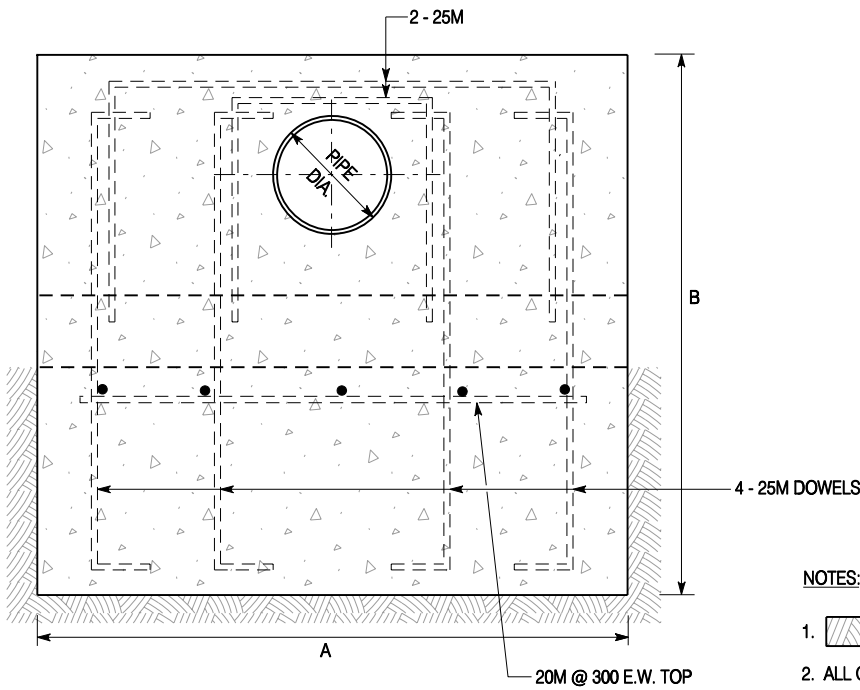
HAMILTON STD No

**WM-204.10**



		PIPE DIA. (mm)				
		100	150	200	250	300
MIN. DIMENSION (mm)	A	1000	1050	1200	1500	1500
	B	900	1000	1150	1450	1550
	C	700	750	1050	1500	1500
	D	150	150	200	200	250
	E	350	400	400	550	600

**SIDE ELEVATION**



**SECTION A-A**

**NOTES:**

1. DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm.
4. ALL REINFORCING STEEL TO BE GRADE 400.
5. FLANGE BOLTS TO BE PLACED PRIOR TO POURING CONCRETE.

City of Hamilton  
Public Works Department

**CONCRETE ANCHOR BLOCK FOR  
100mm TO 300mm DIA. D.I. WATERMAIN @ 45° VERTICAL BEND**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

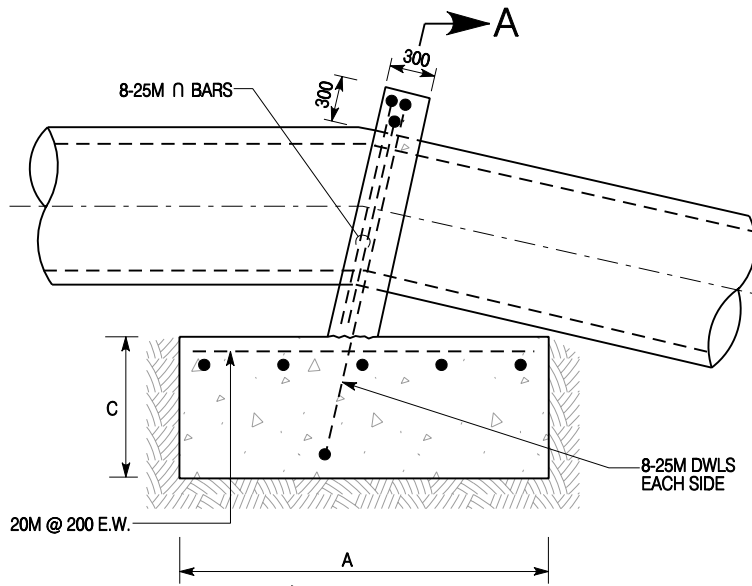
DATE  
January 2011

REV No  
1

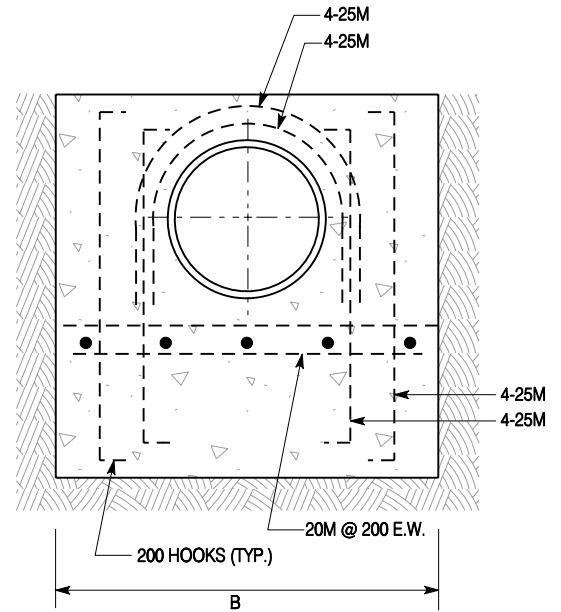
FORMERLY: RWS-409

HAMILTON STD No

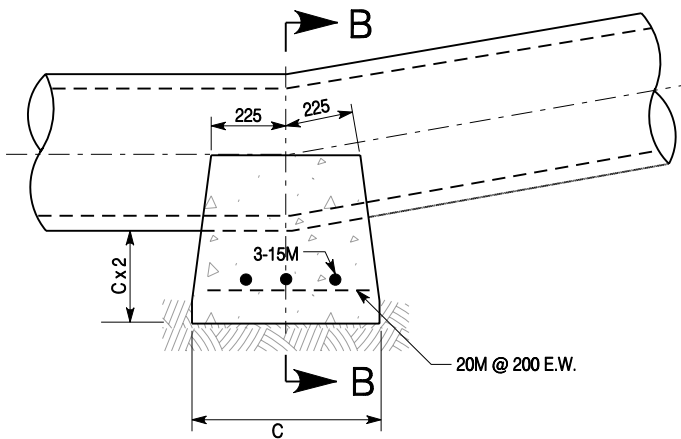
**WM-204.11**



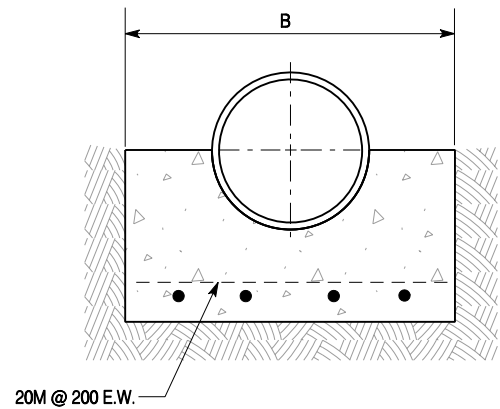
**FOR UPWARD THRUST**



**SECTION A-A**



**FOR DOWNWARD THRUST**



**SECTION B-B**

**NOTES:**

1. DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm.
4. ALL REINFORCING STEEL TO BE GRADE 400.

		PIPE DIA. (mm)				
		400	500	600	750	900
<b>7 ½° to 10°</b>	<b>A</b>	1200	1500	1800	1800	2000
	<b>B</b>	1200	1500	1500	1800	2100
	<b>C</b>	450	600	600	750	900
<b>11 ¼° to 22 ½°</b>	<b>A</b>	1500	1800	1800	2400	2700
	<b>B</b>	1200	1500	1800	2100	2400
	<b>C</b>	750	750	750	900	1050

City of Hamilton  
Public Works Department

**VERTICAL BEND ANCHOR BLOCK**  
**7-½° TO 22-½° FOR 400mm TO 900mm DIA D.I. WATERMAIN**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

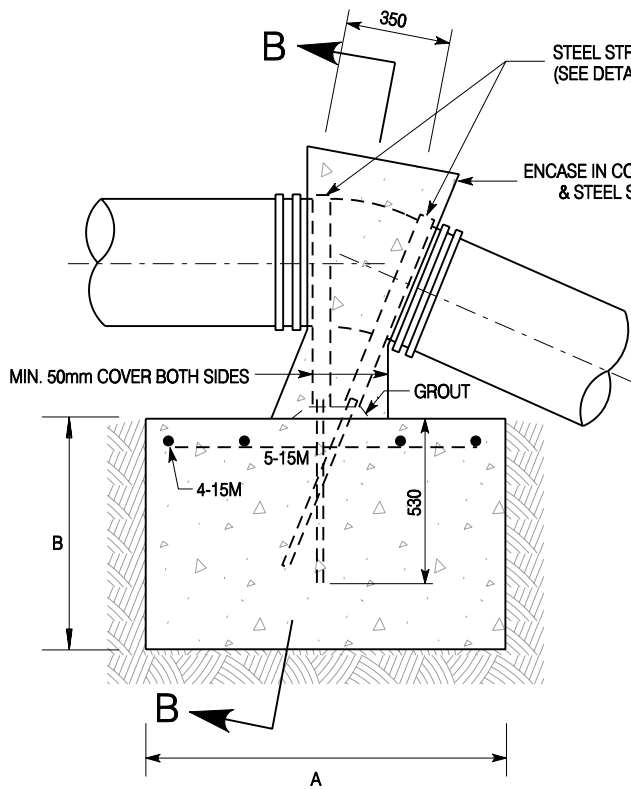
DATE  
January 2011

REV No  
1

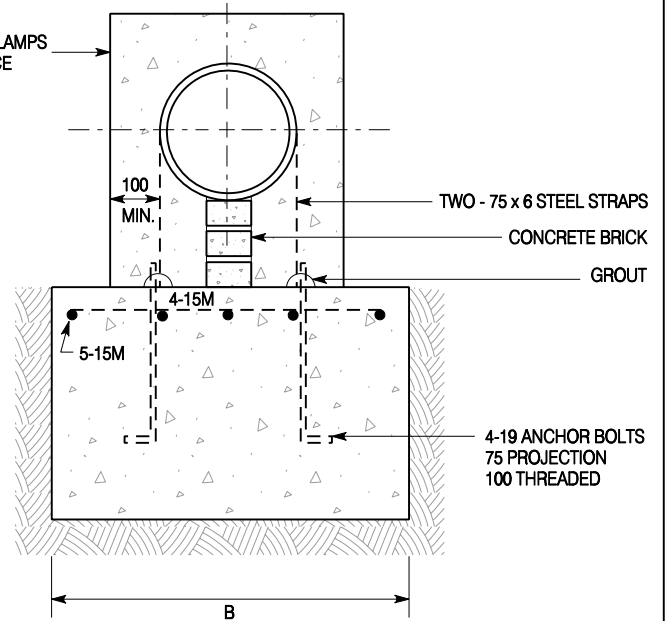
FORMERLY: RWS-412

HAMILTON STD No

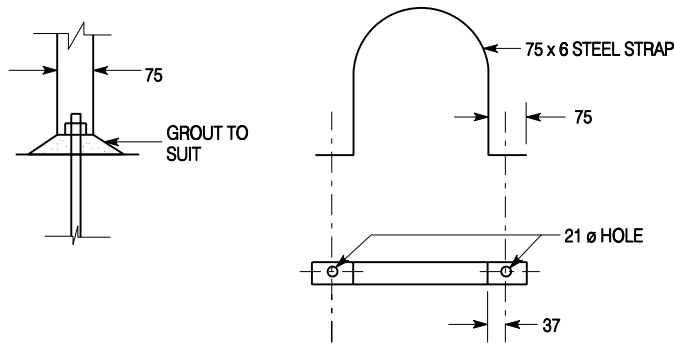
**WM-204.12**



**SIDE ELEVATION  
(DETAIL A)**



**SECTION B-B**



**STEEL STRAPPING  
DETAILS**

**NOTES:**

1. DENOTES UNDISTURBED GROUND.
2. ALL CONCRETE TO BE 30 MPa.
3. MINIMUM COVER OF CONCRETE OVER REINFORCING TO BE 75mm.
4. ALL REINFORCING STEEL TO BE GRADE 400.

		MIN. DIMENSION (mm)			
		22 1/2° BEND		45° BEND	
		A	B	A	B
PIPE DIA. (mm)	150	900	450	1100	700
	200	1000	550	1350	800
	250	1100	650	1500	900
	300	1200	750	1650	1000

City of Hamilton  
Public Works Department

**CONCRETE ANCHOR BLOCK FOR  
100mm TO 300mm DIA. WATERMAIN LOWERING**

DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

DATE  
January 2011

REV No  
1

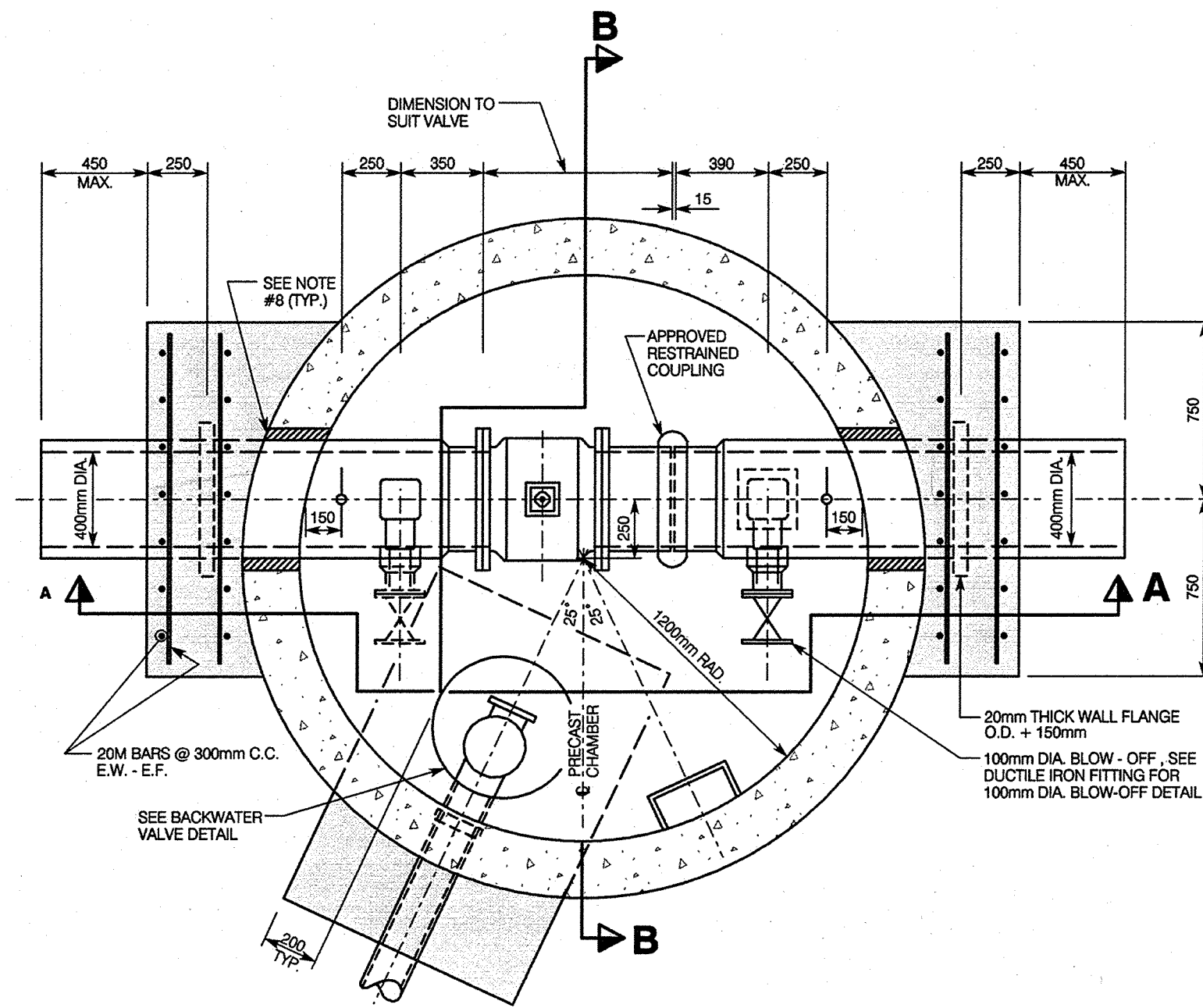
FORMERLY: RWS-413(2)

