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## REVISION INFORMATION SHEET

### CITY OF HAMILTON

## CONSTRUCTION AND MATERIALS SPECIFICATIONS MANUAL

### MANUAL REVISION #1 – April 2008

This revision shall take effect on April 3, 2008. 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 It is recommended that you retain superseded versions of specifications for future reference.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: [www.myhamilton.ca](http://www.myhamilton.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 \$75.30 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:**

Superseded / Cancelled (Remove)		Revised / New (Insert)		Comments
Document	Dated	Document	Dated	
Form 100 Instructions to Bidders	June 2006	Form 100 Instructions to Bidders	June 2007	2007 version included for information
Form 500 Specification for Sewer Pipe Materials and CCTV Inspection	June 2006	Form 500 Specification for the Sewer Pipe Materials and CCTV Inspection	April 2008	Revised – PVC Profile pipe not acceptable – under review
Approved Watermain Products List	June 2006	Approved Watermain Products List	April 2008	Updated
Approved Sewer Products List	June 2006	Approved Sewer Products List	April 2008	Updated
WM-205.01	Nov 2005	WM-205.01	March 2008	Revised
WM-205.02	Nov 2005	WM-205.02	March 2008	Revised

**Revision Summaries**

These summaries are for information purposes and will highlight major or substantial changes only. Each revision and specification should be reviewed in it's entirety.

**Summary of Revisions to Form 100 – Instructions To Bidders**

- June 2007 version provided for information purposes

**Summary of Revisions to Form 500 – Specification for Sewer Pipe Materials and CCTV Inspection**

- “Ribbed” or “Profile” pipe is no longer permitted for storm sewer installations (under review)
- CCTV Data format requirements updated

**Summary of Revisions to the Approved Watermain Products List**

- Product listings updated and expanded
- 400mm gate valves shall be resilient wedge, 75mm by-pass not required

**Summary of Revisions to the Approved Sewer Products List**

- Product listings updated and expanded
- PVC “Ribbed” or “Profile” pipe no longer accepted for storm sewer installation (under review)
- KOR-N-TEE sewer connector no longer accepted (under review)

**Summary of Revisions to WM-205.01 and WM-205.02**

- PVC installation detail added – installations will require a pre-manufactured tapped coupling with restrained joints

IRREGULARITY		RESPONSE
1.	Late Bids	Late Bids will not be accepted and will be returned unopened to the Bidder.
2.	Unsealed Bid Envelopes/Containers.	Unsealed Bids will not be accepted.
3.	Bids not completed by legible writing, ink or typewriter.	Automatic rejection.
4.	Part Bids: (a) All required sections in Form of Tender not bid  (b) unit price Bids: (i) unit price missing  (ii) lump sum item price missing  (c) lump sum Bids: (i) lump sum contract price missing  (ii) missing information on the lump sum breakdown page	Automatic rejection  Automatic rejection  Automatic rejection  Automatic rejection  Two (2) City business days from time of demand by City staff to provide missing information. If Bidder fails to do so, the Bid will be rejected by the City. Breakdown page is for administrative purposes only.
5.	Qualified Bids (Bids restricted by a statement added to the Form of Tender or a covering letter or alterations to the Form of Tender)	Automatic rejection unless the Tender documents specifically permit such qualification.
6.	Execution of Form of Tender by Bidder:  (a) Original signature of Bidder missing, with or without any seal being affixed.  (b) Original signature of Bidder present but corporate seal or red legal seal missing.	Automatic rejection.  Two (2) City business days from time of demand by City staff to affix corporate seal or red legal seal. If Bidder fails to do so, the Bid may be rejected by the City.
7.	Failure of Bidder to complete page totals or the summary page, or both, in it's Bid.	No impact on the City rejection or acceptance of Bids since these are for administrative purposes only
8.	Failure of Bidder to acknowledge and provide for all Addenda issued to the Bidder in the Form of Tender.	Automatic rejection unless every change set out in all of the Addenda issued is clearly visible on the face of the Bid submitted OR the relevant Addendum issued is solely for the purpose of revising a closing date.
9.	Bids received on documents other than those original documents supplied by the City in the Tender package.	Automatic rejection unless a Bid is received on a true photocopy of the original documents supplied by the City in the Tender package.



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**.01 BIDS**

**.01.01 Submission of Bids**

Sealed Bids, marked with the name of the project/Contract, addressed and delivered to the Purchasing Section, will be received up to and including the closing date and time specified and to the location specified in the Tender documents.

**.01.02 Form of Tender**

The prices in a Bid shall be in legible inked numbers, and words where applicable, and shall include all materials, appliances, equipment, labour, and services required to complete the work.

The signatures of the authorized signing officers of the Bidder will be in their respective original handwriting and shall be inscribed as required in the Form of Tender. Bids not bearing the original signature of an authorized signing officer(s) of the Bidder will be rejected. Stamped signatures or signatures made by mechanical means (electronic signatures) will be rejected.

**.01.03 Withdrawal of Bids**

Withdrawal of a sealed Bid after its submission to the Purchasing Section will only be allowed prior to the date and time of the closing of the Tender. A withdrawal request must be made in person.

**.01.04 Variation in Bid Prices**

No variation in any unit prices in a Bid will be permitted after a sealed Bid has been submitted to the Purchasing Section, except in the instance of variation due solely to an increase or decrease in the rate of eligible taxes, beyond the control of the Bidder, occurring after the date and time of submission of its Bid. An increase or a decrease in the rate of eligible taxes, under these circumstances, shall alter the price of the tender, but only to the extent of the tax increase or decrease. In the event that a tax increase does occur after the submission of its Bid, the Bidder must prove to the satisfaction of the City that the Bidder will not benefit in any way by reason of the increase.

**.01.05 Correction of Bid Prices**

For unit price Tenders, the City will consider only the unit prices and lump sum item prices provided by the Bidder in its Bid for the respective materials to be supplied or items of work or services to be performed. The City may, at its discretion, correct obvious mathematical errors on the part of the Bidder in computing:

- (a) total prices derived for the estimated quantities and the related unit prices provided by the Bidder in its Bid; and/or
- (b) the Contract Price derived from the sum of all total prices

**.01.06 Rejection of Bids**

The City may reject any Bid, the lowest Bid or all Bids, or may cancel the Request for Tenders and require the submission of new Tenders for any reason within its absolute discretion.

No Bid will be considered by the City unless properly set out on the documents furnished by the City or true photocopies thereof.

Bids received after the designated closing date and time on their due date will not be considered regardless of the circumstances which resulted in their late arrival and regardless of the postal cancellation date that may be imprinted on them.