HAMILTON STD No  
2 OF 2

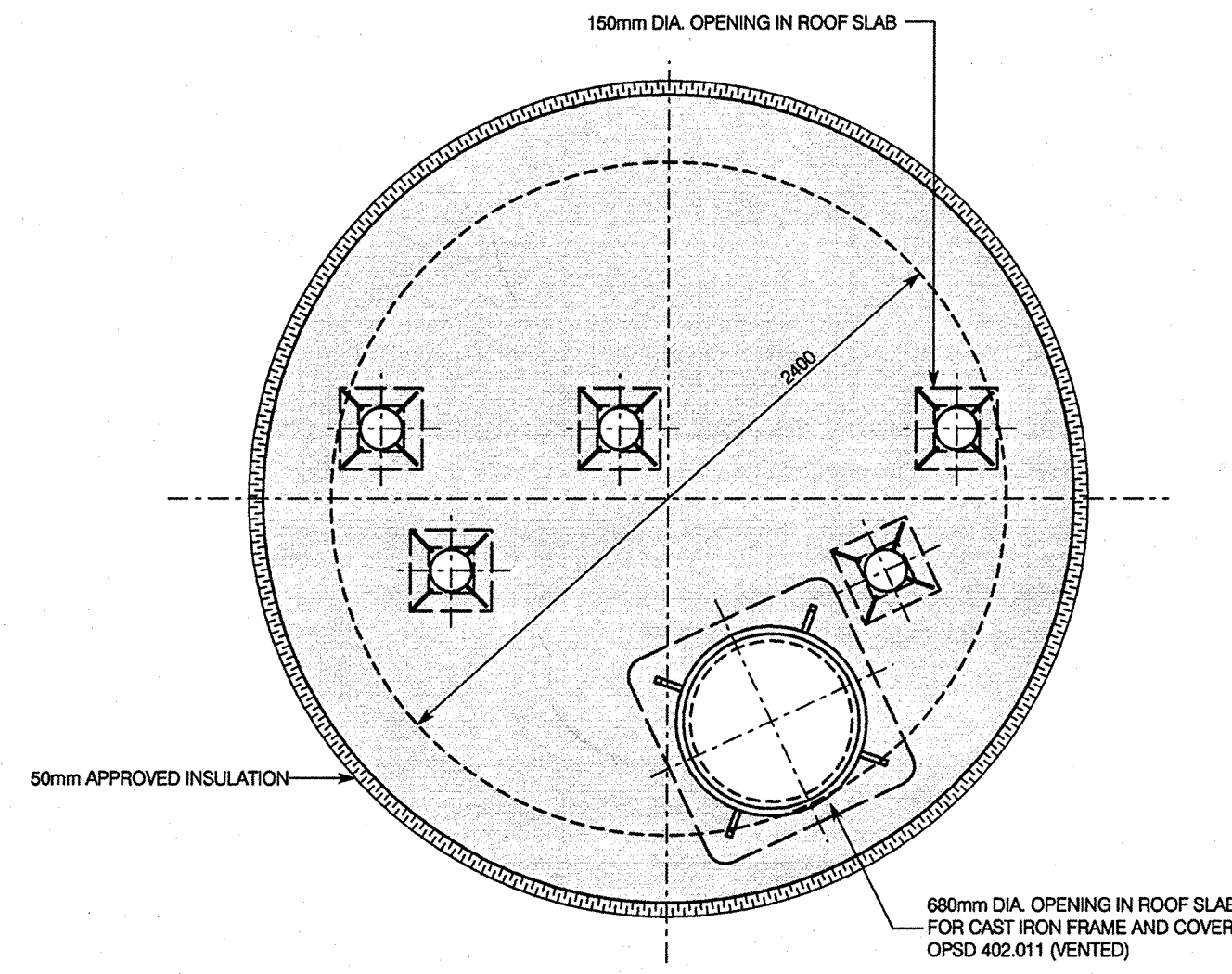
**WM-204.13**



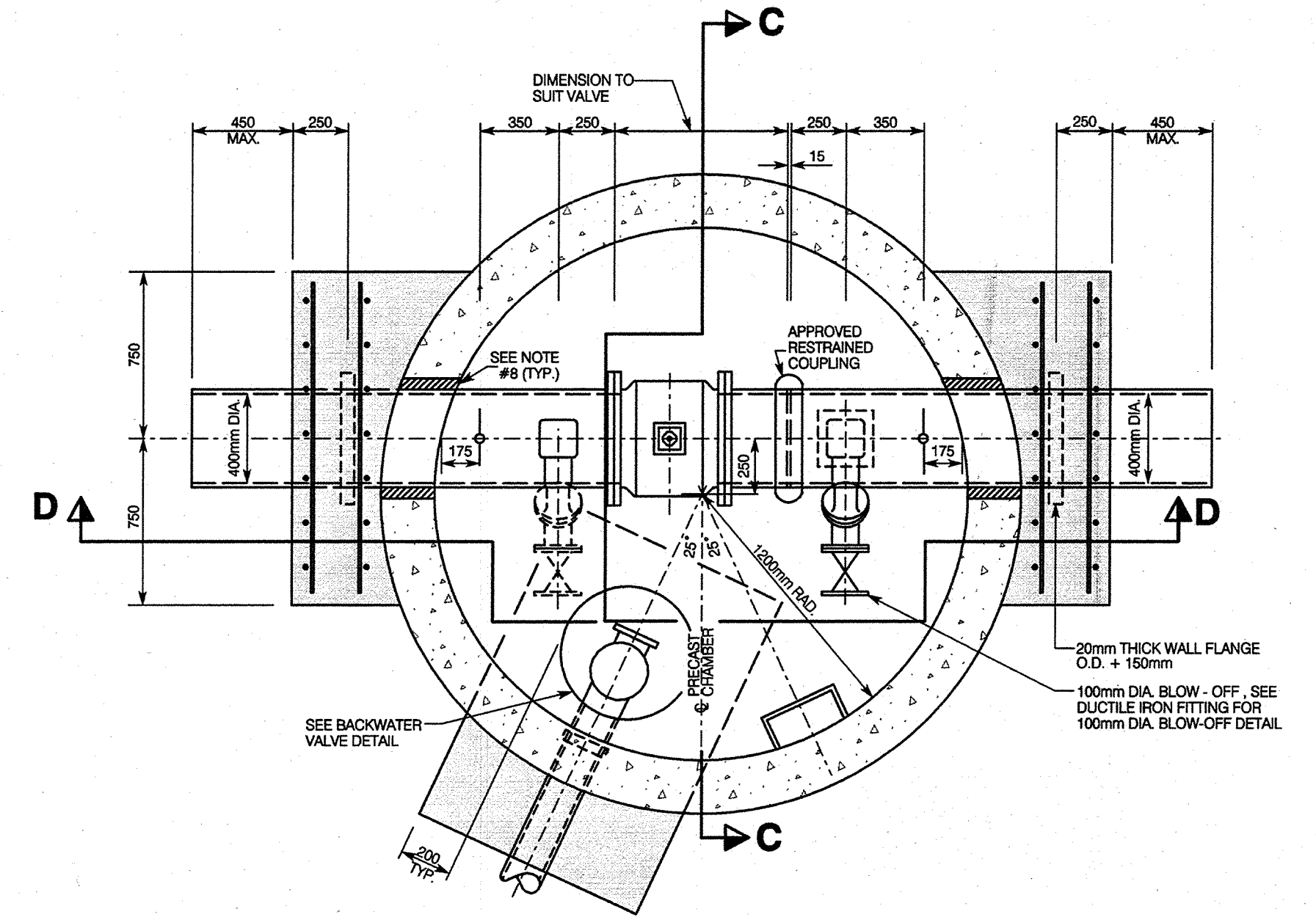
**2400mm PRECAST VALVE CHAMBER FOR 400mm DIA. CONCRETE OR DUCTILE IRON PIPE WITH 50mm AIR VALVE & 100mm BLOW-OFF**



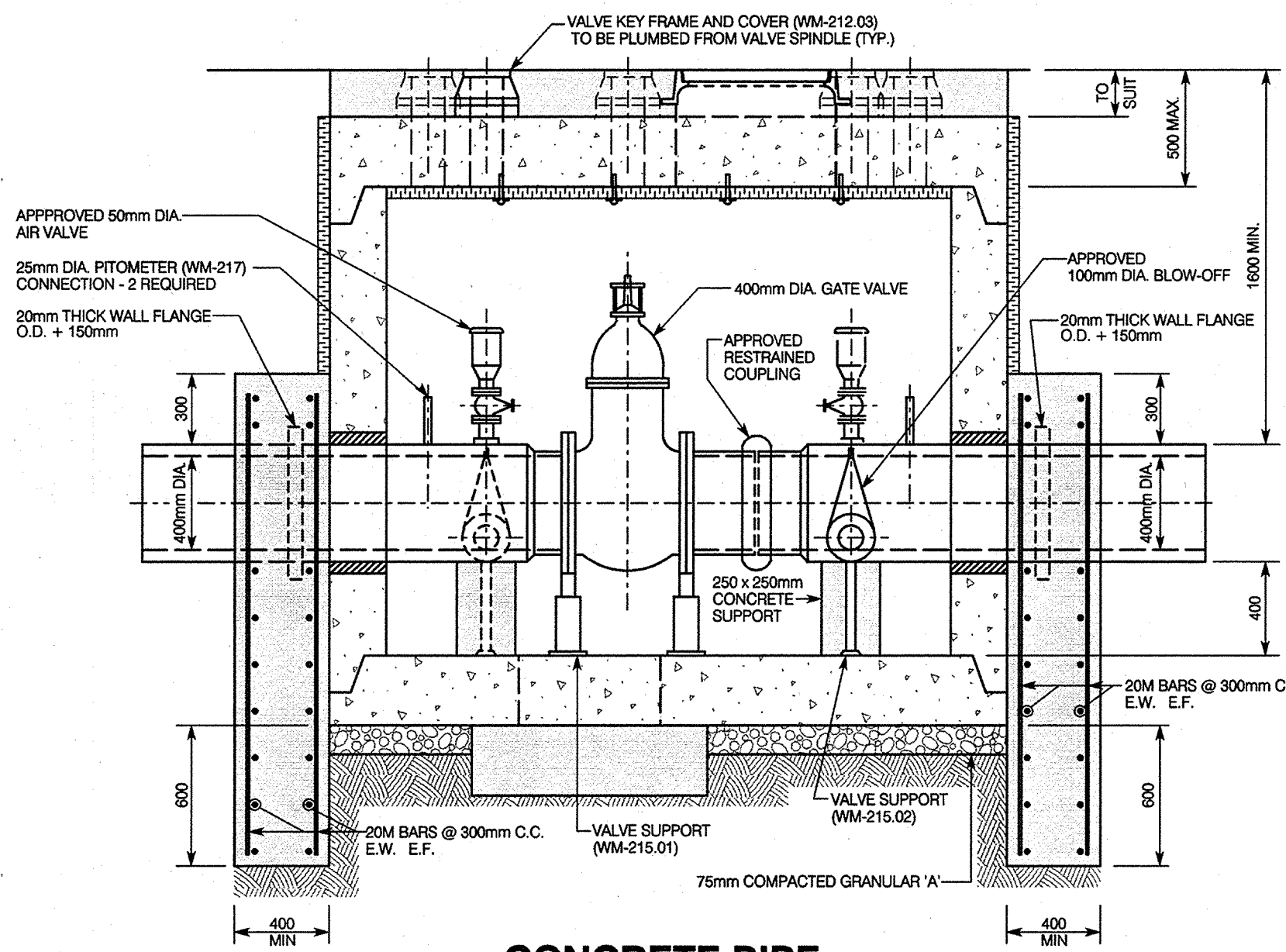
**CONCRETE PIPE - PIPING LAYOUT**



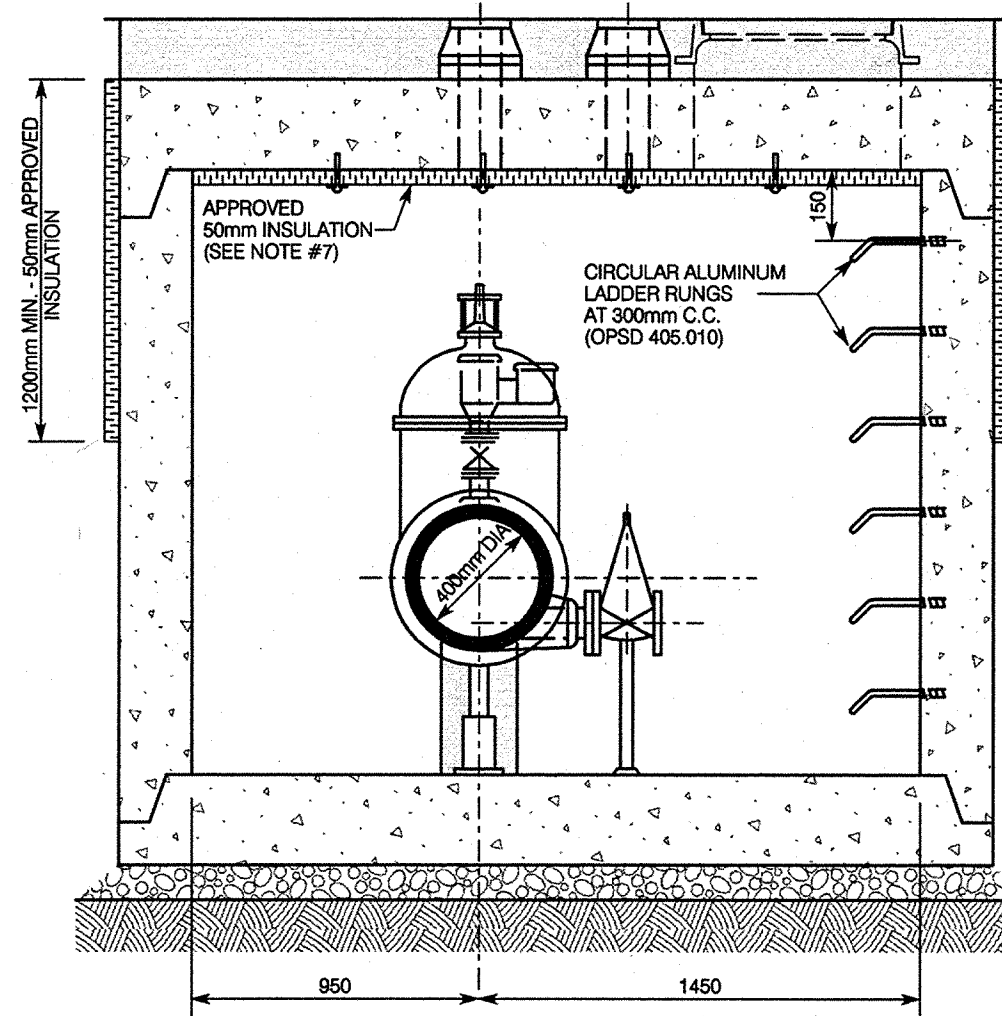
**ROOF PLAN - TYPICAL**



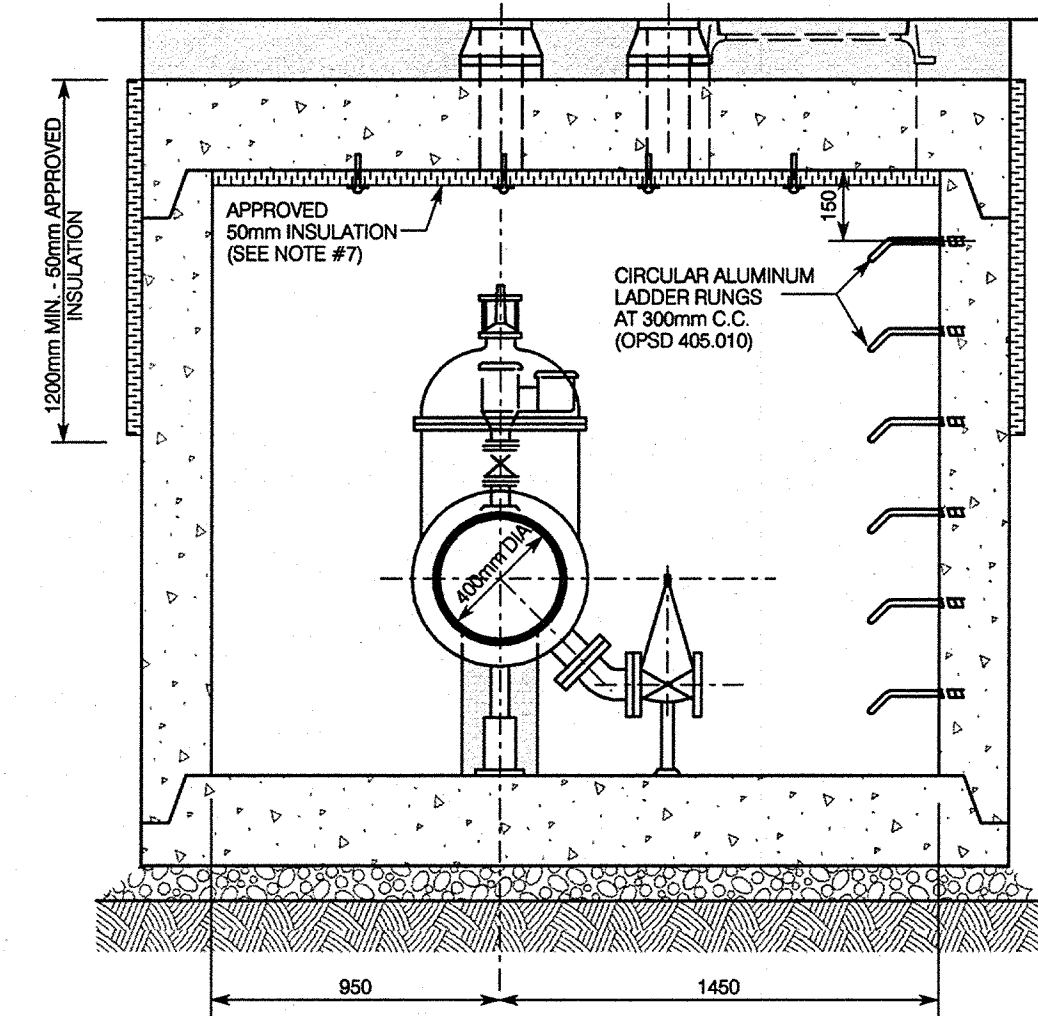
**DUCTILE IRON PIPE (CL 54) - PIPING LAYOUT**



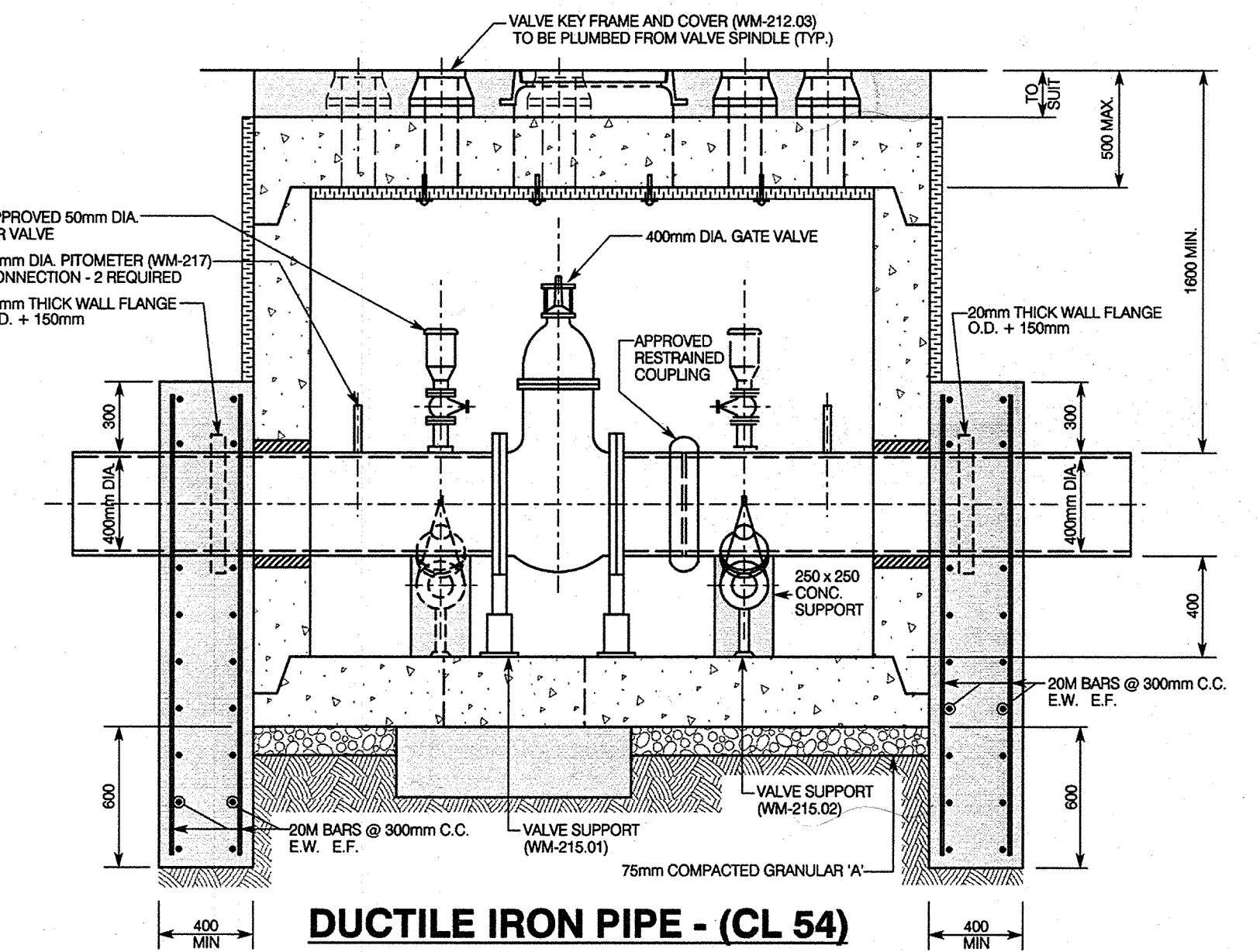
**CONCRETE PIPE SECTION A-A**



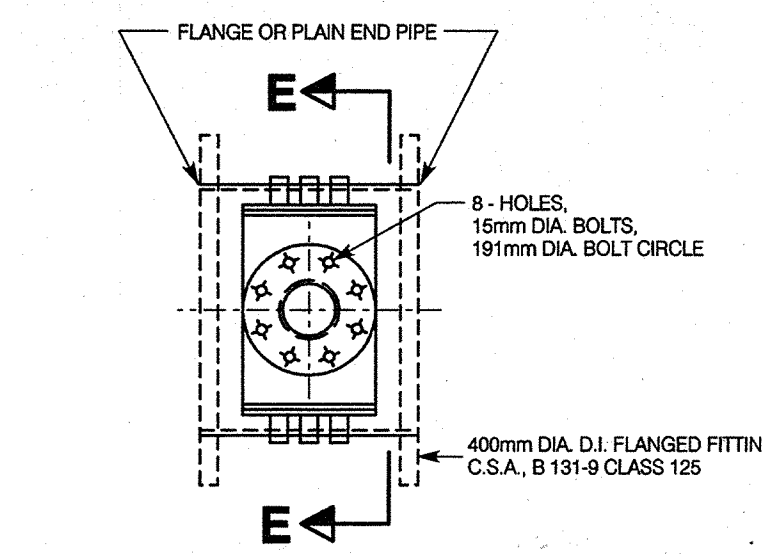
**CONCRETE PIPE SECTION B-B**



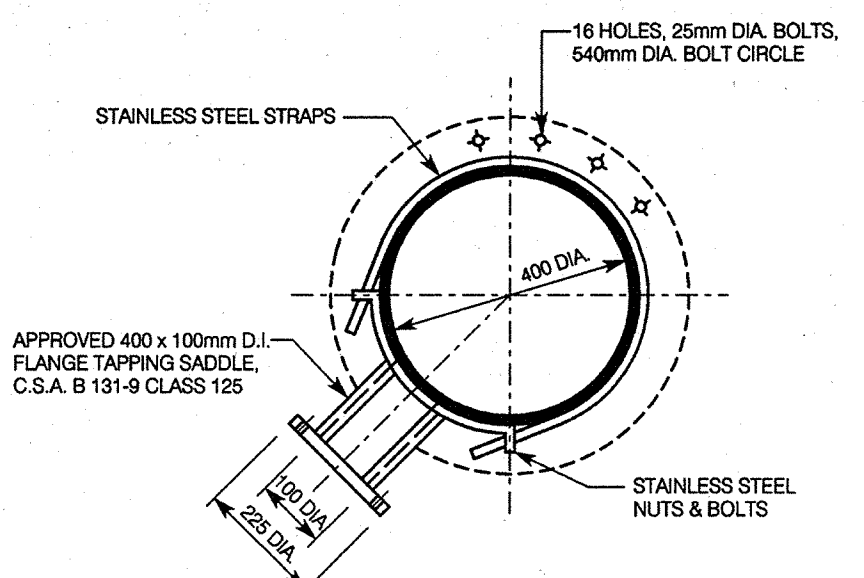
**DUCTILE IRON PIPE - (CL 54) SECTION C-C**