As a guide to Bidders, but without qualifying any rights and privileges reserved to the City, the Bidders Guidelines attached as Schedule "A" to these "Instructions to Bidders" are indicative of the manner in which discretion reserved by the City is likely to be exercised with respect to irregular or non-compliant Bids. However, the City shall not be liable to any Bidder or other person where it elects to exercise a discretion or reserved privilege or right in a manner different from that above indicated. Irregularities that go beyond the scope of the attached Bidders' Guidelines shall be considered by the Manager of Purchasing.

**01.07. Bids Open for Acceptance**

- (a) Bids shall not be opened until after the date and time specified for the closing of the Tender, and so far as practicable, all Bids shall be opened at one time.
- (b) Unless otherwise provided in the terms and conditions governing a specific Bid, a bid shall be irrevocable (i.e. open for acceptance by the City of Hamilton) for a period of **60 days** following the closing date and time for the Tender.

**.02 ABILITY OF BIDDER**

The Bidder shall submit, when requested, evidence in writing of its ability to furnish all labour and materials necessary and complete all work required in a satisfactory manner.

A statement of the Bidder's current status with the Workplace Safety and Insurance Board is to be submitted prior to execution of the Contract.

**.03 BID SECURITY**

The Bidder must submit with its Bid a bid bond, a certified cheque or irrevocable letter of credit equal to the amount shown in the Form of Tender, Form 002.07 for the particular Contract.

The bid bond, certified cheque or irrevocable letter of credit shall be security of the Bidder that if its Bid is accepted by the City, the Bidder will enter into a contract for the performance of the specified work, within 10 calendar days after the City has given the Bidder written notice that its Bid has been accepted.

If notice is given by prepaid mail, it shall be deemed to have been received on the fifth calendar day following the date of mailing.

The bid bond, certified cheque or irrevocable letter of credit shall be forfeited and surrendered as the assessed amount of liquidated damages in the event of failure on the part of the Bidder to enter into a Contract with the City for the performance of the specified work.

By submitting a Bid, the Bidder agrees that the amount of the bid bond, certified cheque or irrevocable letter of credit is an estimate of the actual damage which may be incurred by the City as a consequence of the Bidder's failure to enter into the said Contract.

The bid bonds, certified cheques or irrevocable letters of credit of Bidders will be promptly returned to them after a Contract for the performance of the specified work has been legally executed by both the City and the Successful Bidder.

**.04 PERFORMANCE OF CONTRACT SECURITY**

Where required by the Form of Tender, a Performance of Contract Bond or an irrevocable letter of credit, and a Labour and Material Payment Bond, each in the amount specified in the Form of Tender are to be supplied by the Bidder in a form approved by the City Solicitor, and is required to be deposited with the City by the Successful Bidder at the time of execution of the Contract.

**.05 NAMING OF SUB-CONTRACTORS**

If the Bidder intends to subcontract a portion, or portions of the work, unless otherwise specified in the Tender documents, the Bidder must provide, within two City business days from the time of demand by City staff, the names and addresses of requested Sub-Contractors acceptable to the Project Manager or designate. Failure to provide the names and addresses, or to provide Sub-Contractors acceptable to the Project Manager or designate, will result in the rejection of the Bid.

**.06 INSURANCE**

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 and paid for by the Successful Bidder, in the amounts and in accordance with all other requirements set out in the General Conditions of the Contract, (Form: 200), and in a form approved by the City.

**.07 TAXES**

Various parts of the project may or may not be exempt from FEDERAL TAXES and ONTARIO PROVINCIAL SALES TAX. For details respecting payment exemptions, rebates and taxes, refer to the "Special Provisions".

**.08 EXAMINATION AND CLARIFICATION OF CONTRACT DOCUMENTS**

Bidders shall carefully examine each of the several Contract Documents and such other documents as are incorporated therein by reference. All questions respecting the interpretation of the terms set out in these documents, or other queries respecting the work, shall be referred, in writing, to the City prior to Bid submission, allowing sufficient time for written clarification to be issued by and received from the Project Manager should the Project Manager consider it necessary.

The submission of such questions or other queries and the failure of the City to answer by the expiration of the tendering period as set out in paragraph 100.01.01 above shall not cause the time for the submission of Bids to be extended.

**.09 ADDENDA**

During the tendering period, the City may advise the Bidder by an Addendum or Addenda, of required changes to be made in these Tender documents. Changes issued in this manner shall become parts of the Tender documents and shall be allowed for in determining the price, or prices, bid for the work. Only written Addenda issued by the City shall be recognized as altering any of the provisions stated in the originally issued Tender documents, and as binding with respect to any contract entered into with the City by the Bidder.

Oral information, instruction and advice from any City representative, including but not limited to City staff and consultants, will not be recognized as changing in any way the content of the written Tender documents and all Addenda thereto, and shall not be relied upon by any Bidder.

**.10 NOTICE TO PROCEED**

After execution of the Contract, the Project Manager shall issue a written Notice to Proceed to the Contractor. The work shall commence on the commencement date specified in the Notice to Proceed, unless otherwise stated in the "Special Provisions".

**.11 LIQUIDATED DAMAGES**

Liquidated damages in the amount specified in the "Special Provisions" and in accordance with the provisions stated in "General Conditions" will be strictly enforced.

**.12 PERMITS, LICENCES AND APPROVALS**

Unless otherwise specifically stated in the Tender documents, the Contractor is responsible for obtaining and maintaining all necessary permits, licences and approvals relating to the work.

**.13 REPORTS AND DRAWINGS**

All soils, geotechnical, borehole and other reports related to the subsurface conditions of the Works which are dated within five years of the date of issuance of the tender for the Works and are in the possession of the City shall be made available to all Bidders. If such a report is not available for a specific project, the City shall make available to all Bidders such other reports which are so dated and are in its possession relating to the geographic area in question. These reports are being provided to the Bidders solely for information purposes and do not form part of the Contract Documents. The information contained in such reports has been used only for the design of the Works. The City accepts no responsibility for the completeness and accuracy of the information contained in such reports and makes no guarantees of the conditions that may be encountered.

Prior to submitting a Bid, Bidders shall do such additional investigation as required to completely satisfy themselves of the subsurface conditions which may be encountered and shall not make any claim to the City because of any error which might exist in the said reports.