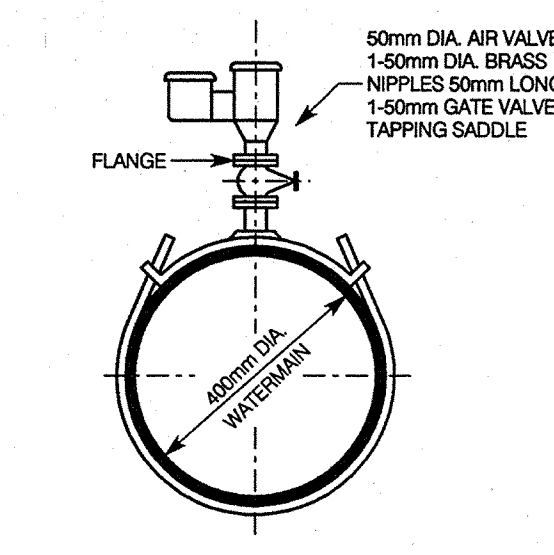
**DUCTILE IRON PIPE - (CL 54) SECTION D-D**



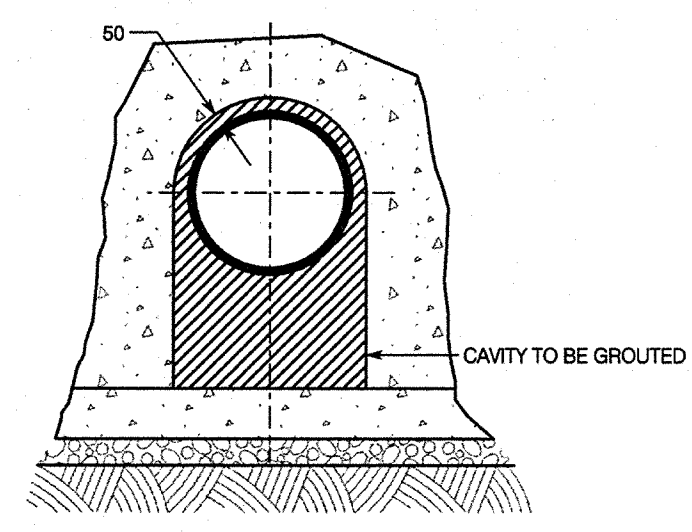
**DUCTILE IRON FITTING FOR 100mm DIA. BLOW-OFF**



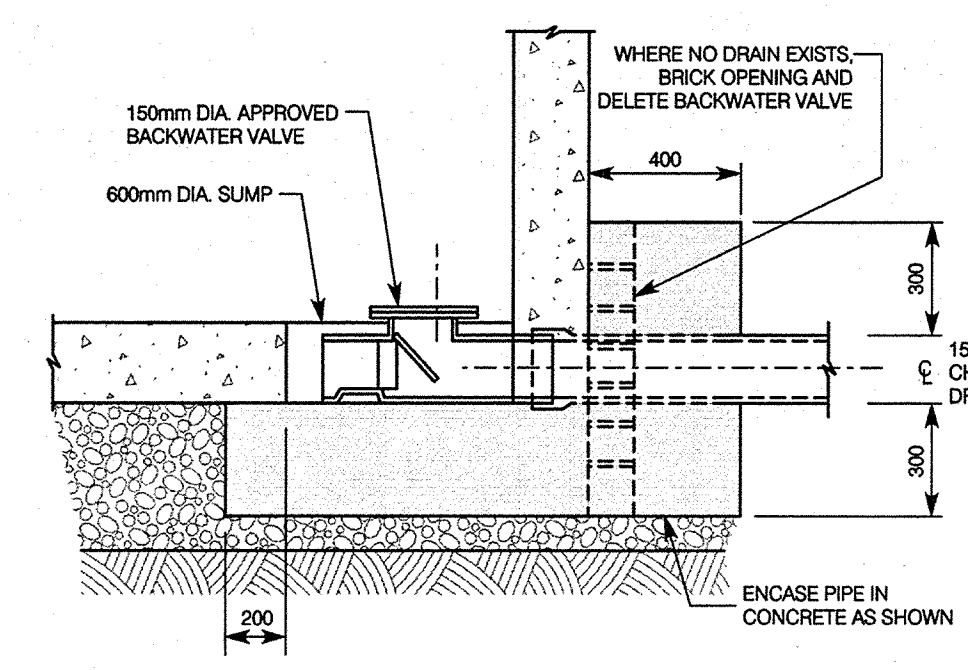
**SECTION E-E**



**AIR VALVE INSTALLATION FOR DUCTILE IRON PIPE**

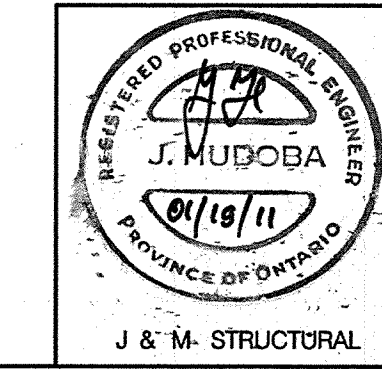
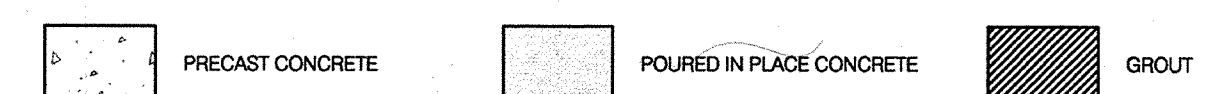


**DOGHOUSE DETAIL**



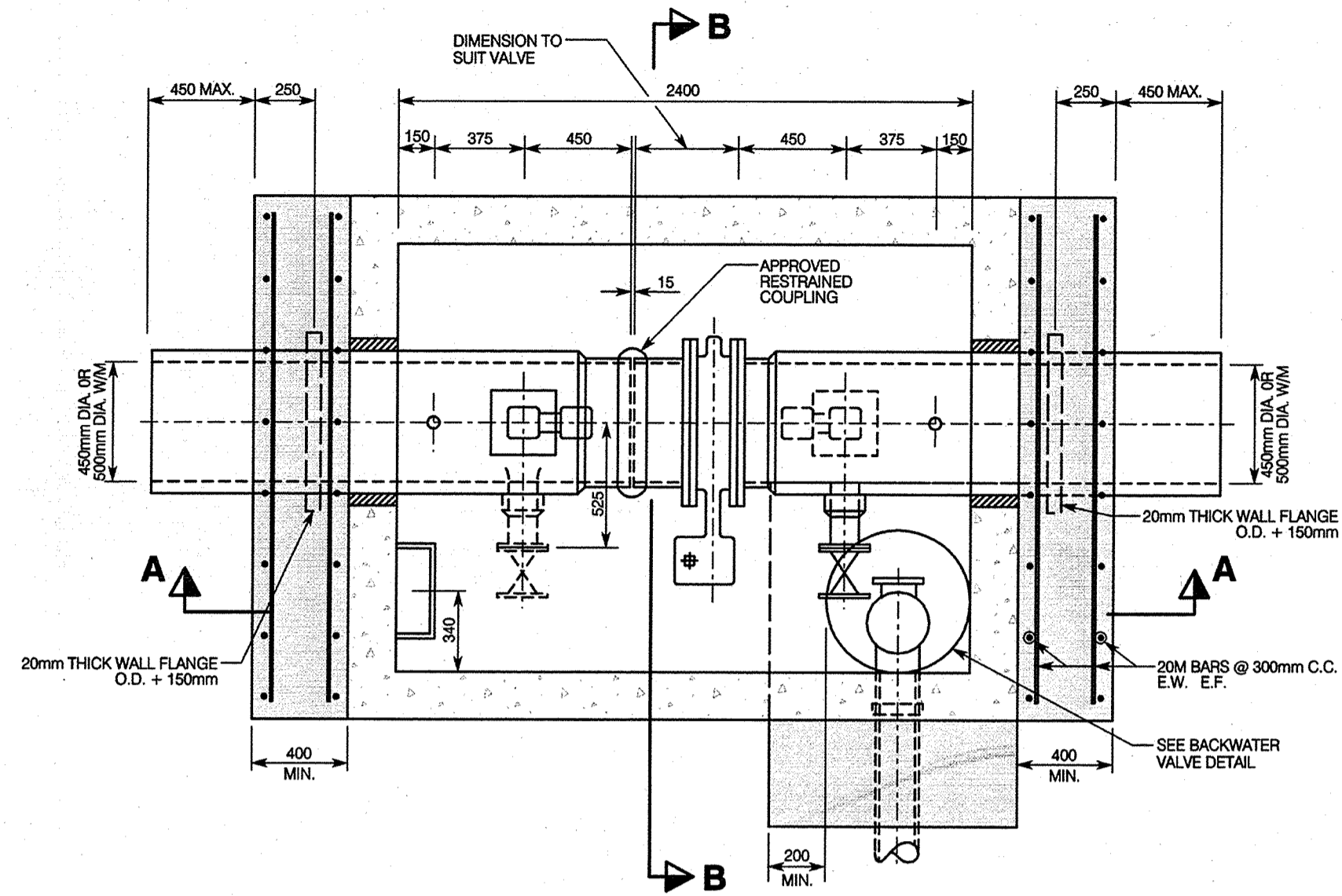
**BACKWATER VALVE DETAIL**

- NOTES:**
1. PRECAST CHAMBERS AND SECTIONS SHALL BE MANUFACTURED TO ASTM C-478, CSA MEET H-20 S16 LOADING REQUIREMENTS AND IN ACCORDANCE WITH THE APPROVED WATERMAIN PRODUCTS LIST.
  2. FILL ALL JOINTS AND LIFTING HOLES (INSIDE & OUT) 15mm THICK WITH 1:3 NON-SHRINK MORTAR MIX.
  3. ALL ADJUSTMENTS TO CHAMBER AND KEY COVERS SHALL BE MADE WITH FORTIFIED CONCRETE.
  4. ALL CONCRETE TO BE 30 MPa, TYPE 50 CEMENT.
  5. ALL REINFORCING TO BE HIGH BOND STRUCTURAL GRADE.
  6. WHEN AIR VALVE SPECIFIED, THE CHAMBER WALLS, ROOF, COVER (SEE DETAIL) AND CHIMNEY SHALL BE INSULATED WITH 50mm APPROVED INSULATION TO A MINIMUM DEPTH OF 100mm BELOW TOP OF CHAMBER.
  7. FASTEN INSULATION TO CEILING WITH 50mm DIA. WASHERS (GALVANIZED) & 6mm DIA. TAPCON CONCRETE ANCHORS @ 450mm CENTRES.
  8. DOGHOUSE OPENING TO BE CUT OUT MIN. 50mm LARGER THAN O.D. OF PROPOSED WATERMAIN. PIPE TO BE WRAPPED WITH MIN. 50mm THICK OF DENSO PLAST MASTIC. REMAINING CAVITY TO BE GROUTED. (SEE DOGHOUSE DETAIL).
  9. ALL FLANGES TO BE IN ACCORDANCE WITH ANSI/AWWA.
  10. SUPPLY AND APPLY DENSO CORROSION PROTECTION AS SPECIFIED, TO ALL STEEL, CAST OR DUCTILE IRON SURFACES, SADDLES, (INCLUDING BALES) VALVES, FLANGES, NUTS AND BOLTS.
  11. SEE CONTRACT DRAWINGS FOR LOCATION / ORIENTATION OF 50mm AIR VALVE OR 100mm BLOW-OFF IN CHAMBER.
  12. CHAMBER PIPING SHALL BE CONCRETE OR DUCTILE IRON CLASS 54.
  13. WATERPROOF MEMBRANE SHALL BE APPLIED TO ALL CHAMBER WALLS PRIOR TO BACKFILLING.
  14. APPROVED RESTRAINED COUPLING SHALL BE IN ACCORDANCE WITH THE APPROVED WATERMAIN PRODUCTS LIST.

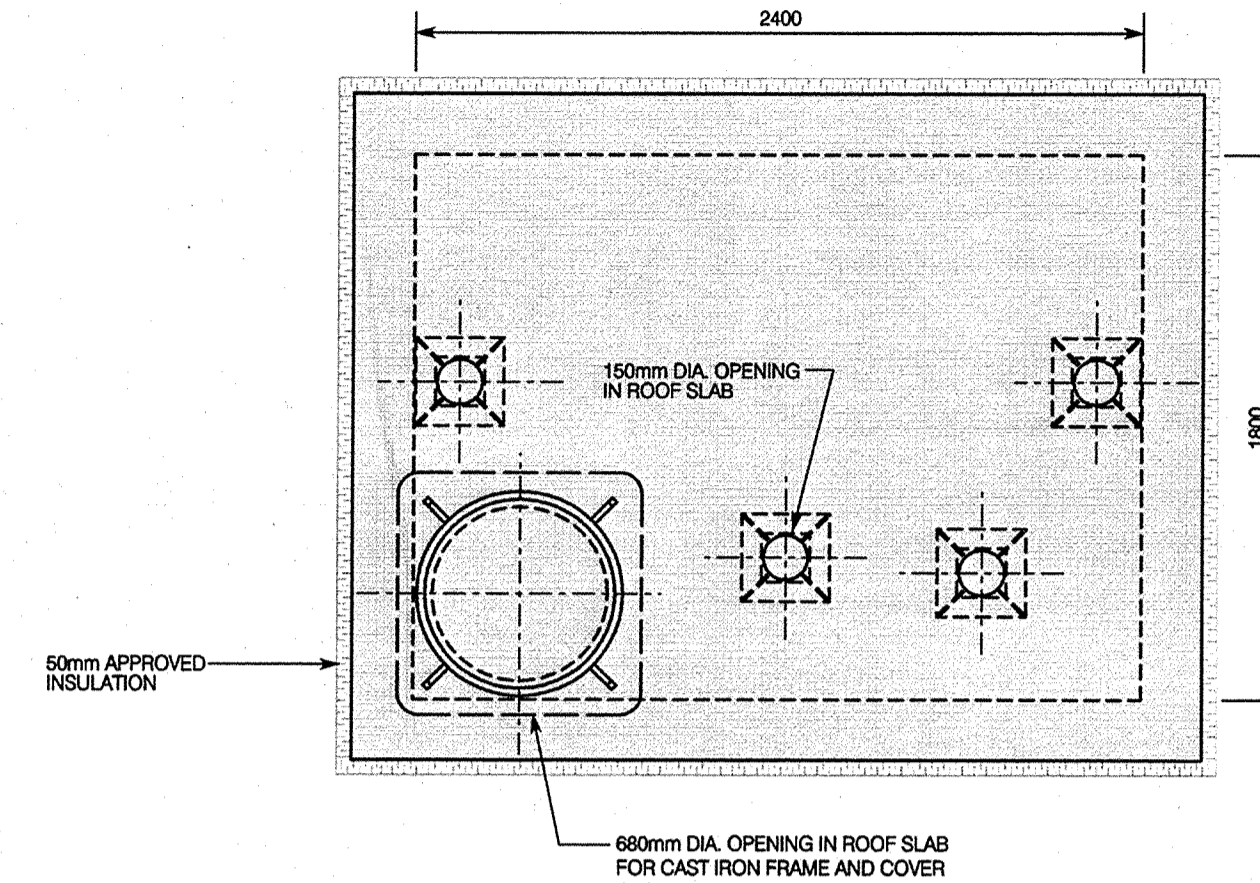


City of Hamilton Public Works Department				
<b>2400mm PRECAST VALVE CHAMBER FOR 400mm DIA. CONCRETE OR DUCTILE IRON PIPE WITH 50mm AIR VALVE &amp; 100mm BLOW-OFF</b>				
DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED	DATE JANUARY 2011	REV No 1	FORMERLY RWS-323	HAMILTON STD No. WM-230

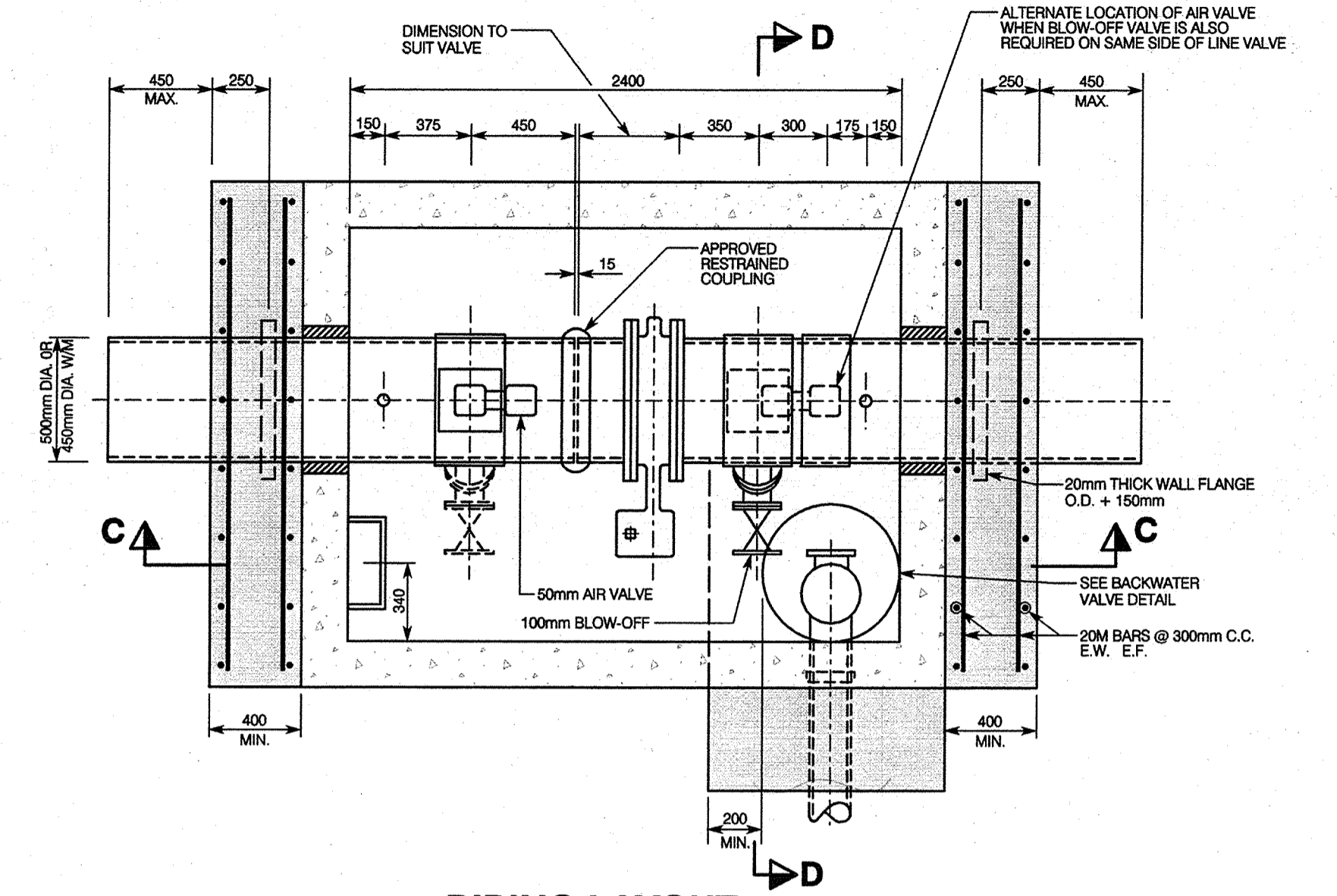
**1800 x 2400mm PRECAST VALVE CHAMBER  
FOR 450mm DIA. OR 500mm DIA.  
CONCRETE PIPE OR DUCTILE IRON PIPE**



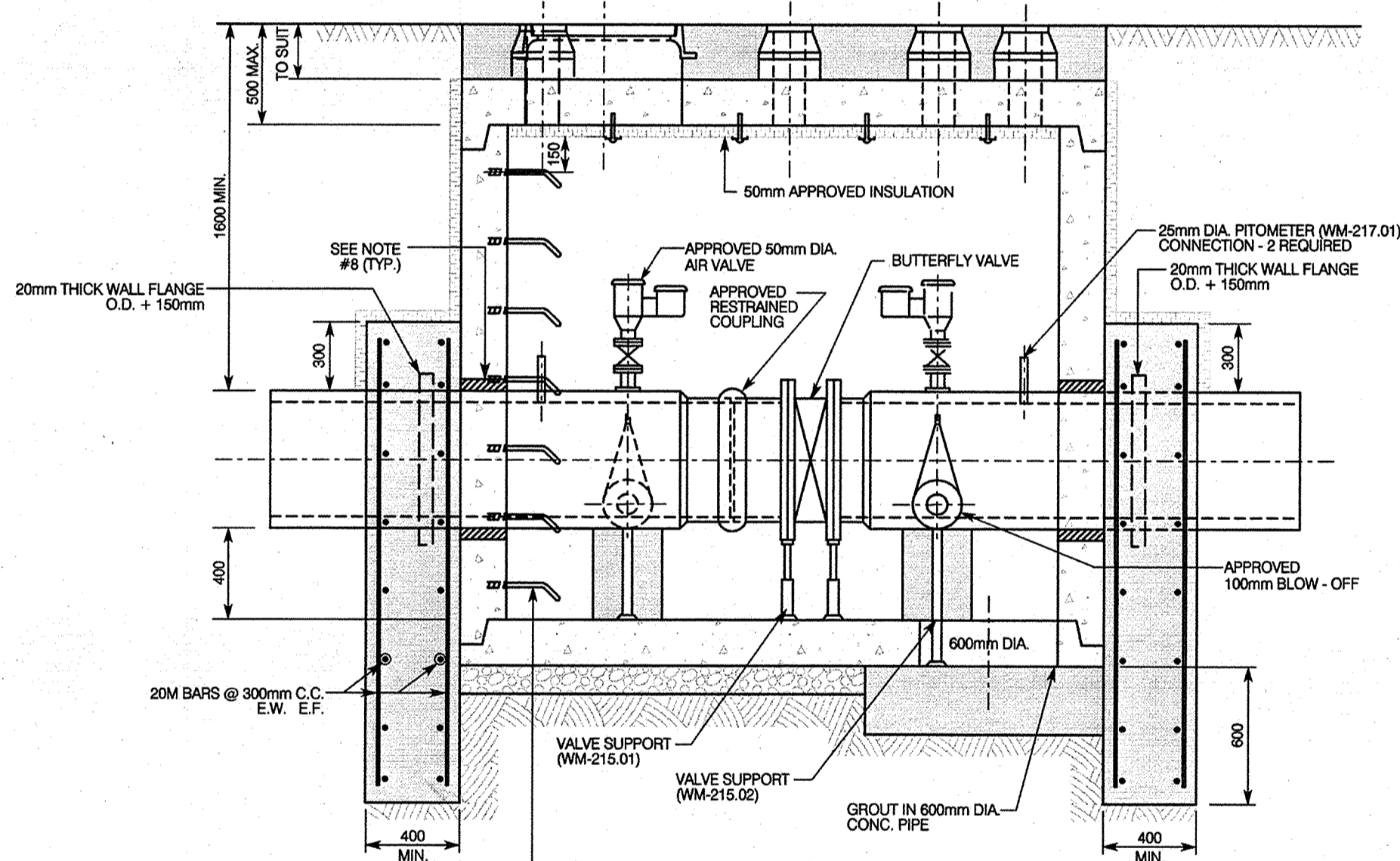
**PIPING LAYOUT  
CONCRETE PIPE**



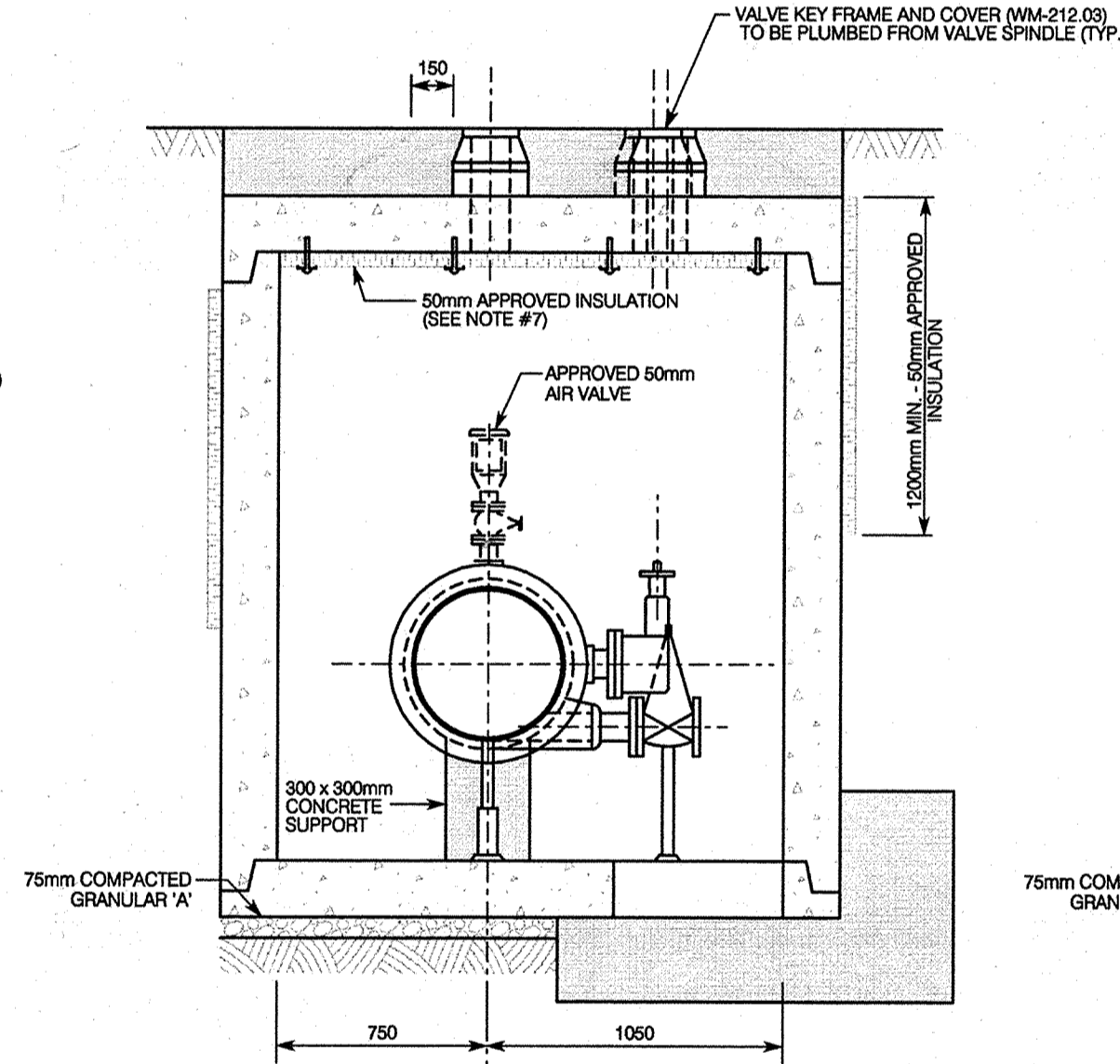
**ROOF PLAN**



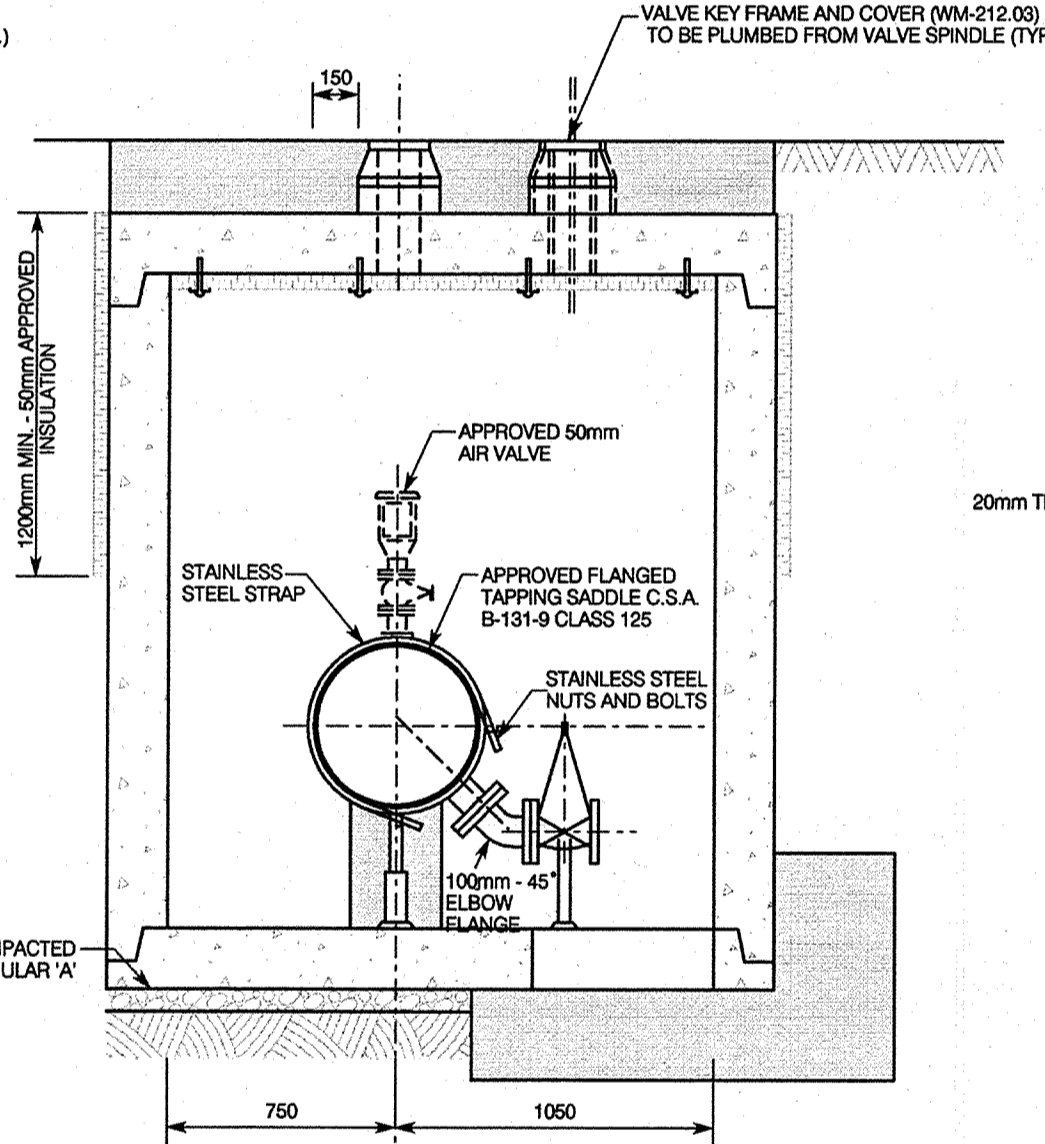
**PIPING LAYOUT  
DUCTILE IRON PIPE - (CL54)**



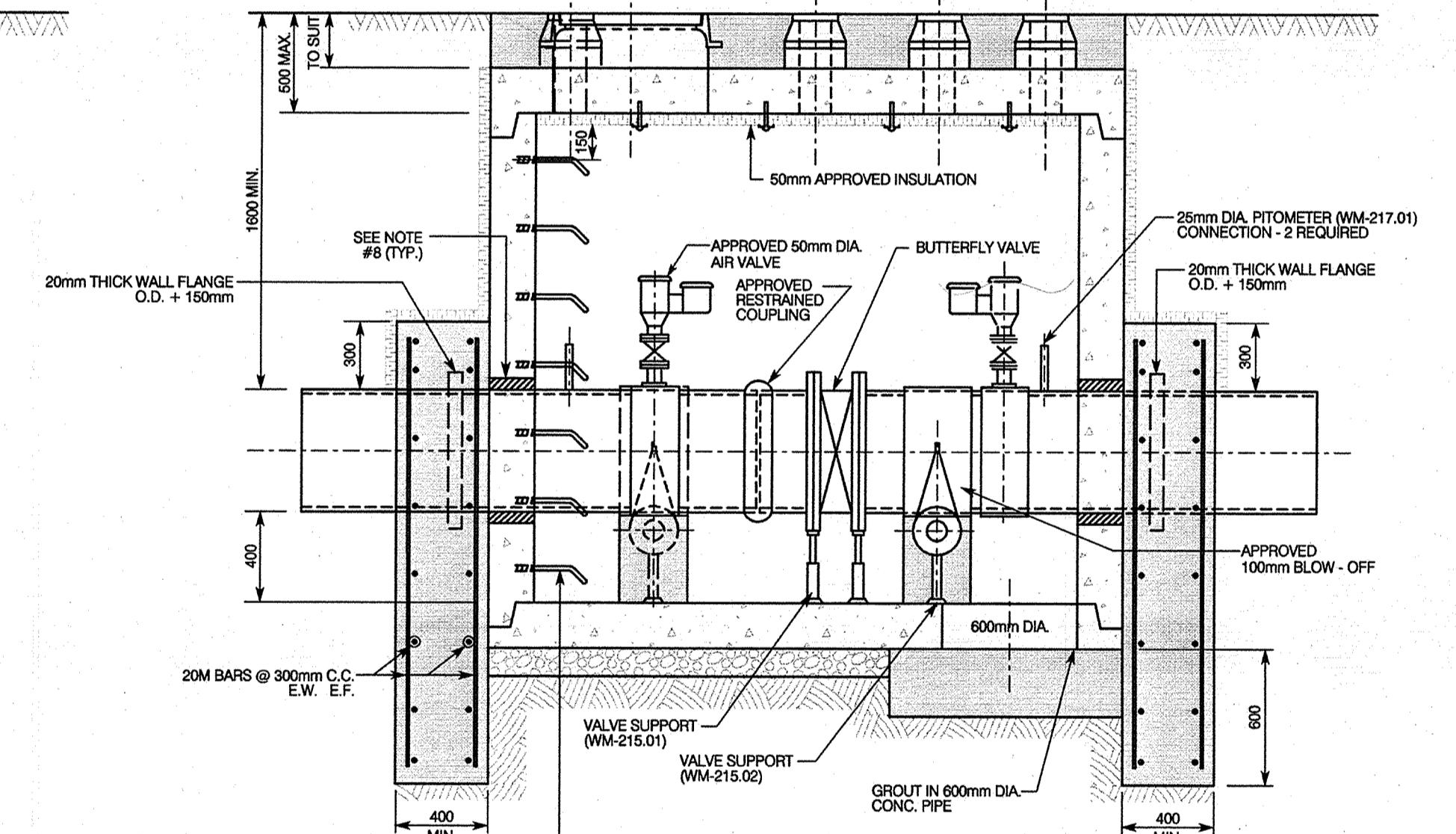
**SECTION A-A  
CONCRETE PIPE**



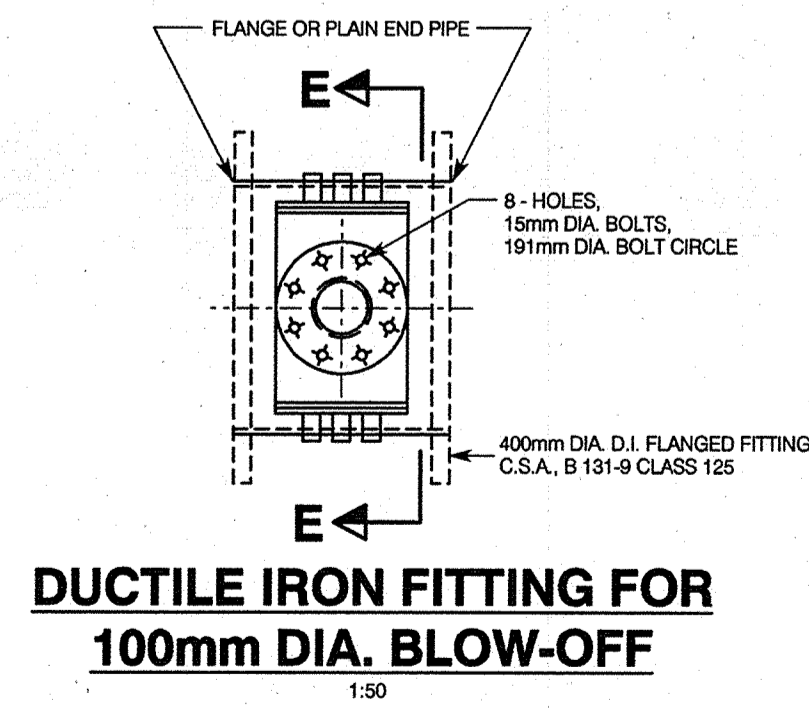
**SECTION B-B  
CONCRETE PIPE**



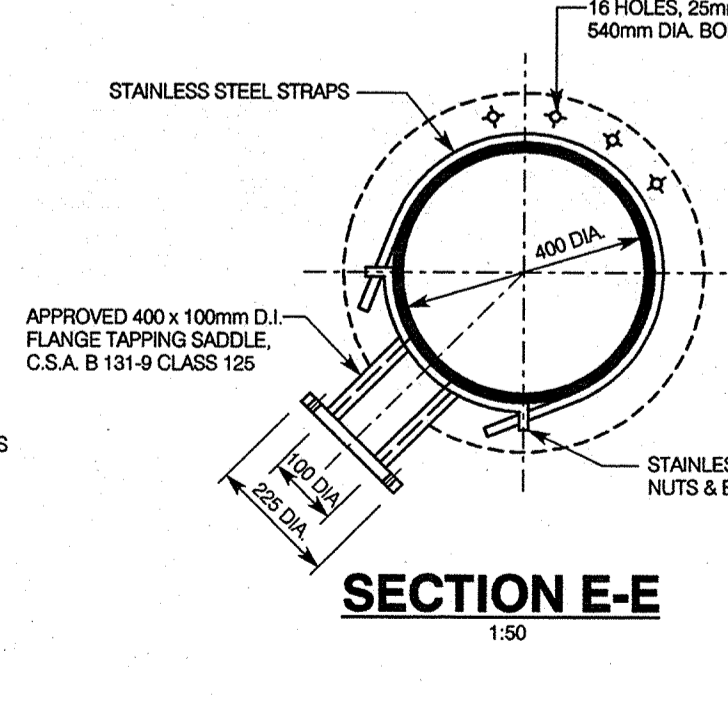
**SECTION D-D  
DUCTILE IRON PIPE - (CL 54)**