The information shown on the Contract drawings regarding subsurface and other site conditions is provided for information purposes only. The City assumes no responsibility for the completeness and accuracy of this information and makes no guarantees of the conditions that may be encountered. Prior to submitting a Bid, Bidders shall do such additional investigation as required to completely satisfy themselves of the subsurface conditions which may be encountered and shall not make any claim to the City on account of its encountering conditions other than those indicated on the Contract Drawings.

**.14 FAIR WAGE POLICY AND SCHEDULE**

All workers employed by the Successful Bidder and its Sub-Contractors to perform the Works shall be paid or provided with wages, benefits and hours of work in accordance with the Fair Wage Policy and Fair Wage Schedule of the City which were in effect on the date of the closing of the Tender for this Contract. The Successful Bidder shall comply in all respects with the Fair Wage Policy and Fair Wage Schedule and is fully responsible for ensuring that all of its subcontractors also comply in all respects with the Fair Wage Policy and the Fair Wage Schedule.

**.15 RECORD AND REPUTATION**

At the discretion of the City the City reserves the right to reject a Bid or to not enter into the Contract where:

- a) the Bidder, or any corporation that is an affiliate of or successor to the Bidder, or an officer, director or shareholder of any of the foregoing, has been involved in litigation with the City of Hamilton, the former Regional Municipality of Hamilton-Wentworth, or any local municipality which formed part of the Regional Municipality of Hamilton-Wentworth, within the five year period immediately preceding the date on which the Contract commences;
- b) the City of Hamilton, the former Regional Municipality of Hamilton-Wentworth or any local municipality which formed part of The Regional Municipality of Hamilton-Wentworth, has made a claim against the Bidder, any corporation that is an affiliate of or successor to the Bidder, or an officer, director or shareholder of any of the foregoing, under a bid bond, performance bond or a warranty bond with the five year period immediately preceding the date on which the Contract commences;
- c) in the opinion of Council or its staff, there are reasonable grounds to believe that it would not be in the best interest of the City to enter into a Contract with the Bidder or any person or entity, including (without limiting the foregoing) the conviction of that Bidder or any person or entity with whom that Bidder is not at arm's length with the meaning of the *Income Tax Act* (Canada) of an offence,
  - (i) under any taxation statute in Canada,
  - (ii) of moral turpitude, whether in Canada or elsewhere;
  - (iii) under the *Environmental Protection Act*, or the corresponding legislation of any other province or any member of the European Union or the United States of America, where the circumstances of that conviction evidence a gross disregard on the part of that Bidder or any person or entity for the environmental well-being of the communities in which it carries on business;

- (iv) relating to product liability or occupational health or safety, whether of Canada or elsewhere, where the circumstances of that conviction evidence a gross disregard on the part of that Bidder or any person or entity for the health and safety of its workers or customers;
- (v) under the *Securities Act* or the corresponding legislation of any other province or any member of the European Union or the United States of America or any state thereof.

**.16**

**REVIEW OF BIDS**

- (1) At the close of the Request For Tenders, all apparently eligible Bids will be examined by a representative of the City to confirm that they are compliant and otherwise complete.
- (2) At its sole discretion, the City may clarify any aspect of any Bid received in respect of the Bid with any Bidder at any time, and may clarify any aspect of the price Bid by the Bidder, and
  - (a) the purpose of such clarification may be,
    - (i) to enable the City to determine whether the Bid to which it relates complies with the Request For Tenders;
    - (ii) to resolve any ambiguity in the language used, or any other vague or uncertain aspect of the Bid.
  - (b) no such clarification shall alter the Bid or constitute negotiation or re-negotiation of the price or any aspect thereof, or the nature or quality of the goods or services to be supplied or performed as set out in the Bid at the date and time of the closing of the Request For Tenders, and all correspondence with a Bidder for the purposes of such clarification shall be conducted through the Purchasing Section or designate.
- (3) Without limiting subsection (2), the City's right to clarify shall include the right to request additional or missing information relating to the work that is to be done or the goods or services that are to be supplied or the manner in which the project or work is to be carried out.
- (4) The right of clarification provided under this section is within the sole, complete and unfettered discretion of the City and is for its exclusive benefit, and may or may not be exercised by the City at any time and in respect to any or all Bids.

- (5) The right to clarify shall ***not*** impose upon the City a requirement to clarify with the Bidder any part of a Bid, and where in the opinion of the Purchasing Manager or Project Manager the Bid is ambiguous, incomplete, deficient, or otherwise not acceptable in any aspect, and the City may reject a Bid either before or after seeking a clarification under this section.
- (6) Neither the review of its submission with any Bidder, nor the seeking of clarification under this section, shall oblige the City to enter into a contract with that Bidder, and shall not constitute an acceptance of that Bid or any other Bid.
- (7) All clarifications under this section shall be in writing, in a form satisfactory for inclusion in the contract and satisfactory to the City.
- (8) Any Bidder may be required to meet with officials of the City within 30 days of being so requested to explain details of the submission, at a place in Hamilton specified by the City, and transportation to and from the meeting for the Bidder's representatives, as well as the hourly or per diem costs of the meeting itself for any such representative, shall be at the expense of the Bidder.

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**.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, sewage, and industrial waste, and to be used as culverts. Unless otherwise amended herein, this specification covers the requirements in OPSS 1820 for concrete pipe materials and production.

**.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 waste. Unless otherwise amended herein, this specification covers the requirements in OPSS 1841 for PVC gravity pipe materials and production.

**.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.

**.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.

**.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.

**.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.

**.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.

**.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 CCTV INSPECTION AND DATA FORMAT**

**.04.01 General**

The following generally describes the work covered under this section:

Inspect sewers to observe and record structural defects, service defects and to assess overall quality of installation.

Code the sewer condition in accordance with the requirements of the UK Water Industry, Engineering and Operations Committee, (WRc) "Manual of Sewer Condition Classification" Third Edition, August 1993 and "Addendum" dated February 1996 and include the findings in an inspection report consisting of a map and CD.

Code all observations in accordance with WRc "Manual of Sewer Condition Classification". Only operators who have successfully attained the North American Association of Pipeline Inspectors (NAAPI) Level of Qualification or equivalent for CCTV Operators shall perform condition coding.

All references to operators having NAAPI Level of Qualification for CCTV Operators shall be understood to mean operators that have been certified or re-certified within the last three (3) years.

Pictures must be clear and in focus and must not be hazy due to steam or water vapour. Level in sewer must be controlled by jetting, by-passing, etc. so that any significant occurrence or defect can be seen in enough detail for identification, including the invert of the line.