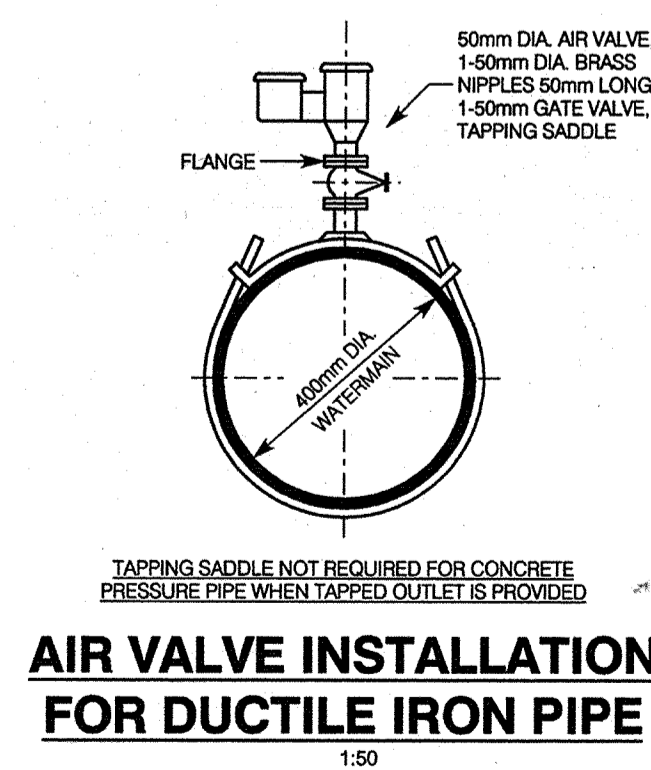
**SECTION C-C  
DUCTILE IRON PIPE - (CL54)**



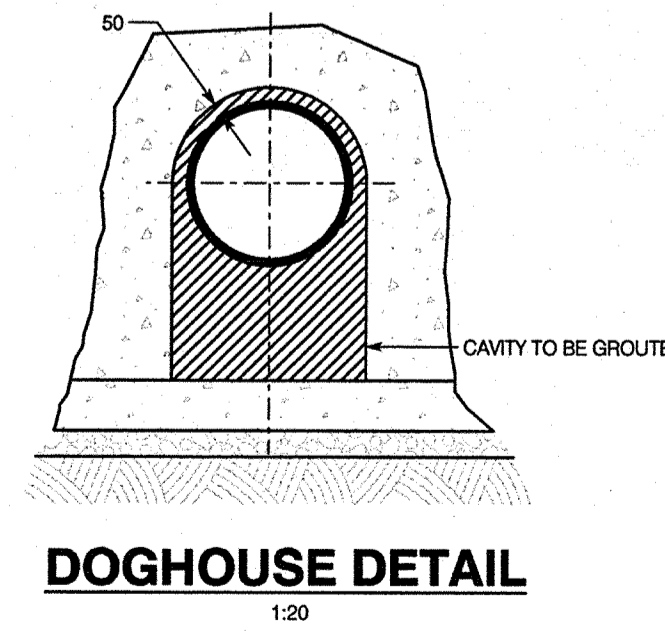
**DUCTILE IRON FITTING FOR  
100mm DIA. BLOW-OFF**



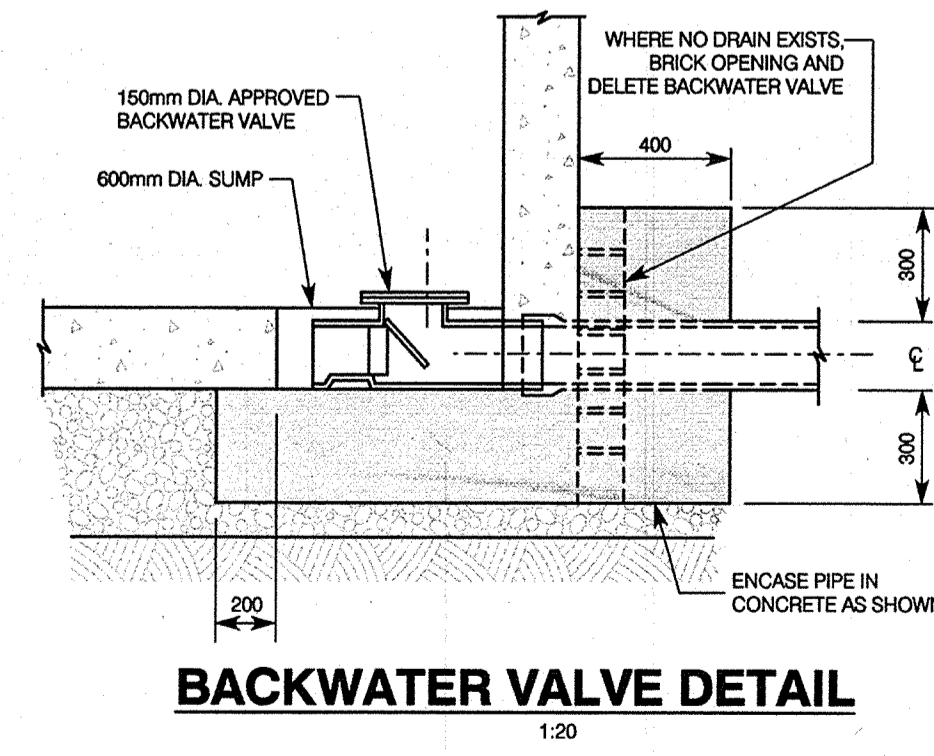
**SECTION E-E**



**AIR VALVE INSTALLATION  
FOR DUCTILE IRON PIPE**



**DOGHOUSE DETAIL**

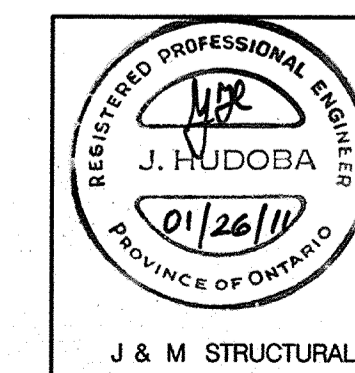


**BACKWATER VALVE DETAIL**

**NOTES:**

1. PRECAST CHAMBERS AND SECTIONS SHALL BE MANUFACTURED TO ASTM C-478, CSA, MEET H-20 S16 LOADING REQUIREMENTS AND IN ACCORDANCE WITH THE APPROVED WATERMAN PRODUCTS LIST.
2. FILL ALL JOINTS AND LIFTING HOLES (INSIDE & OUT) 15mm THICK WITH 1:3 NON-SHRINK MORTAR MIX.
3. ALL ADJUSTMENTS TO CHAMBER AND KEY COVERS SHALL BE MADE WITH POURED CONCRETE.
4. ALL CONCRETE TO BE 30 MPa, TYPE 50 CEMENT.
5. ALL REINFORCING TO BE HIGH BOND STRUCTURAL GRADE.
6. WHEN AIR VALVE SPECIFIED, THE CHAMBER WALLS, ROOF COVER (SEE DETAIL) AND CHIMNEY SHALL BE INSULATED WITH 50mm APPROVED INSULATION TO A MINIMUM DEPTH OF 1200mm BELOW TOP OF CHAMBER.
7. FASTEN INSULATION TO CEILING WITH 50mm DIA. WASHERS (GALVANIZED) & 6mm DIA. TAPCON CONCRETE ANCHORS @ 400mm CENTRES.
8. DOGHOUSE OPENING TO BE CUT OUT MIN. 50mm LARGER THAN O.D. OF PROPOSED WATERMAN PIPE TO BE WRAPPED WITH MIN. 50mm THICK OF DENSO PLAST MASTIC. REMAINING CAVITY TO BE GROUTED. (SEE DOGHOUSE DETAIL).
9. ALL FLANGES TO BE IN ACCORDANCE WITH ANSI/AWWA.
10. SUPPLY AND APPLY DENSO CORROSION PROTECTION AS SPECIFIED, TO ALL STEEL, CAST OR DUCTILE IRON SURFACES, SADDLES, (INCLUDING BAILS) VALVES, FLANGES, NUTS AND BOLTS.
11. SEE CONTRACT DRAWINGS FOR LOCATION / ORIENTATION OF 50mm AIR VALVE OR 100mm BLOW-OFF IN CHAMBER.
12. CHAMBER PIPING SHALL BE CONCRETE OR DUCTILE IRON CLASS 54.
13. WATERPROOF MEMBRANE SHALL BE APPLIED TO ALL CHAMBER WALLS PRIOR TO BACKFILLING.
14. APPROVED RESTRAINED COUPLING SHALL BE IN ACCORDANCE WITH THE APPROVED WATERMAN PRODUCTS LIST.

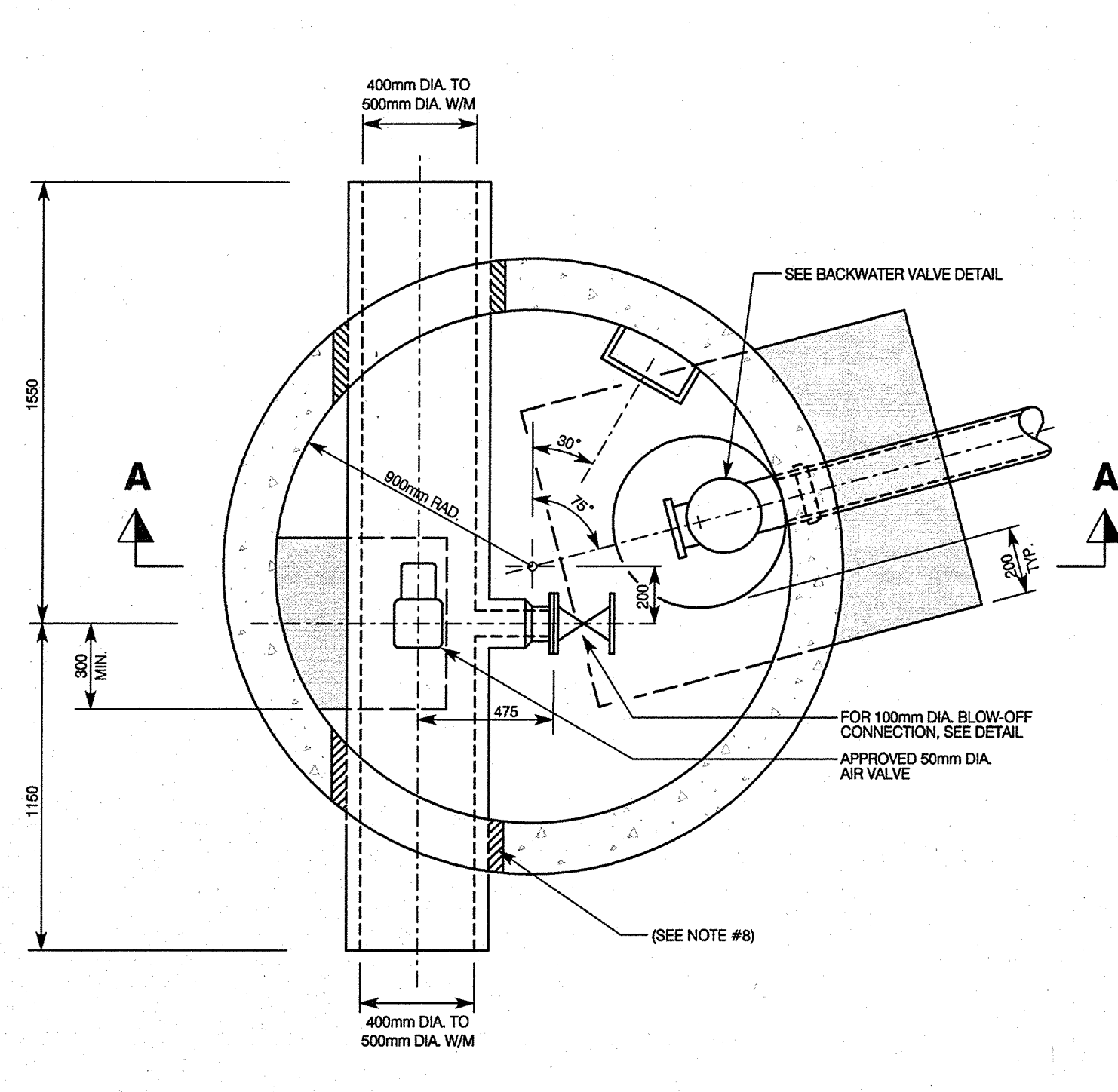
PRECAST CONCRETE      POURED IN PLACE CONCRETE      GROUT



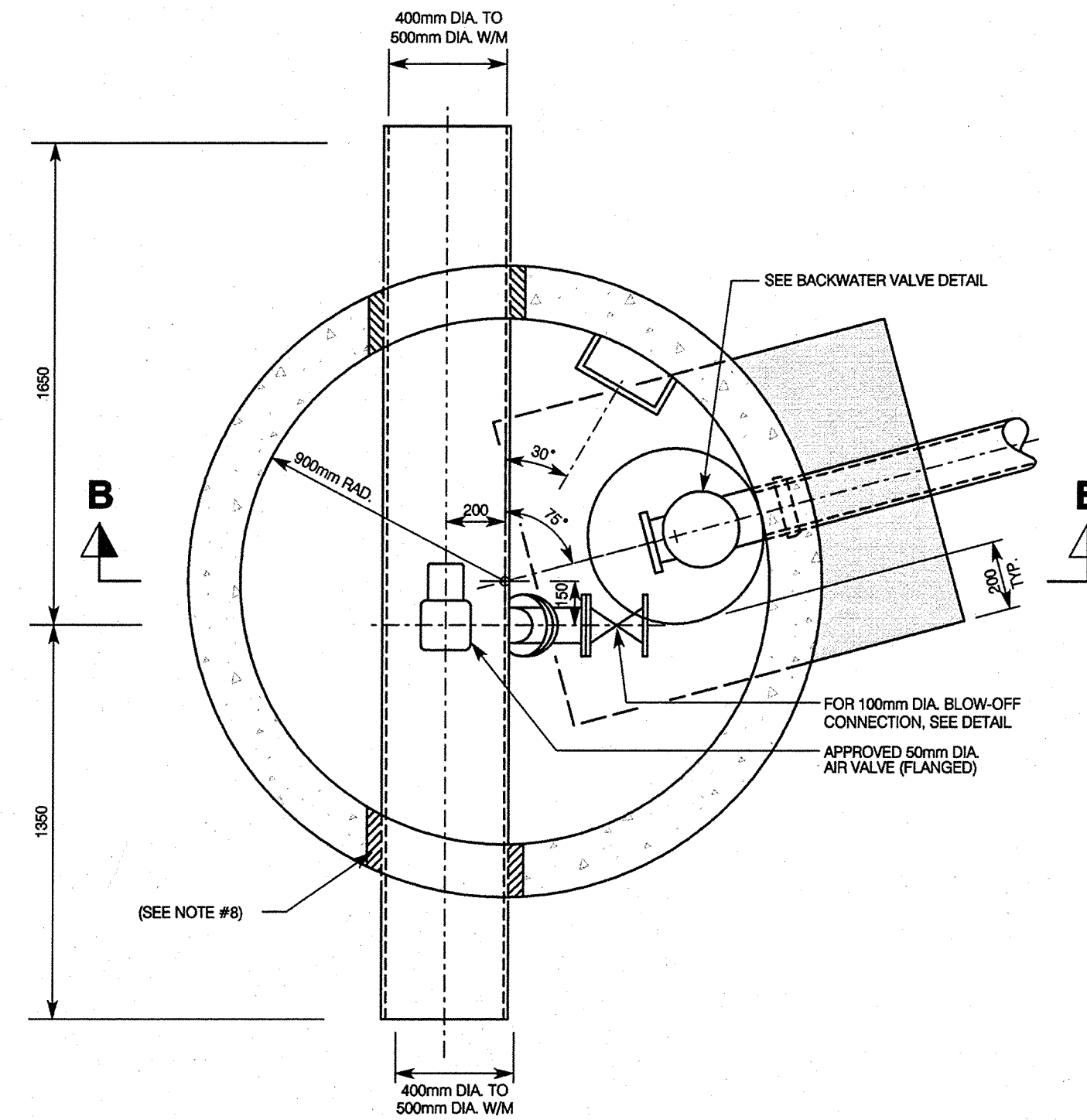
City of Hamilton Public Works Department				
1800 x 2400mm PRECAST VALVE CHAMBER FOR 450mm OR 500mm DIA. CONCRETE PIPE OR DUCTILE IRON PIPE				
DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED	DATE JANUARY 2011	REV No. 1	FORMERLY RWS-324	HAMILTON STD No. WM-231

**1800mm PRECAST VALVE CHAMBER FOR  
400mm TO 500mm DIA. CONCRETE OR DUCTILE IRON PIPE  
WITH 50mm AIR VALVE & 100mm BLOW-OFF**

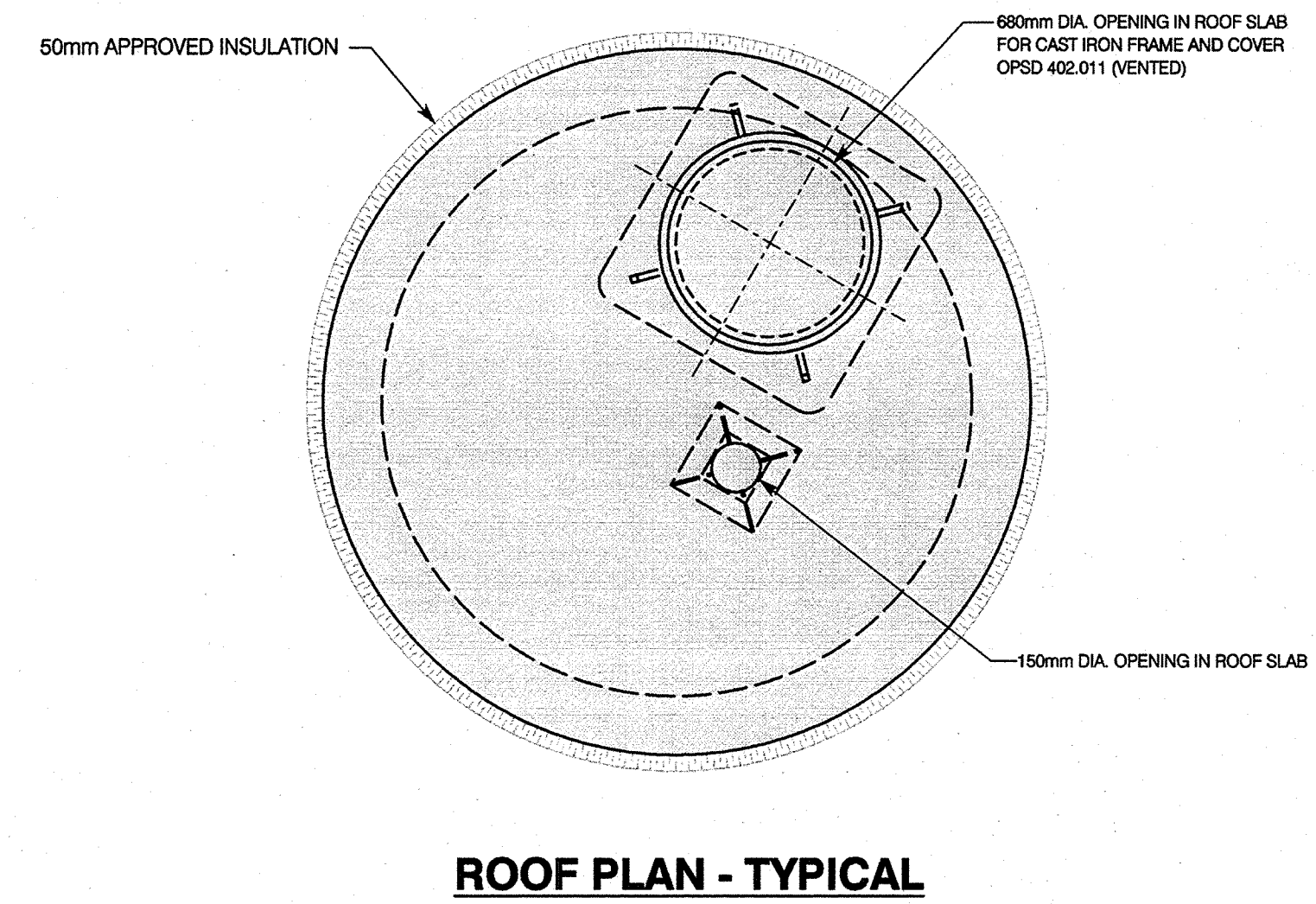
WM-232



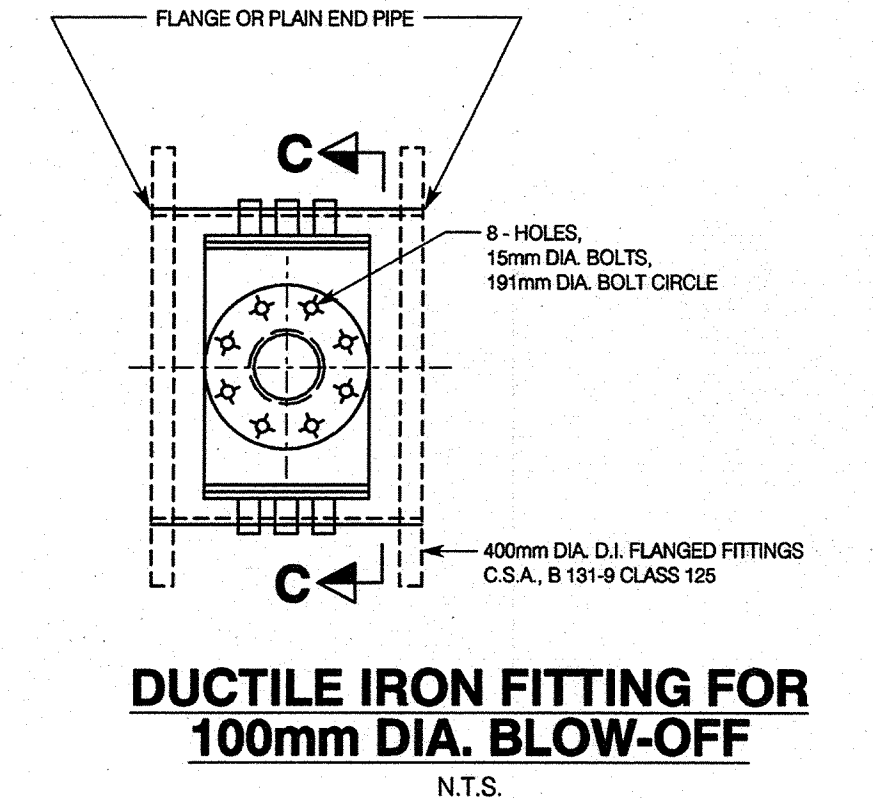
**PIPING LAYOUT  
CONCRETE PIPE**



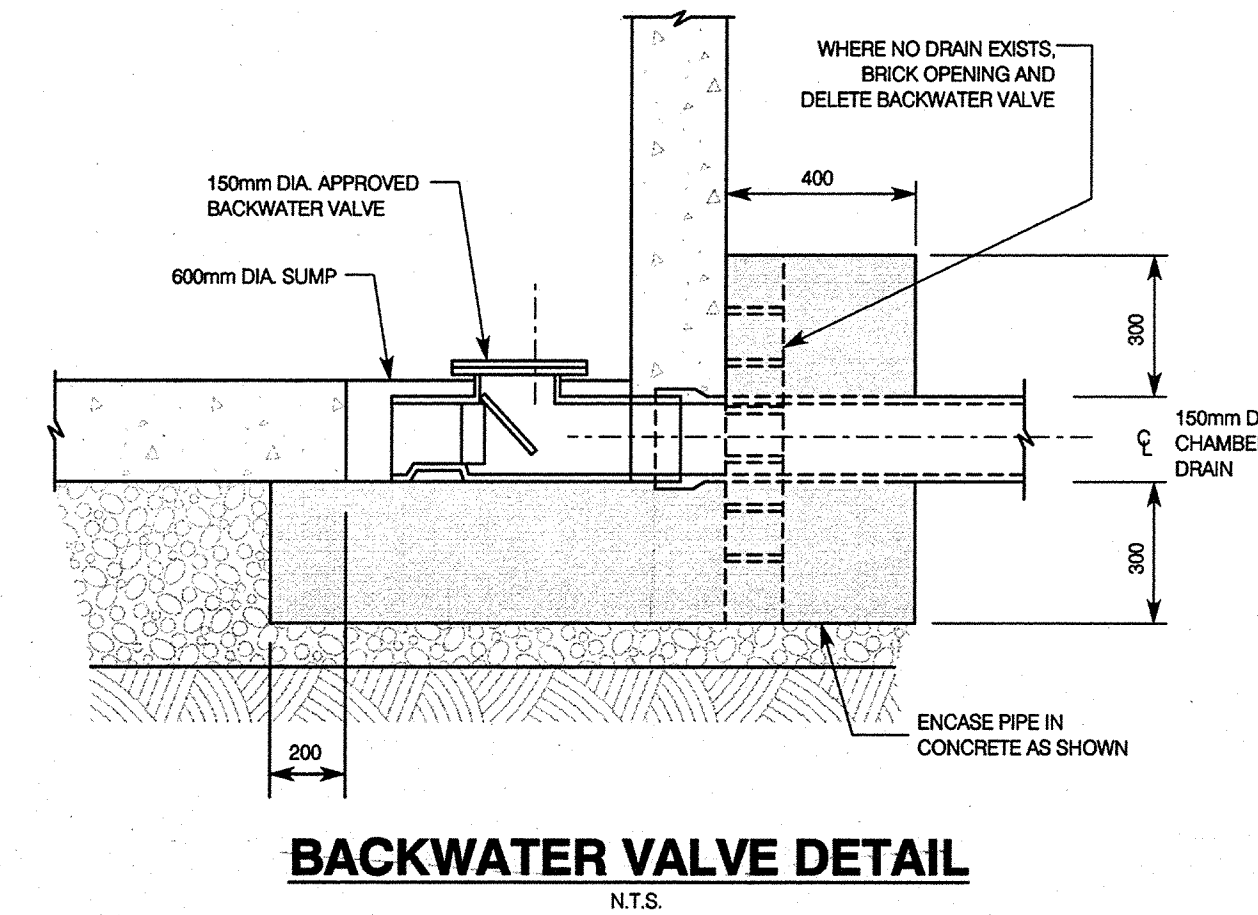
**PIPING LAYOUT  
DUCTILE IRON PIPE**



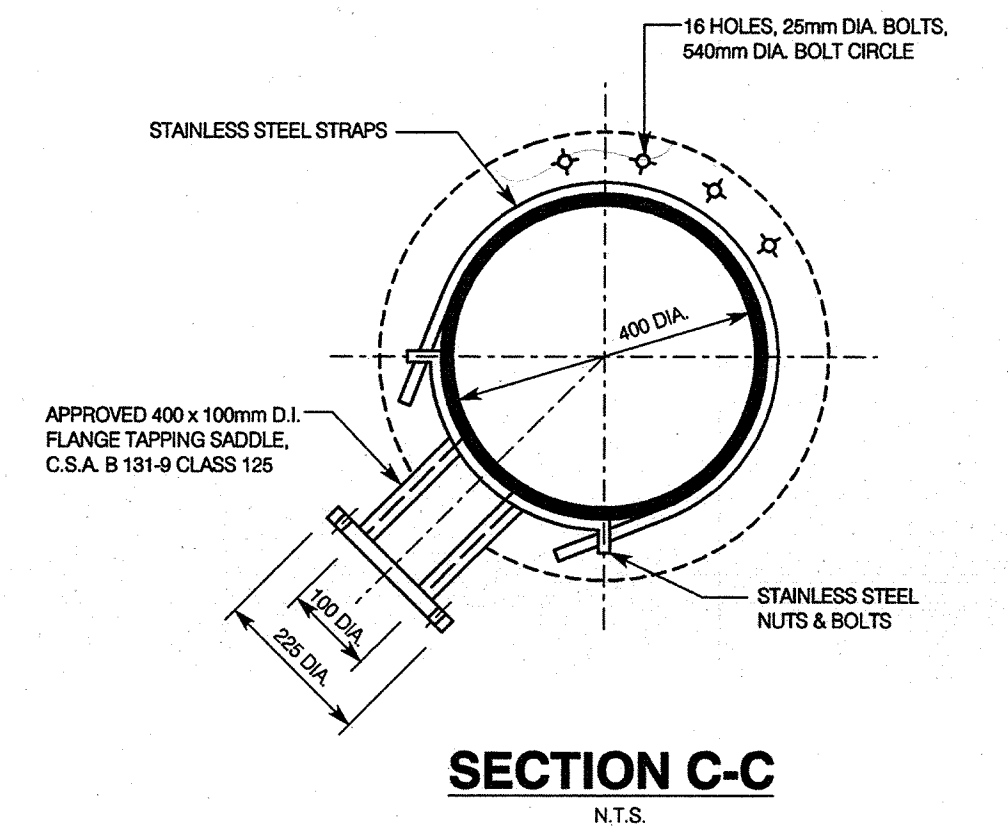
**ROOF PLAN - TYPICAL**



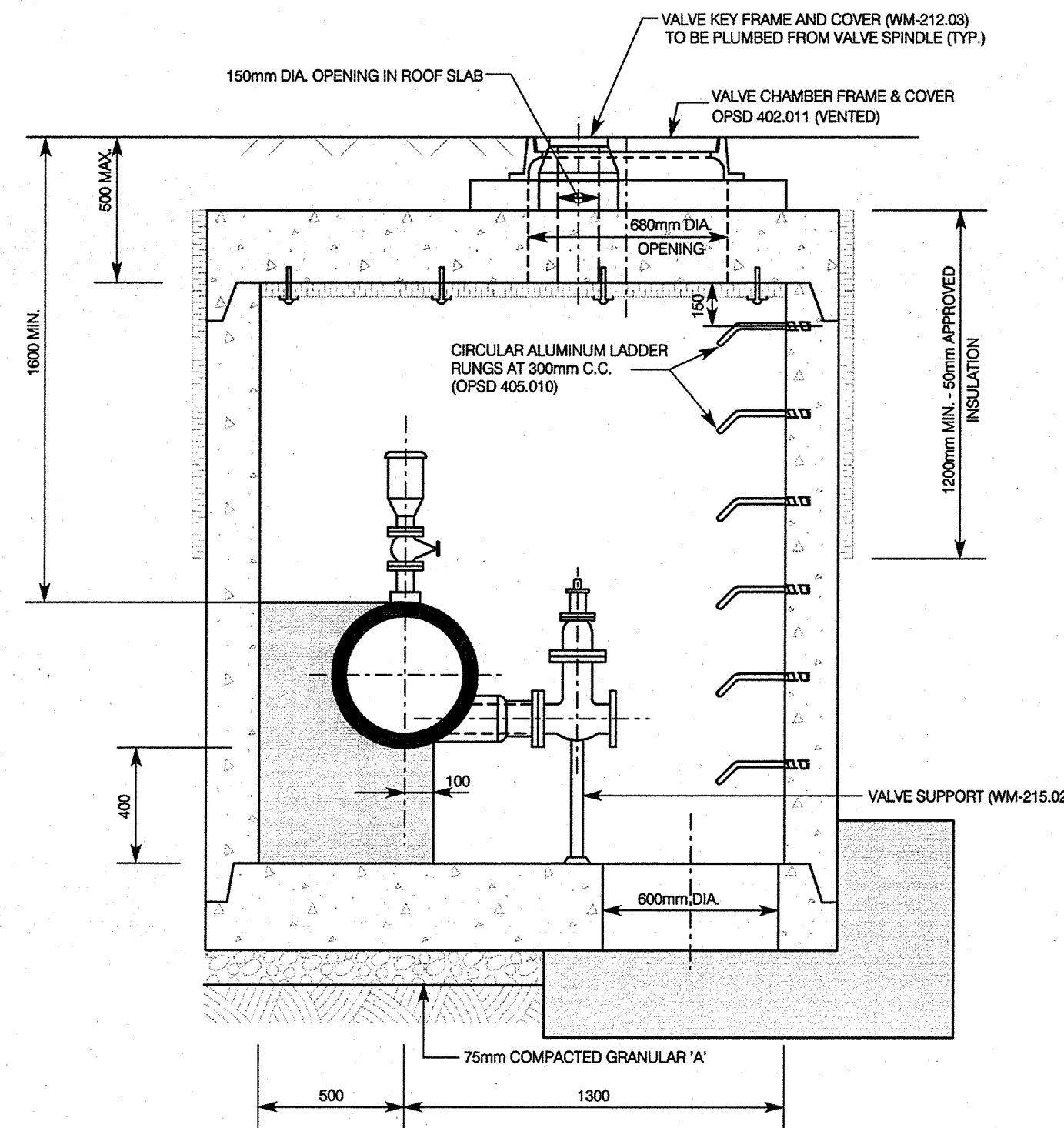
**DUCTILE IRON FITTING FOR  
100mm DIA. BLOW-OFF**  
N.T.S.



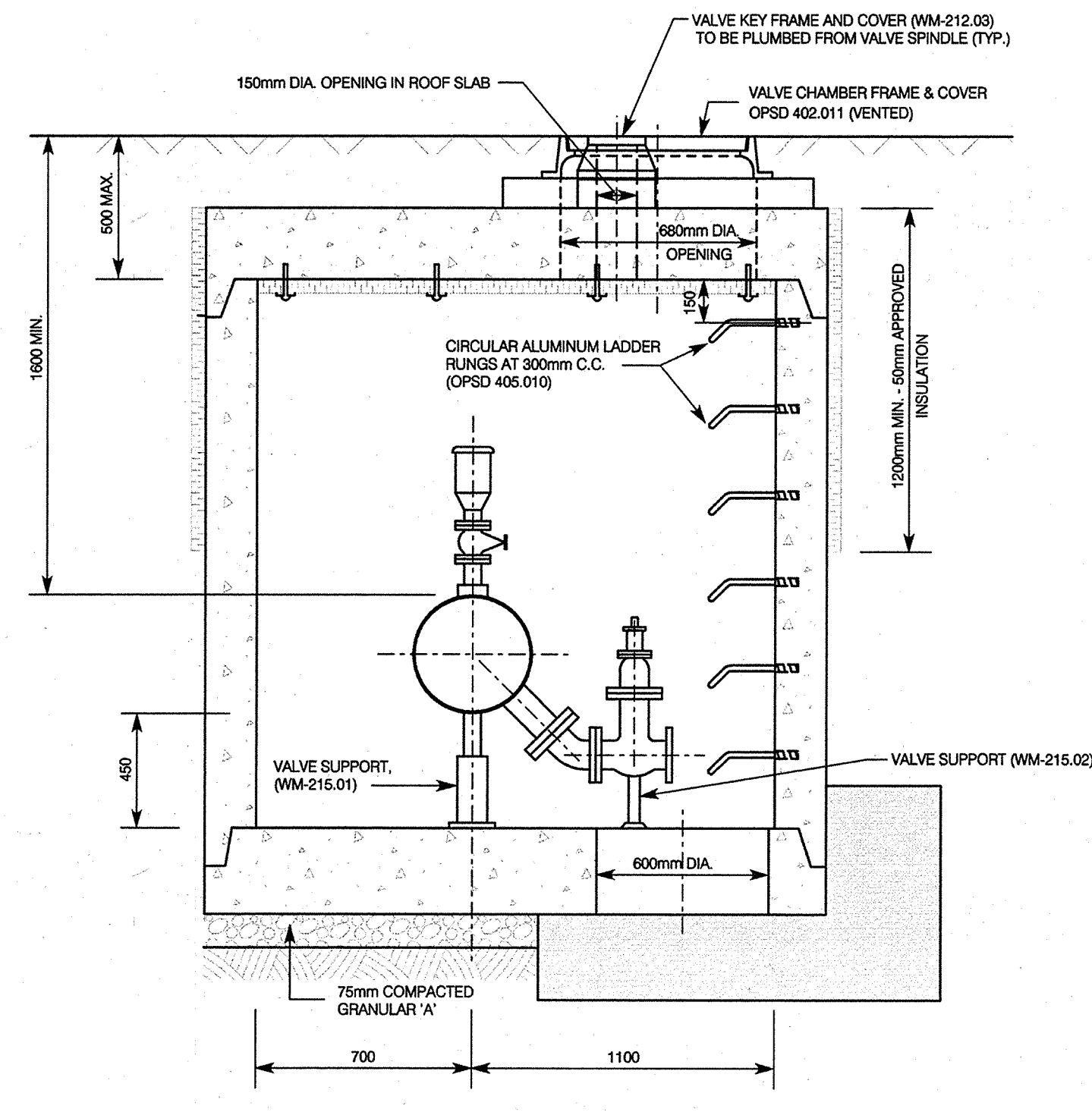
**BACKWATER VALVE DETAIL**  
N.T.S.



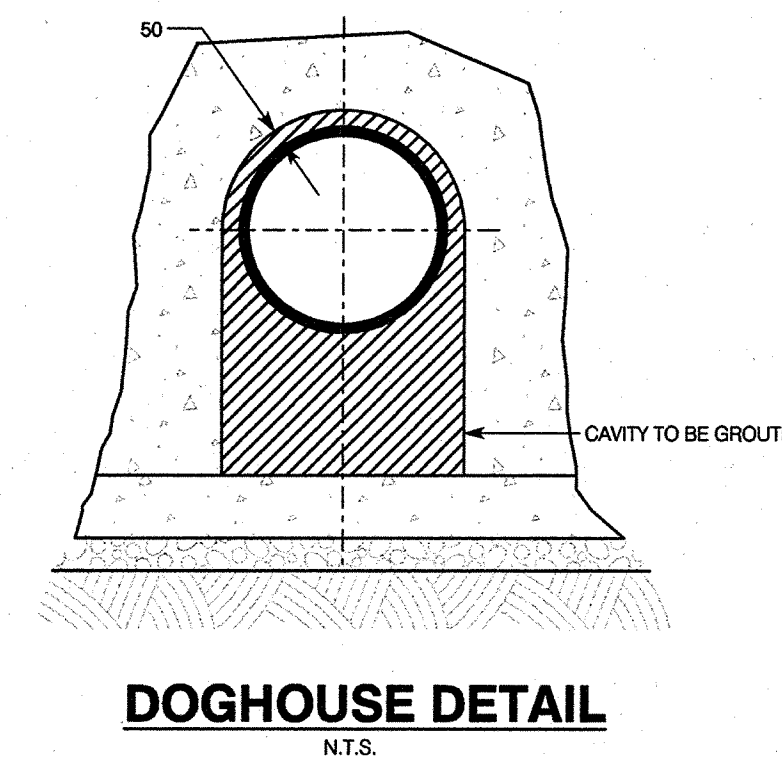
**SECTION C-C**  
N.T.S.