If stringing of lines is necessary, it shall be carried out by the contractor as part of the quoted price. The contractor shall be responsible for the removal of all lines, which have been strung. The contractor must immediately notify the Project Manager of any obstruction encountered. Video inspection will begin as soon as possible after stringing is completed. Under no circumstances will string be left in the main for more than two (2) days unless permission is granted from the Project Manager.

Were the contractor encounters manholes (MH's) and/or sewer segments which were not identified by the City and/or not identified on the City's sewer system maps, the contractor shall identify these MH's as MH0001, MH0002 etc. The Work Order No. shall be recorded as 000001, 000002, etc.

**.04.02 Camera Positioning and Speed of Travel**

Ensure that the camera is centred in circular sewer lines and manhole risers and is set at two thirds of the vertical dimension of egg shaped sewer lines at all times during inspection.

Position tolerances will be +/- 10% of the vertical dimension of the sewer.

Camera speed will not exceed 9 metres/minute during sewer and manhole inspections.

If the camera position does not satisfy the requirements for the inspection, re-perform inspection at the Contractor's expense.

**.04.03 Distance Measurement**

Ensure that distance measurement within the sewer is accurate to within 0.5% of the above ground measurement.

Inspection distances will be determined by a remote reading counter capable of measuring to the nearest 0.10 metre.

If the distance measurement does not satisfy the accuracy requirements re-inspect the line at the Contractor's expense.

Use a steel tape to measure manhole depths from the sewer invert to the manhole frame to the nearest 0.01 of a metre.

**.04.04 Picture Quality**

Ensure that CD and digital MPEG video playback provides a minimum of 250 lines of resolution around the periphery of the picture.

Confirm resolution by recording a RETMA type resolution chart or an equivalent approved by the Project Manager; use the following procedure:

Set-up the camera and accessories as is done for actual inspection (i.e. video signal routed through the cable reel, video overlay system etc.);

Show the camera being introduced and reaching its final position for the test

Fill monitoring screen with the resolution chart image;

Illuminate the resolution chart evenly and uniformly without reflection; ensure that the illumination source accurately simulates the lighting used in the sewer;

Record test video for 30 seconds;

Identify camera on the recording;

Record the test at the start of a tape or digital recording.

**.04.05 Operator Certification**

Only operators who have successfully attained the NAAPI (formerly APIO) Level of Qualification for CCTV Operators or have completed an accepted alternate training program will be permitted to operate inspection equipment.

The operator will be fully trained in all aspects of sewer inspection and capable of making accurate observations and recording of all conditions, which may be encountered in the sewers.

Submit a copy of NAAPI (Formerly APIO) qualifications for CCTV Operators Certificate for each operator that will be working on this Contract. Only work completed by NAAPI certified operators will be accepted.

**.04.06 Quality Control/Quality Assurance Procedures**

The Contractor shall implement a formal coding accuracy verification system at the onset of the work to ensure that these accuracy requirements are met. Use the

following procedure as a base and adjust review frequency as required.

Calculate accuracy as a function of the number of defects or construction features not recorded (omissions), and the correctness of the coding and classification recorded.

Verify coding accuracy on a random basis, on a minimum of 10% of the inspection reports or one per videotape, whichever is greater. Submit the coding accuracy checks along with the corresponding CD.

Perform a minimum of two accuracy verifications for each operator for each week working. Re-code inspections not satisfying the accuracy requirements and check the accuracy of the inspection immediately proceeding and following the non-compliant inspection verified by the Contractor. Repeat this process until the preceding and subsequent inspections meet the accuracy requirements.

The City or their designated representative may visit the Contractor's office, at their discretion, to periodically audit quality control procedures and review associated documentation.

The Project Manager or their designated representative will review inspection CD's to ensure compliance with the specifications; only inspections which match the City's Hansen database and have a minimum accuracy for header information of 95%, and a minimum detail accuracy for defects and features of 80% will be accepted.

The Project Manager or their designated representative will review submittals and confirm acceptance within ten (10) working days of submission.

The Project Manager or their designated representative will return non-compliant submissions to the Contractor, for correction at the Contractor's expense.

The Contractor shall resubmit corrected submissions within five working days.

Operators failing to meet the accuracy requirements on two occasions will not be permitted to code on the remainder of this Contract, unless they have successfully re-attained the NAAPI Level of Qualification for CCTV Operators.

#### **.04.07 Equipment**

Inspect sewers using a self-contained inspection unit conforming to the following minimum criteria.

Unit will be configured with separate areas for CCTV viewing and equipment storage.

Unit will be equipped with a cellular telephone and a suitable communication system linking all crew members.

Unit will be equipped with fans and blowers to remove any fog, which may be present in the sewer at the time of the inspection.

Inspect sewers using an integrated CCTV sewer inspection system consisting of cameras, lighting, transport, cables, power source, monitor, videocassette recorder, digital video recorder, and other related equipment.

The camera will be pan and tilt type capable of panning 360° and tilting 270°. The adjustment of focus and iris will allow optimum picture quality and a focal range adjustable from 100 mm to infinity.

The light source will be adjustable to allow an even distribution of light around the sewer perimeter without loss of contrast, flare out of picture, or shadowing.

Video overlay equipment will be capable of superimposing alpha-numeric information onto the video tape and capable of providing a minimum of 15 lines of information, 30 characters per line.

The transport unit will be capable of moving the camera through the sewer using either a rubber tired or crawler tractor.

The transport unit will be capable of passing over minor surface imperfections including but not limited to broken joints and solid debris up to 40 mm in height.

Transport using a float or skid for tow through the sewer will only be permitted where the condition of the sewer precludes the use of a tractor or where authorized by the Project Manager. If the camera is towed the supporting equipment will not impede the view of the camera and will be stable to ensure steady and smooth progress.

The camera transport will permit complete inspection of the sewer from the centre of the start manhole to the centre of the finish manhole.

The camera transport and cable will be capable of inspecting a minimum of 200 metres of sewer from a single access point.

The transport unit will use a remote reading counter to measure distance traveled from the centre of the start manhole; this information will be recorded in metres to the nearest .10 metre.

The camera transport will permit the adjustment of camera height so as to position the centre of the lens in the centre of circular sewers and two thirds of the vertical dimension above the invert of egg shaped sewers.

Sewer plugs will stop or reduce flow from upstream sewer(s) and will permit tethering to and be removable from the ground surface. Plugs will be capable of permitting all or any portion of the flow to be released.