**SECTION A-A  
CONCRETE PIPE**



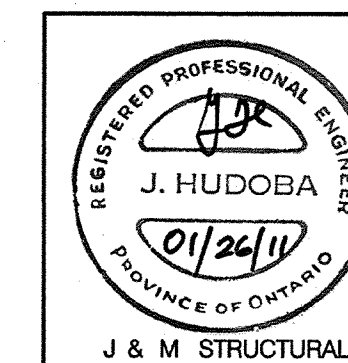
**SECTION B-B  
DUCTILE IRON PIPE**



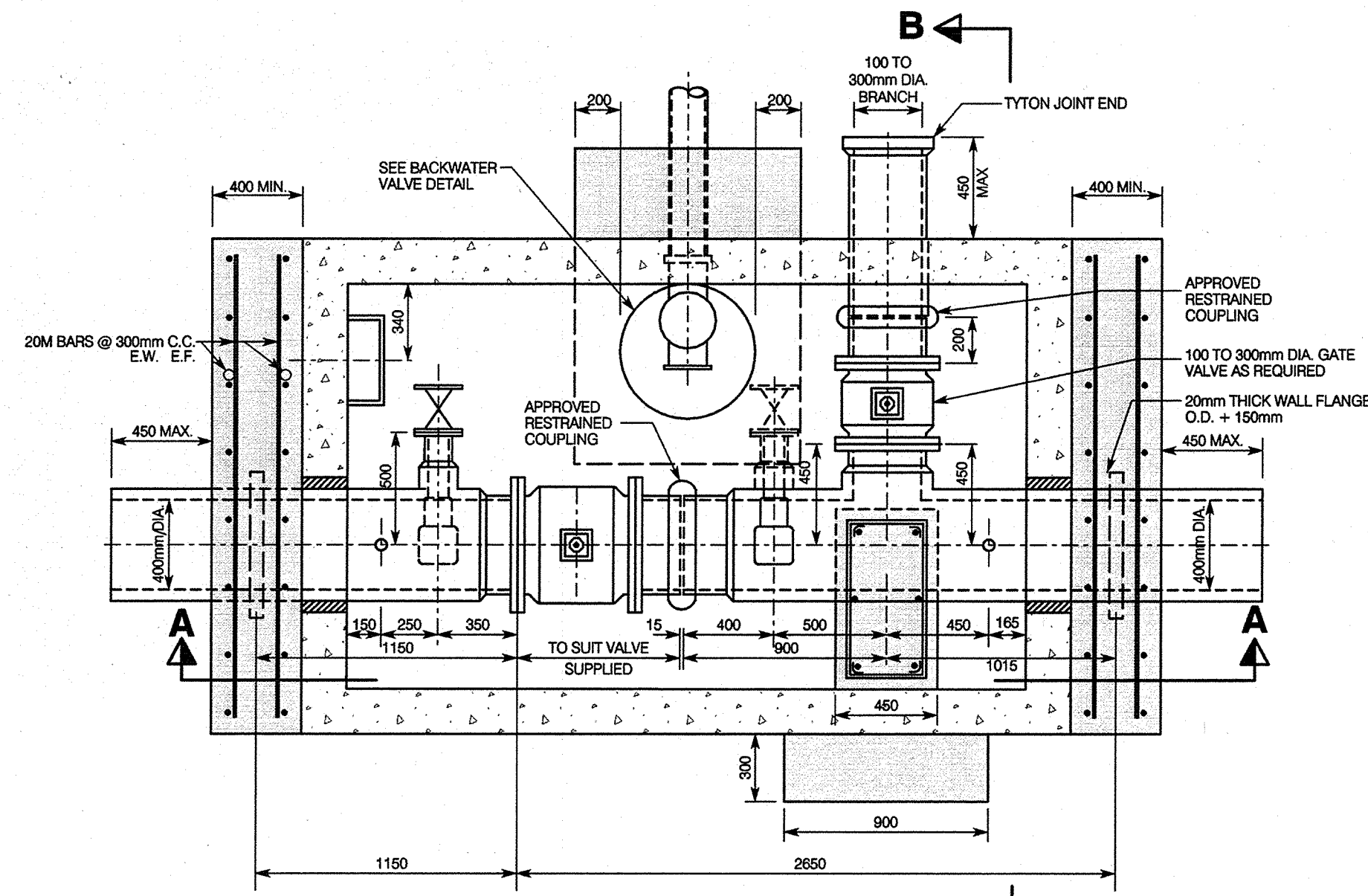
**DOGHOUSE DETAIL**  
N.T.S.

- NOTES:**
1. PRECAST CHAMBERS AND SECTIONS SHALL BE MANUFACTURED TO ASTM C-478, CSA MEET H-20 S16 LOADING REQUIREMENTS AND IN ACCORDANCE WITH THE APPROVED WATERMAN PRODUCTS LIST.
  2. FILL ALL JOINTS AND LIFTING HOLES (INSIDE & OUT) 15mm THICK WITH 1:3 NON-SHINK MORTAR MIX.
  3. ALL ADJUSTMENTS TO CHAMBER AND KEY COVERS SHALL BE MADE WITH POURED CONCRETE.
  4. ALL CONCRETE TO BE 30 MPa, TYPE 50 CEMENT.
  5. ALL REINFORCING TO BE HIGH BOND STRUCTURAL GRADE.
  6. WHEN AIR VALVE SPECIFIED, THE CHAMBER WALLS, ROOF COVER (SEE DETAIL) AND CHIMNEY SHALL BE INSULATED WITH 50mm APPROVED INSULATION TO A MINIMUM DEPTH OF 1200mm BELOW TOP OF CHAMBER.
  7. FASTEN INSULATION TO CEILING WITH 50mm DIA. WASHERS (GALVANIZED) & 6mm DIA. TAPCON CONCRETE ANCHORS @ 450mm CENTRES.
  8. DOGHOUSE OPENING TO BE CUT OUT MIN. 50mm LARGER THAN O.D. OF PROPOSED WATERMAIN. PIPE TO BE WRAPPED WITH MIN. 50mm THICK BENSOL PLAST MASTIC. REMAINING CAVITY TO BE GROUTED. (SEE DOGHOUSE DETAIL).
  9. ALL FLANGES TO BE IN ACCORDANCE WITH ANSI/AWWA.
  10. SUPPLY AND APPLY DENSOL CORROSION PROTECTION AS SPECIFIED, TO ALL STEEL, CAST OR DUCTILE IRON SURFACES, SADDLES, (INCLUDING BAILS) VALVES, FLANGES, NUTS AND BOLTS.
  11. SEE CONTRACT DRAWINGS FOR LOCATION/ ORIENTATION OF 50mm AIR VALVE OR 100mm BLOW-OFF IN CHAMBER.
  12. CHAMBER PIPING SHALL BE CONCRETE OR DUCTILE IRON CLASS 54.
  13. WATERPROOF MEMBRANE SHALL BE APPLIED TO ALL CHAMBER WALLS PRIOR TO BACKFILLING.
  14. APPROVED RESTRAINED COUPLING SHALL BE IN ACCORDANCE WITH THE APPROVED WATERMAN PRODUCTS LIST.

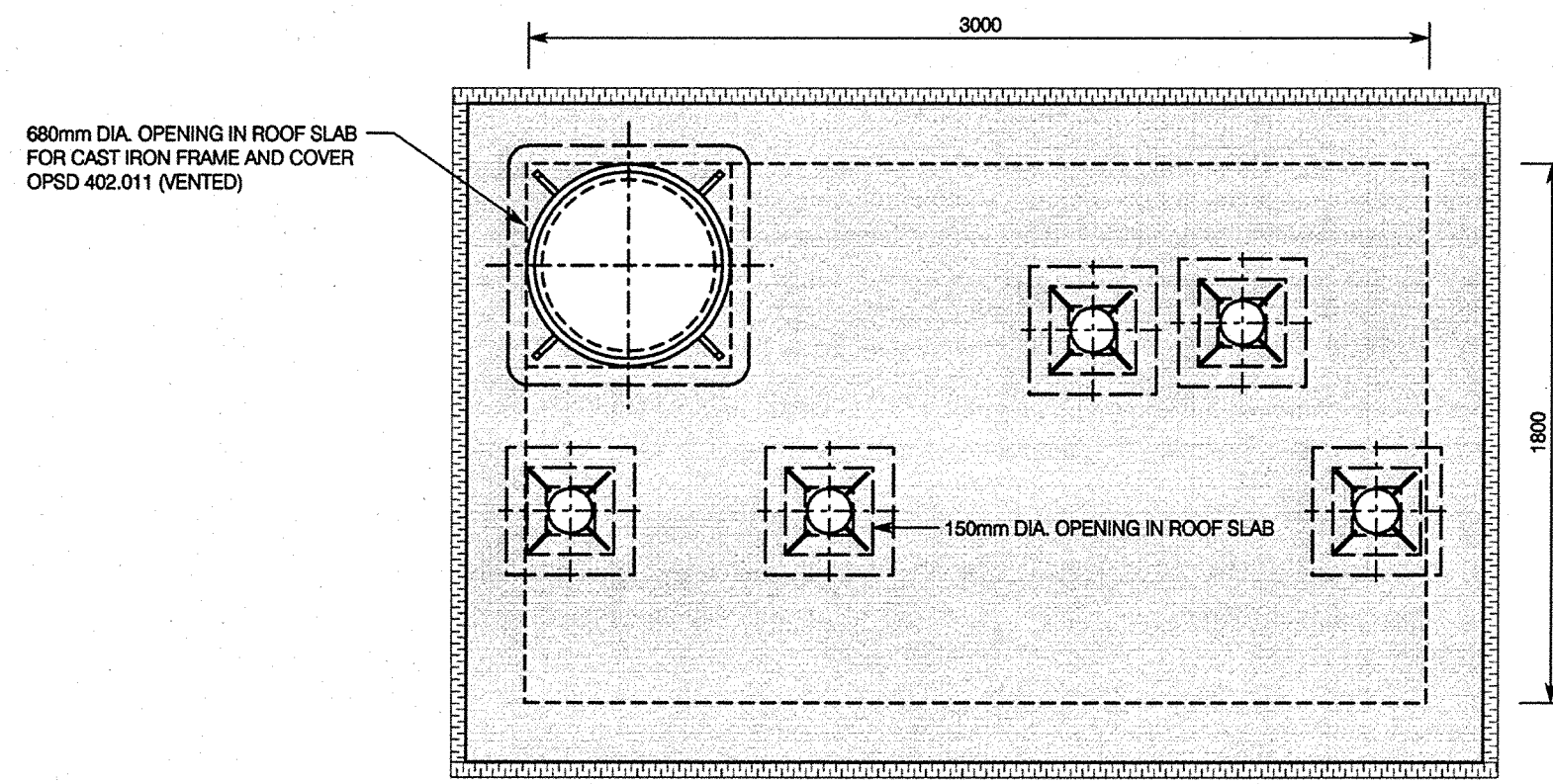
PRECAST CONCRETE
  POURED IN PLACE CONCRETE
  GROUT



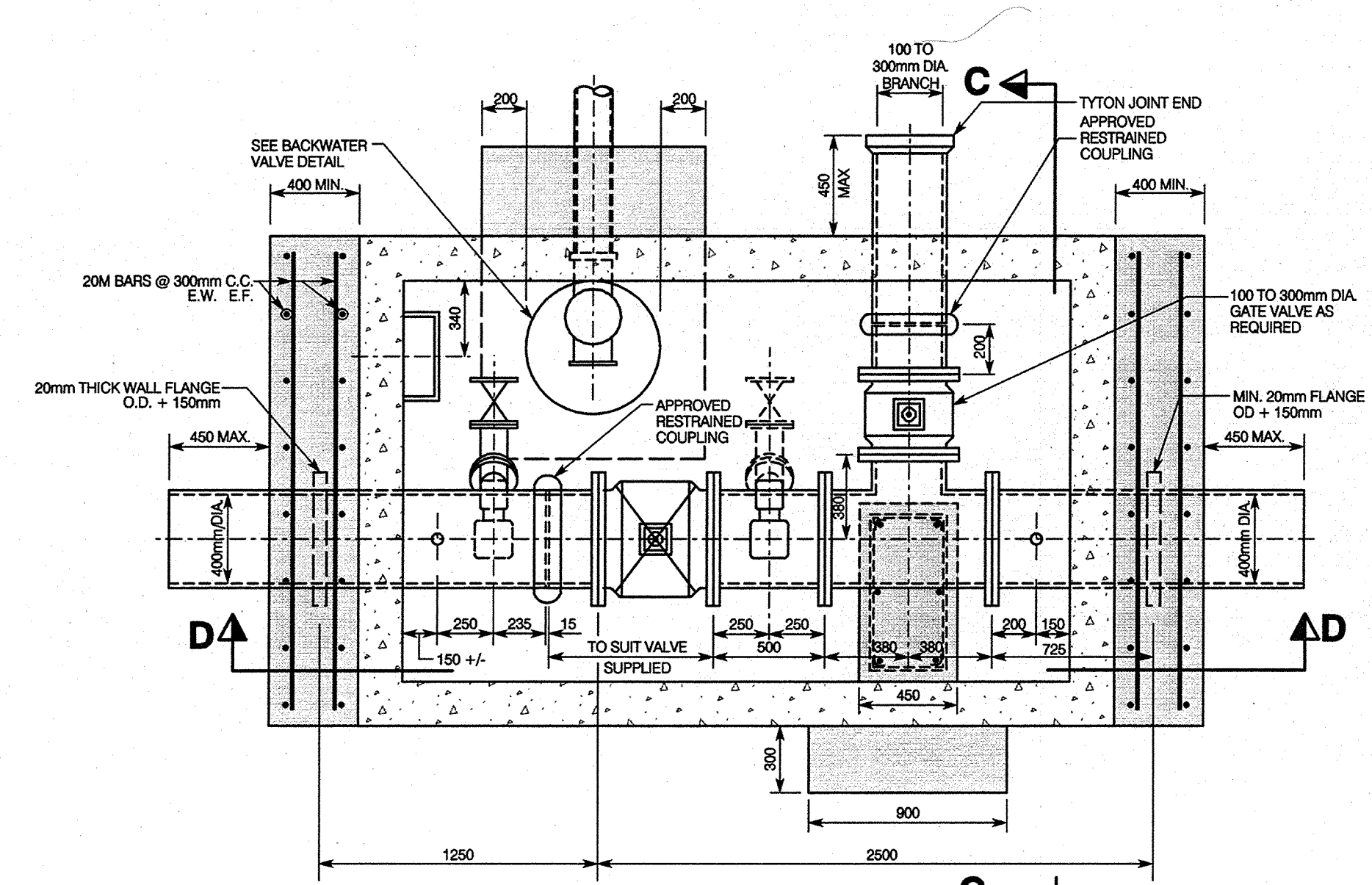
City of Hamilton Public Works Department				
<b>1800mm PRECAST VALVE CHAMBER FOR 400mm TO 500mm DIA. CONCRETE OR DUCTILE IRON PIPE WITH 50mm AIR VALVE &amp; 100mm BLOW-OFF</b>				
DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED	DATE JANUARY 2011	REV No 1	FORMERLY RWS-343	HAMILTON STD No. WM-232