#### **.04.08 CCTV Inspection – Execution of the Work**

Measure the distance between the centres of the start and finish manhole on the ground surface to the nearest 0.01 of a metre using a steel tape prior to beginning the inspection. Implement flow control measures to ensure a minimum of 80% of the height of the sewer is visible for the entire inspection. Evacuate all fog from the sewer. Keep camera lens clean at all times and keep the sewer clear of fog during the entire inspection.

Measure the vertical distance of manholes from the sewer invert to the manhole frame to the nearest 0.01 of a metre using a steel tape before beginning the sewer or manhole inspection.

Conduct all sewer inspections in accordance with the following:

Inspect sewers in the direction of flow unless a reverse set up is required. Begin with the upstream sewer in the system and proceed downstream in a consecutive manner. Inspect all contributing upstream sewers before proceeding downstream.

Ensure that the start manhole is clearly visible at the start of the inspection and perform the inspection from the centre of the start manhole to the centre of the finish

manhole. At the start of the inspection record the length of sewer from the face of the manhole to the cable calibration point and adjust the distance reading at the cable calibration point such that zero is at the face of the start manhole.

Ensure that the automatic distance measurement is displayed on-screen at all times during the inspection. Ensure that the distance measurement is accurate from the cable calibration point to the centre of the finish manhole. Set a maximum camera speed of 9 metres/minute.

Keep the picture in focus during the inspection from the point of observation to a minimum of two pipe diameters ahead. Stop camera for 2 seconds at major defects and connections, junctions, and major branches. Rotate and pan the camera to provide a perpendicular view of all major defects, connections, junctions, and major branches. Major defects to include but not be limited to deformed sewers, displaced bricks, holes, large displaced joints, missing bricks, missing mortar, obstructions, and large open joints.

Capture an image (jpeg, CD or digital file) and notify the Project Manager immediately if flow disparity, clear water infiltration, hole or missing bricks, collapse, void, or deformation > 10%, are observed during the course of inspection. Turn over captured images to the Project Manager with the submission of the inspection report (CD), photograph's shall be in JPEG format, in colour and saved to CD.

The Contractor shall re-perform sewer inspections where the Project Manager has determined the specified tolerance requirements have not been satisfied.

#### **.04.09 Reverse Set-up**

If inspection of an entire sewer cannot be completed due to a collapse, excessive deformation or solid debris, intruding connections, obstructions, or large displaced joints, move equipment to the downstream manhole and attempt inspection in the upstream direction.

Advise the Project Manager if complete manhole-to-manhole inspection still cannot be performed. Jointly, the Contractor and Project Manager will decide to:

- i. abandon the inspection;
- ii. re-perform the inspection subsequent to:
- iii. perform solid debris cutting;
- iv. remove intruding connections;
- v. modify the camera setup (position and/or method of transport);
- vi. complete emergency repairs.

Track all locations where a complete inspection could not be obtained. Review these locations with the Project Manager on a daily basis. Record the Sewer ID number & Work Order No., steel tape measurement, length inspected (up and downstream), length of missing video and the reason the inspection could not be completed.

#### **.04.10 Digital File Formats**

Digital Format Video will be in conformance with the following requirements.

Capture in colour from the live video source directly to the recording equipment in digital format.



slim-line clear “jewel cases” capable of displaying the information in the ‘Report Label Template’ and the ‘Typical Video Summary Data’ tables.

Ensure that the entire inspection is contained on same compact disc. Where possible, record reverse set-up inspections immediately after original inspection.

At the start of each survey use a video overlay system to clearly display, on the monitor and video recording, the following alpha-numeric information for 30 seconds.

**CCTV HEADER SCREEN TEMPLATE**

CITY OF: HAMILTON	
GROUP: AM06-28	DATE: 06-05-12
	TIME: 10:46
STREET: DESJARDINS AV	
START MH: DA12A019	MH DEPTH: 03.90
MH LOC: MH AT GRANT BLVD	
FINISH MH: DA11A008	MH DEPTH: 04.10
MH LOC: MH AT ADELAIDE AV	
MATERIAL: Vitrified Clay	
SIZE: 0250	SURF DIST: 114.0
DUTY: Sanitary	DIR: Downstream
WEATHER: Dry	CON: XYZ HK

During the inspection clearly display the following information on the periphery of the screen, on the monitor and video and compact disc recording. Arrange the information to minimize interference with the inspection image:

DESJARDINES AV	
DA12A019	
	DA11A008
62.8m	

The Contractor shall ensure that HANSEN manhole numbers and Work Order inspection numbers are used on all inspection reports. Failure to include this information on all hard-copy, video and digital data provided may result in delay of payment for work completed.

If more than one inspection is provided on a single CD or DVD, then the contractor shall submit with the CD/DVD a table of contents identifying the inspected sewer segments contained on the CD.

One copy (first generation copy quality) is to be provided to the City of Hamilton. The database shall be inside the first CD/DVD and shall contain all inspections done under the job package.

#### **.04.11 Data Format**

##### **1. General**

The following describes the database format and data deliverable requirements.

All electronic deliverables shall be delivered in CD/DVD. Depending on the size of the work package, more than one CD/DVD might be required.

The first CD/DVD must contain:

1. The WRc.mdb database file containing all inspection data under the work package.
2. The Abandoned Surveys.doc describing the reasons of any abandoned and not completed surveys, if any.
3. A video file can be included here but it is not mandatory and can be part of other CDs/DVDs that are part of the package.

The Database file (mdb), the Abandoned Surveys file (doc), picture files (Jpg), and all video files (mpg) on all deliverables must be in the root directory (no folders) of CD/DVD.

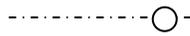
The database format is a combination of NAAPI and City of Hamilton standards for Header and Condition Details sections.

- a) The database file must be named WRc.mdb
- b) The database file must contain all final inspections ordered in the job package excluding abandoned surveys or surveys not done for any reason.
- c) Inspections done prior to reaming or extra cleaning should be excluded from the database but be included in the video deliverable as proof of reaming or extra cleaning requirements.

**The Format/Structure of submitted Database will be as follows:**

HEADER		
PK	ID	LONG
	<b>SURVEYEDBY</b>	<b>CHAR(12)</b>
	<b>CONTRACTNUMBER</b>	<b>CHAR(8)</b>
	<b>JOBNUMBER</b>	<b>CHAR(10)</b>
	<b>DATE</b>	<b>DATETIME</b>
	<b>TIME</b>	<b>DATETIME</b>
	<b>LOCATION</b>	<b>CHAR(30)</b>
	<b>STARTMANHOLE</b>	<b>CHAR(10)</b>
	<b>SDEPTH</b>	<b>DOUBLE</b>
	<b>FINISHMANHOLE</b>	<b>CHAR(10)</b>
	<b>FDEPTH</b>	<b>DOUBLE</b>
	<b>DIRECTION</b>	<b>CHAR(1)</b>
	<b>SIZE1</b>	<b>INTEGER</b>
	<b>SIZE2</b>	<b>INTEGER</b>
	<b>SHAPE</b>	<b>CHAR(1)</b>
	<b>MATERIAL</b>	<b>CHAR(5)</b>
	<b>PIPELENGTH</b>	<b>INTEGER</b>
	<b>TOTALLENGTH</b>	<b>DOUBLE</b>
	<b>VIDEONUMBER</b>	<b>CHAR(5)</b>
	<b>COMMENTS</b>	<b>CHAR(50)</b>
	<b>PURPOSE</b>	<b>CHAR(1)</b>
	<b>SEWERCATEGORY</b>	<b>CHAR(1)</b>
	<b>PRECLEANING</b>	<b>CHAR(1)</b>
	<b>WEATHER</b>	<b>CHAR(1)</b>
	<b>FURTHERDETAILS</b>	<b>CHAR(48)</b>

ConDetail		
PK	ID	LONG
	<b>VIDEONUMBER</b>	<b>INTEGER</b>
	<b>PHOTGRAPH NUMBER</b>	<b>INTEGER</b>
	<b>DISTANCE</b>	<b>DOUBLE</b>
	<b>CONTINUOUSDEFECT</b>	<b>CHAR(2)</b>
	<b>CODE</b>	<b>CHAR(4)</b>
	<b>DIAMETER_DIMENSION</b>	<b>INTEGER</b>
	<b>CLOCKFROM</b>	<b>CHAR(2)</b>
	<b>CLOCKTO</b>	<b>CHAR(2)</b>
	<b>PERCENTAGE</b>	<b>INTEGER</b>
	<b>INTRUSION</b>	<b>INTEGER</b>
	<b>JOBNUMBER</b>	<b>CHAR(10)</b>
	<b>REMARKS</b>	<b>CHAR(10)</b>
<b>Fk1</b>	<b>HEADERID</b>	<b>LONG</b>



**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	PACKAGE/JOB NUMBER PROVIDED BY CITY IN ORDER FORM (AM09-12)
JOBNUMBER	CHAR(10)	YES	INSPECTION NUMBER PROVIDED BY CITY IN ORDER FORM (1596565)
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	LENGTH OF PIPE FROM MH TO MH
VIDEONUMBER	CHAR(5)		VIDEO FILE REFERENCE (09121)
COMMENTS	CHAR(50)		COMMENTS (AVOID USE OF " ' \ \ CHARACTERS)
PURPOSE	CHAR(1)		NOT REQUIRED
SEWERCATEGORY	CHAR(1)		NOT REQUIRED
PRECLEANING	CHAR(1)		Y OR N
WEATHER	CHAR(1)		WEATHER CODE (1 TO 5)
FURTHERDETAILS	CHAR(48)		COMMENTS (AVOID USE OF " ' \ \ CHARACTERS)

### Condition 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)
CONTINUOUSDEFECT	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(10)		REMARKS FOR OBSERVATION (AVOID USE OF " ' \ CHARACTERS)
JOBNUMBER	CHAR(10)	YES	INSPECTION NUMBER PROVIDED BY CITY IN ORDER FORM (1596565)
HEADERID	LONG	YES	FOREIGN KEY LINKING THIS RECORD TO HEADER TABLE

- Required fields are mandatory for successful data transfer.
- 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.
- All preceding and trailing spaces must be removed from all fields.
- Not populated fields must be NULL (empty), the use of 0 will cause problems in data transfer.

The Abandoned surveys document shall be named Abandoned Surveys.doc and must include the following information for each abandoned or failed inspection:

- Street
- Date and time of inspection/cleaning attempt.
- Start Manhole ID and Finish Manhole ID.
- Reason(s) the inspection could not be completed.
- Details to support the reason(s) if necessary.

Some acceptable reasons for abandoned or unsuccessful inspections include, but not limited to:

- Can not locate upstream and downstream manholes
- Line obstruction – reversal not possible (explanation required)
- Line obstruction – can not clean/remove obstruction (explanation required)
- Unsafe conditions due to \_\_\_\_\_ (explanation required)

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>	Anodes for Cathodic Protection  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		
	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, tyton joint, AWWA C104 C110 / A21.10 OPSS 701.05.02	Bibby	
		Sigma	
		Star Pipe Products	
	Ductile Iron 400mm and larger Class 52, cement lined restrained mechanical joint AWWA C104 C110 / A21.10 OPSS 701.05.02	Bibby	
		Sigma	
		Star Pipe Products	
	PVC 100mm, 150mm and 200mm, injection molded AWWA C907 B137.3 OPSS 701.05.04	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 segments of 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  100mm "STORZ" pumper connection  Nuts, bolts and studs to be stainless steel  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 is the 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 500mm and larger AWWA C300, C301, C302 and C303 OPSS 701.05.03	Hyprescon	
	Ductile Iron 100mm to 300mm Pressure Class 350 AWWA C104 / A21.3, C110 / A21.10	Canada Pipe Company	Includes polyethylene encasement of pipe and fittings AWWA C105 / A21.5
	Ductile Iron 400mm to 1050mm Class 52 AWWA C104 / A21.3, C110 / A21.10	Canada Pipe Company	Includes polyethylene encasement of pipe and fittings AWWA C105 / A21.5
	Polyvinyl Chloride (PVC) 100mm to 300mm AWWA C900 - DR18 OPSS 701.05.04	Ipex	Blue Brute
		Royal Pipe	Royal Seal
	Polyvinyl Chloride (PVC) 400mm AWWA C905 – DR18 OPSS 701.05.04	Ipex	Big Brute, Centurion
		Royal Pipe	Royal Seal
	Polyvinyl Chloride (PVC) 500mm to 750mm AWWA C905 OPSS 701.05.04	Ipex	Big Brute, Centurion
		Royal Pipe	Royal Seal
	Water Service Pipe 19mm to 50mm ASTM B88 Type K Soft Copper	Wolverine	
<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