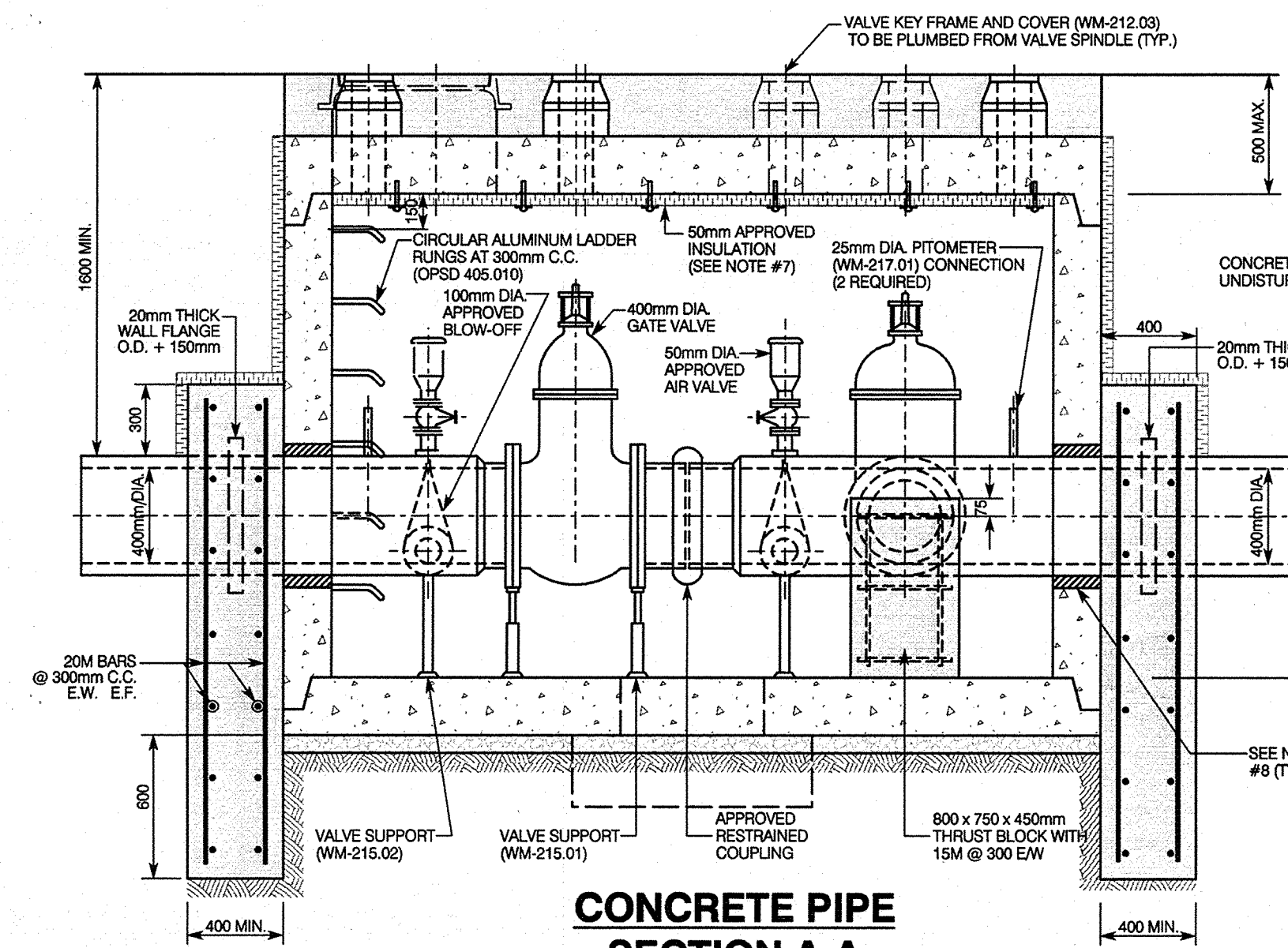
**CONCRETE PIPE PIPING LAYOUT**



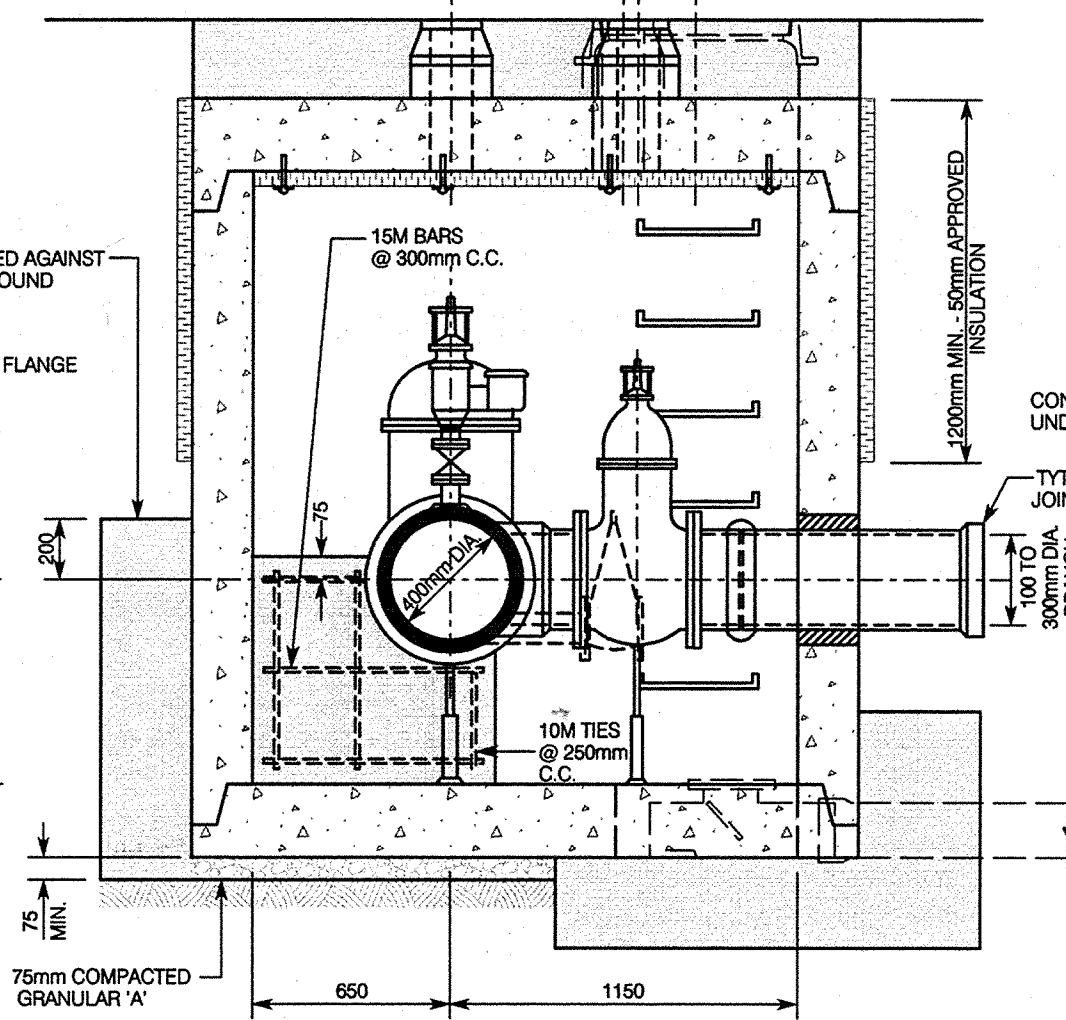
**ROOF PLAN - TYPICAL**



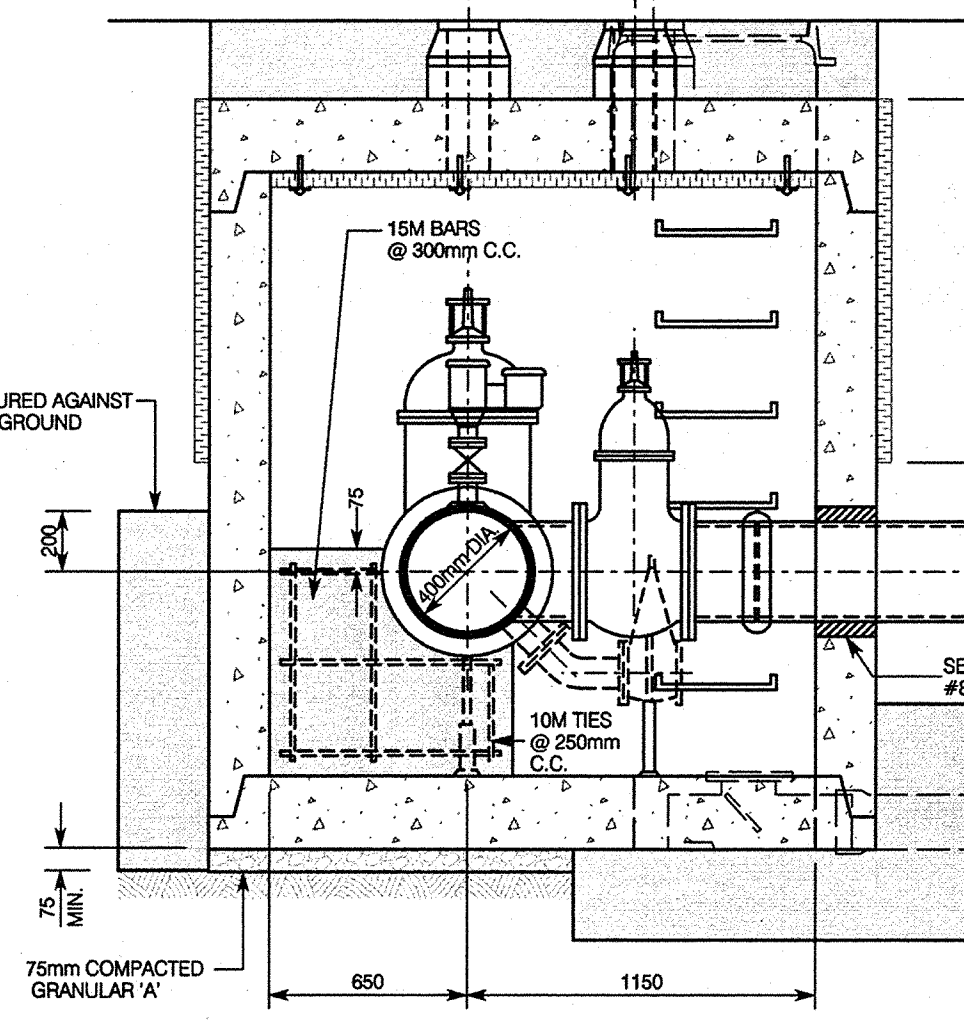
**DUCTILE IRON PIPE - (CL 54) PIPING LAYOUT**



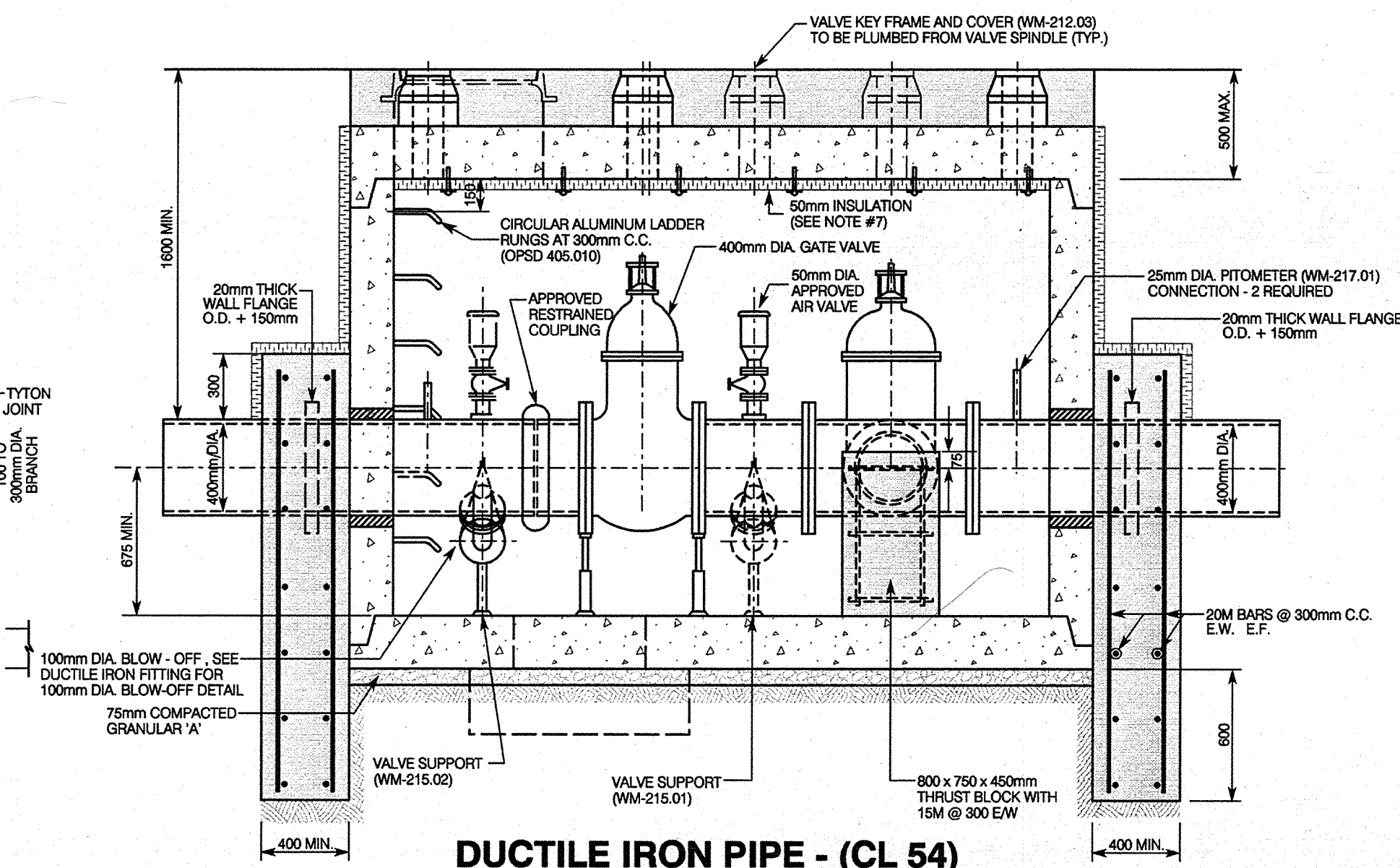
**CONCRETE PIPE SECTION A-A**



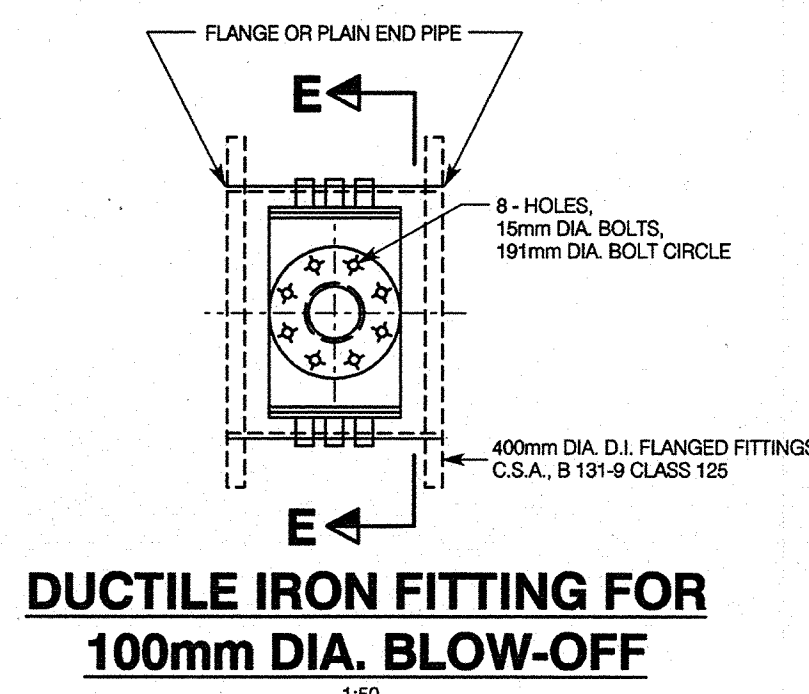
**CONCRETE PIPE SECTION B-B**



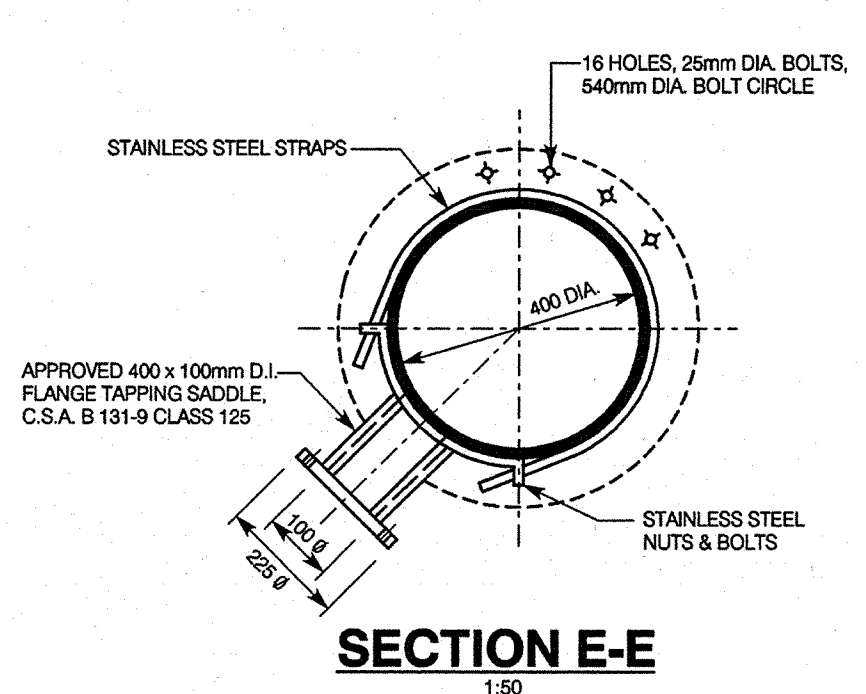
**DUCTILE IRON PIPE - (CL 54) SECTION C-C**



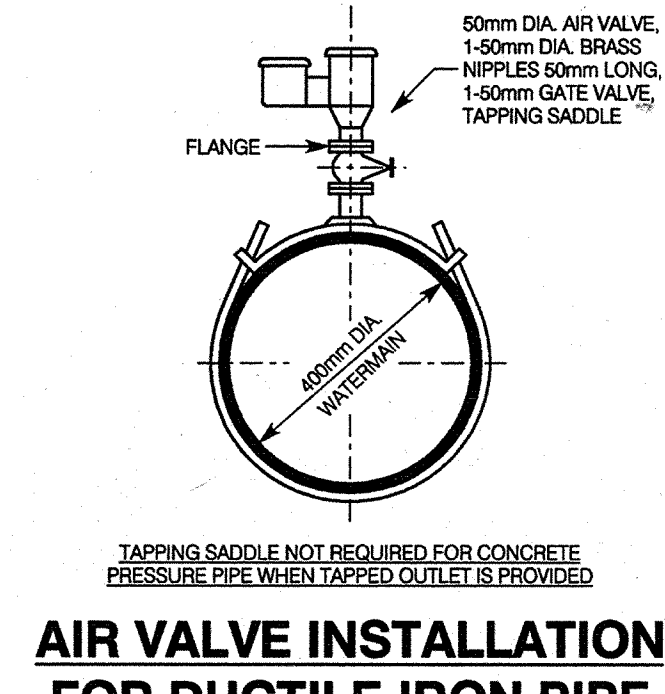
**DUCTILE IRON PIPE - (CL 54) SECTION D-D**



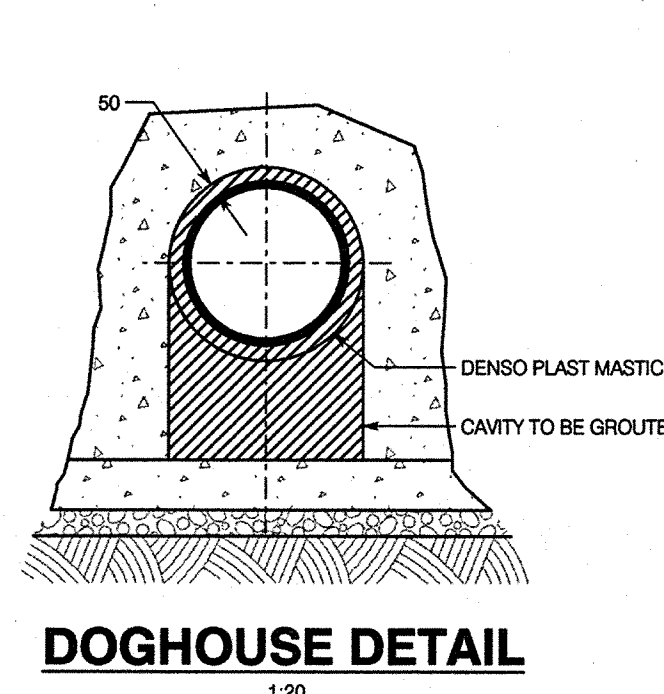
**DUCTILE IRON FITTING FOR 100mm DIA. BLOW-OFF**



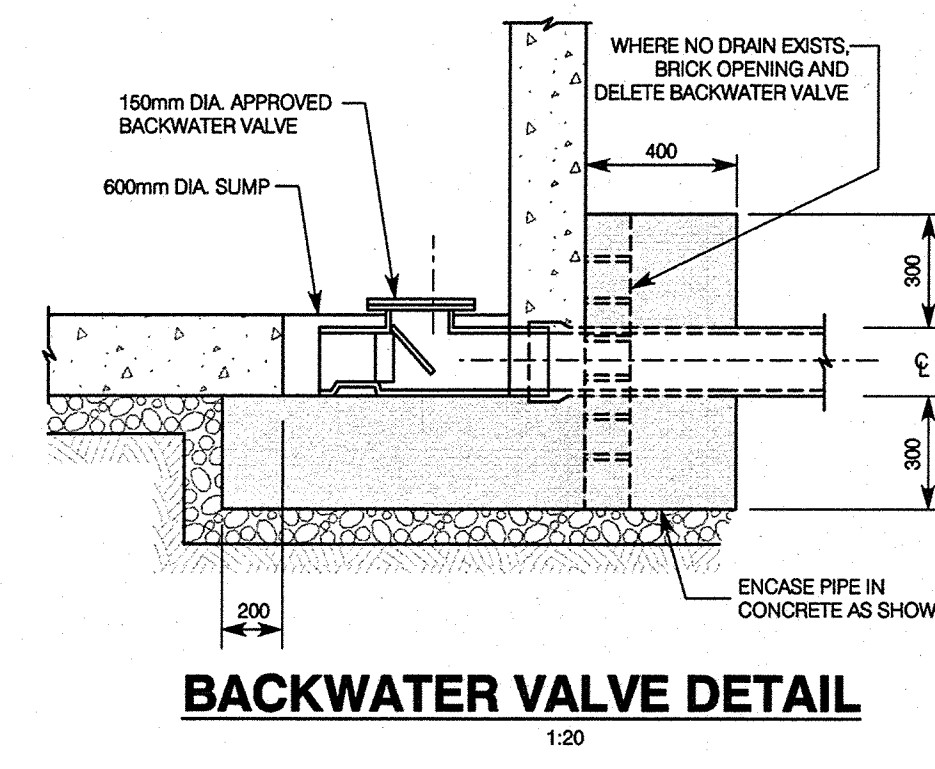
**SECTION E-E**



**AIR VALVE INSTALLATION FOR DUCTILE IRON PIPE**

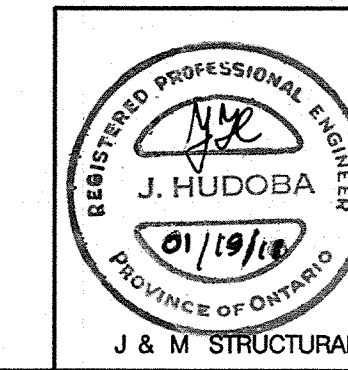


**DOGHOUSE DETAIL**



**BACKWATER VALVE DETAIL**

- NOTES:**
1. PRECAST CHAMBERS AND SECTIONS SHALL BE MANUFACTURED TO ASTM C-478, CSA, MEET H-20 S16 LOADING REQUIREMENTS AND IN ACCORDANCE WITH THE APPROVED WATERMAIN PRODUCTS LIST.
  2. FILL ALL JOINTS AND LIFTING HOLES (INSIDE & OUT) 15mm THICK WITH 1:3 NON-SHRIK MORTAR MIX.
  3. ALL ADJUSTMENTS TO CHAMBER AND KEY COVERS SHALL BE MADE WITH POURED CONCRETE.
  4. ALL CONCRETE TO BE 30 MPa, TYPE 90 CEMENT.
  5. ALL REINFORCING TO BE HIGH BOND STRUCTURAL GRADE.
  6. WHEN AIR VALVE SPECIFIED, THE CHAMBER WALLS, ROOF, COVER (SEE DETAIL) AND CHIMNEY SHALL BE INSULATED WITH 50mm APPROVED INSULATION TO A MINIMUM DEPTH OF 1200mm BELOW TOP OF CHAMBER.
  7. FASTEN INSULATION TO CEILING WITH 50mm DIA. WASHERS (GALVANIZED) & 6mm DIA. TAPCON CONCRETE ANCHORS @ 450mm CENTRES.
  8. DOGHOUSE OPENING TO BE CUT OUT MIN. 20mm LARGER THAN O.D. OF PROPOSED WATERMAIN. PIPE TO BE WRAPPED WITH MIN. 50mm THICK OF DENSO PLAST MASTIC. REMAINING CAVITY TO BE GROUTED. (SEE DOGHOUSE DETAIL).
  9. ALL FLANGES TO BE IN ACCORDANCE WITH ANSI / AWWA.
  10. SUPPLY AND APPLY DENSO CORROSION PROTECTION AS SPECIFIED, TO ALL STEEL, CAST OR DUCTILE IRON SURFACES, SADDLES (INCLUDING BALES) VALVES, FLANGES, NUTS AND BOLTS.
  11. SEE CONTRACT DRAWINGS FOR LOCATION / ORIENTATION OF 50mm AIR VALVE OR 100mm BLOW-OFF IN CHAMBER.
  12. CHAMBER PIPING SHALL BE CONCRETE OR DUCTILE IRON CLASS 54.
  13. WATERPROOF MEMBRANE SHALL BE APPLIED TO ALL CHAMBER WALLS PRIOR TO BACKFILLING.
  14. APPROVED RESTRAINED COUPLING SHALL BE IN ACCORDANCE WITH THE APPROVED WATERMAIN PRODUCTS LIST.



City of Hamilton Public Works Department			
1800 x 3000mm PRECAST VALVE CHAMBER FOR 400mm DIA. CONCRETE OR DUCTILE IRON PIPE WITH 100mm TO 300mm DIA. BRANCH			
DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED 125	DATE JANUARY 2011	REV No 1	FORMERLY RWS-344
HAMILTON STD No. WM-233			