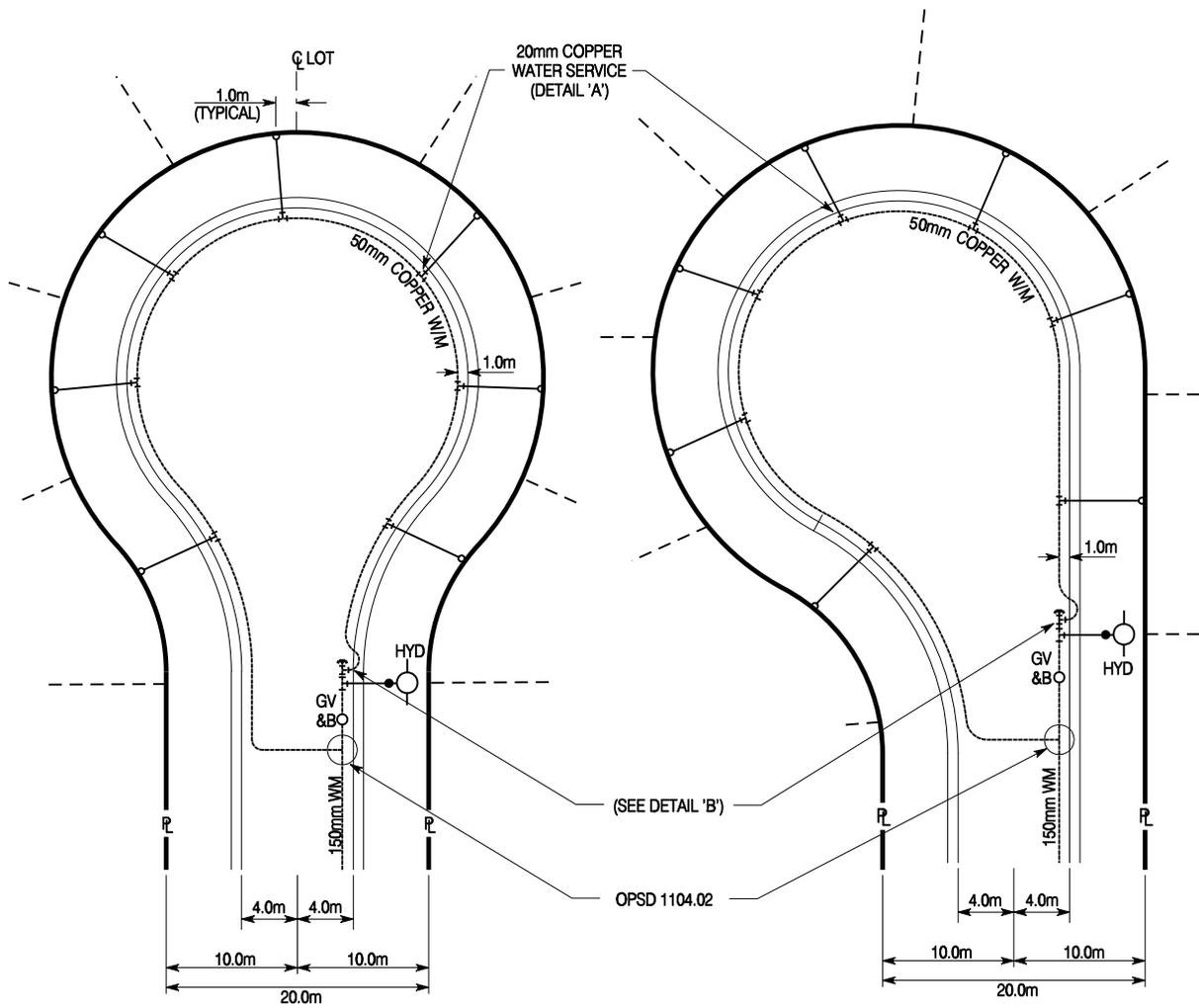
PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Service Saddles</b>	DI, PVC Pipe Outlet size 19mm to 50mm  stainless steel straps Denso protection at installation AWWA taper (cc)	Cambridge Brass	403 and 812 Series
		Ford	FS202
		Robar Industries	2506 DS, 2616
		Romac	202 BS (2 strap model)
		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 TW75, TWU75 or RW90XLPE		
<b>Valves</b>	<b>Butterfly Valve 450mm to 600mm</b>  AWWA C504, Class 150B manual actuator - traveling nut type with external position indicator nuts, bolts, and bolt studs to be stainless steel  Former City of Hamilton: 25mm operating nut, open right (clockwise)  Former Municipalities: 50mm operating nut, open left (counter clockwise)	Clow Canada	M & H 504 (450mm to 500mm)  M & H AWWA Large Diameter (600mm and larger)
		Mueller	Lineseal

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Valves Cont'd.</b>	<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
	<p><b>Combination Air Release and Vacuum Breaker Valves</b></p> <p>AWWA C512 with surge protection</p>	A.R.I Flow Control Accessories	D-060 C HF NS
		Vent-O-Mat	Water RBX Series
	<p><b>Tapping Valves</b> 100mm to 300 mm AWWA C509</p>	Clow	F-6106
		Mueller	A2360-19
	<p><b>Tapping Valves</b> 400mm to 600mm AWWA C509</p>	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

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Valve Chambers</b>	OPSS 407, 1351	Anchor	
		Con Cast	
		Hanson	
		MCon	
		Munro Concrete	
		Wilkinson	
<b>Valve Chamber Frame and Cover</b>	OPSS 1850 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 705 OPSS 1351	Con Cast	
		Hanson	
		M-Con	
		Wilkinson	
<b>Catch Basin Frames &amp; Covers</b>	OPSD 400.020 OPSD 400.070 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	Coldstream	
		Con Cast	
		Hanson	
		M-Con	
		Wilkinson	

PRODUCT	SPECIFICATION	MANUFACTURER	DESCRIPTION/ MODEL No.
<b>Maintenance Hole Frames &amp; Covers</b>	OPSD 401.010 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)
		Con Cast Pipe	
	Concrete Pipe - Reinforced 300mm or greater  CSA A257.2 65-D, 100-D, 140-D and 150-D  Form 500	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  OPSS 1841 Form 500	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
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)



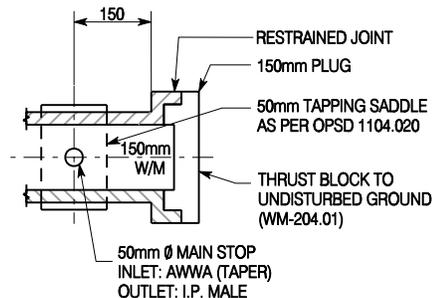
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SYMMETRICAL**

**20.0m R.O.W.  
OFFSET LEFT**

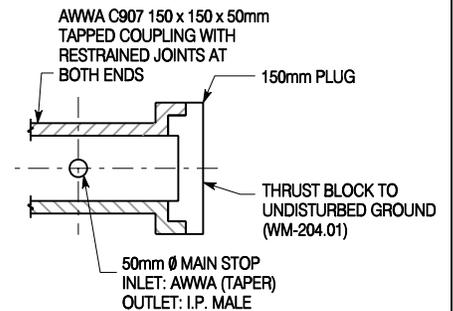


BRASS SERVICE TEE  
COMPRESSION ALL AROUND

**DETAIL 'A'**



**DETAIL 'B'**  
DUCTILE IRON INSTALLATION



**DETAIL 'B'**  
PVC INSTALLATION

City of Hamilton  
Public Works Department

**50mm WATERMAIN LOOPING IN CUL-DE-SACS  
(20m R.O.W.)**

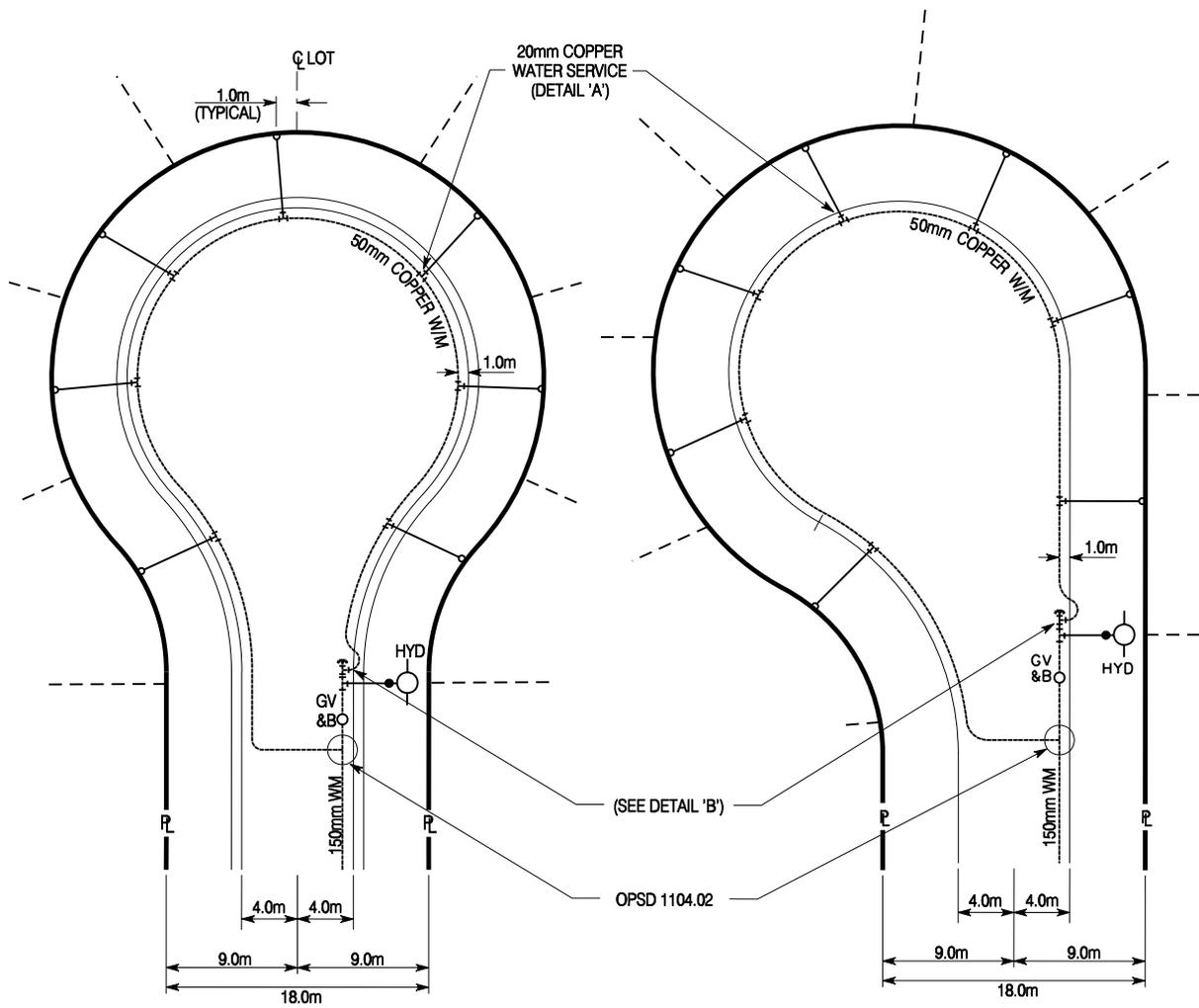
DIMENSIONS SHOWN ARE IN MILLIMETRES  
UNLESS OTHERWISE NOTED (N.T.S.)

DATE  
March 2008

REV No  
1

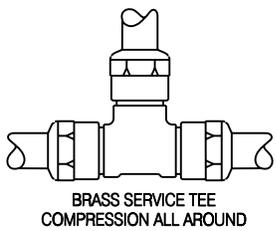
HAMILTON STD No

**WM-205.01**

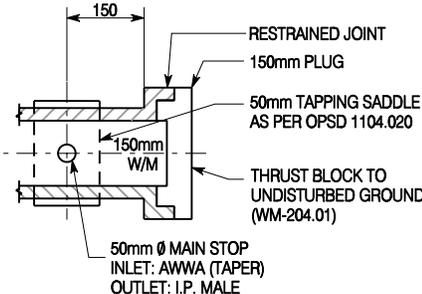


**18.0m R.O.W.  
SYMMETRICAL**

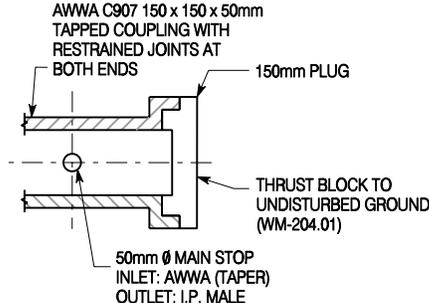
**18.0m R.O.W.  
OFFSET LEFT**



**DETAIL 'A'**



**DETAIL 'B'**  
DUCTILE IRON INSTALLATION



**DETAIL 'B'**  
PVC INSTALLATION

City of Hamilton  
Public Works Department

**50mm WATERMAIN LOOPING IN CUL-DE-SACS  
(18m R.O.W.)**

DIMENSIONS SHOWN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED (N.T.S.)	DATE March 2008	REV No 1	HAMILTON STD No <b>WM-205.02</b>
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