INFRASTRUCTURE DESIGN STANDARDS – FIGURES

SECTION 2 – SANITARY SEWER COLLECTION SYSTEMS

SANITARY SEWER DESIGN SHEET
MIDDLESEX CENTRE

RESIDENTIAL POPULATION DENSITIES

(A) HECTARE BASIS

THE FOLLOWING POPULATION ALLOWANCES WILL APPLY WHEN DESIGNING SANITARY SEWERS:

LOW DENSITY (SINGLE-FAMILY/SEMI-DETACHED	= 30 UNITS/HECTARE @ 3 PEOPLE/UNIT
MEDIUM DENSITY (TOWNHOUSE/ROWHOUSE)	= 75 UNITS/HECTARE @ 2.4 PEOPLE/UNIT
HIGH DENSITY (APARTMENTS)	= 150-300 UNIT/HECTARE @ 1.6 PEOPLE/UNIT

(B) LOT BASIS

SINGLE FAMILY	= 3 PEOPLE
DUPLEX / SEMI	= 6 PEOPLE

DESIGN CRITERA

SEWAGE = 350 LITRES/CAPACITY/DAY
INFILTRATION = 8640 LITRES/HECTARE/DAY
PEAKING FACTOR: $M = 1 + \frac{14}{4+P^{0.5}}$

DATE: _____
DESIGNED BY: _____

PROJECT NAME: _____

PROJECT FILE NO. _____

LOCATION				AREA			POPULATION					SEWAGE FLOWS			SEWER DESIGN					PROFILE						
																								INVERT ELEVATION		
AREA No.	STREET	FROM MANHOLE	TO MANHOLE	NET OR GROSS	DELTA HECTARES	TOTAL HECTARES	PER HECTARE	PER LOT	No OF LOTS	DELTA POP.	TOTAL POP	INFILT L/S	SEWAGE L/S.	TOTAL L/S	n	PIPE SIZE mm	SLOPE %	CAP L/S	VELOCITY m / s	LENGHT M	FALL IN SEWER	HEADLOSS	DROP IN MANHOLE	U.S.	D.S.	PEAKING FACTOR

FIGURE 2.1

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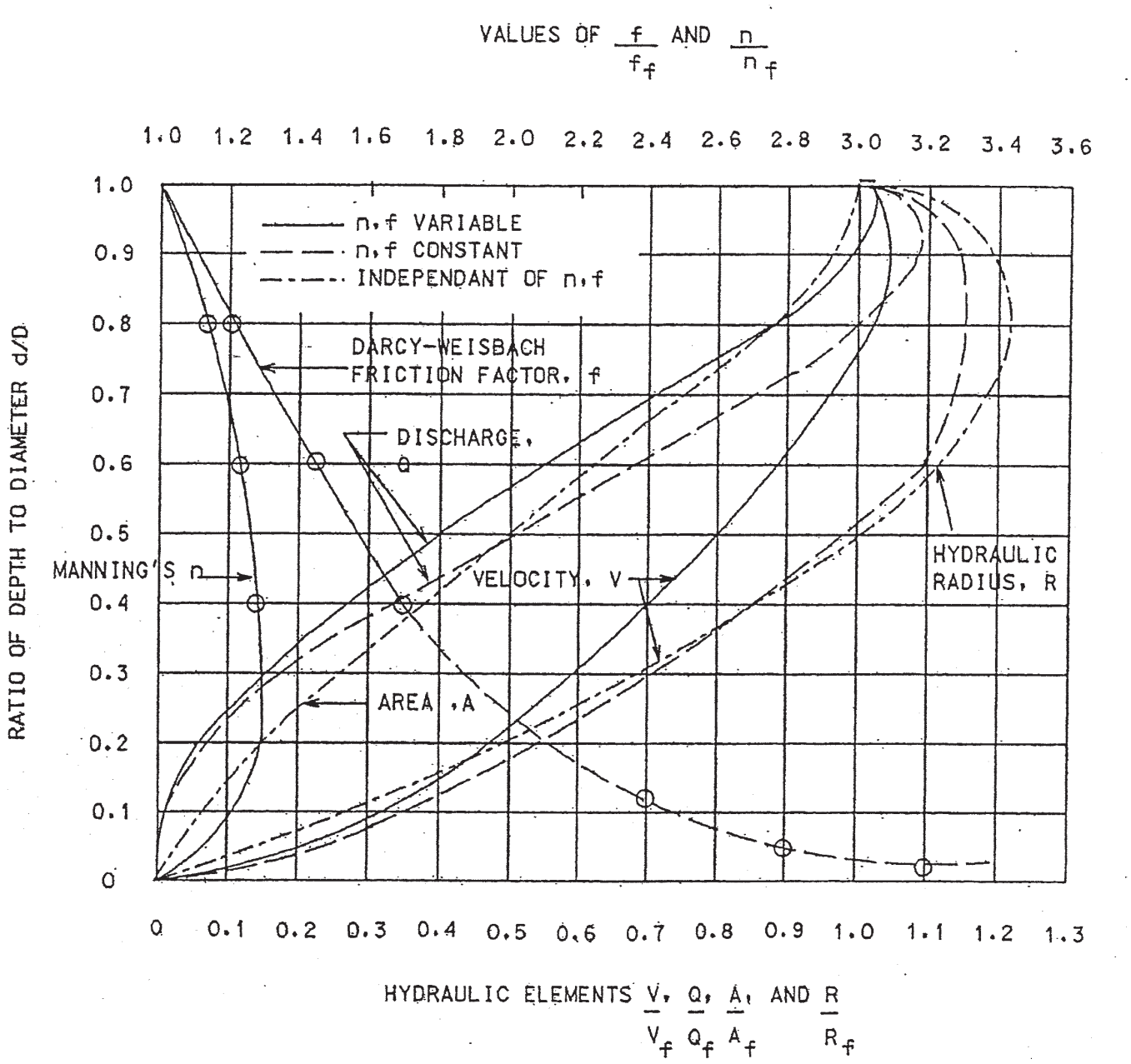
SANITARY SEWER DESIGN CHART

SAMPLE ONLY

To be produced on Design Drawing at legiable scale

DATE: 2017-04

FIGURE 2.1



NOTE:

1. Information taken from the American Society of Civil Engineers (ASCE) Manual

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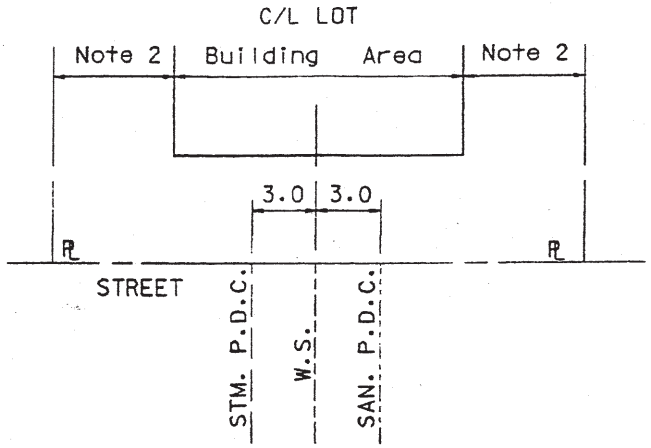
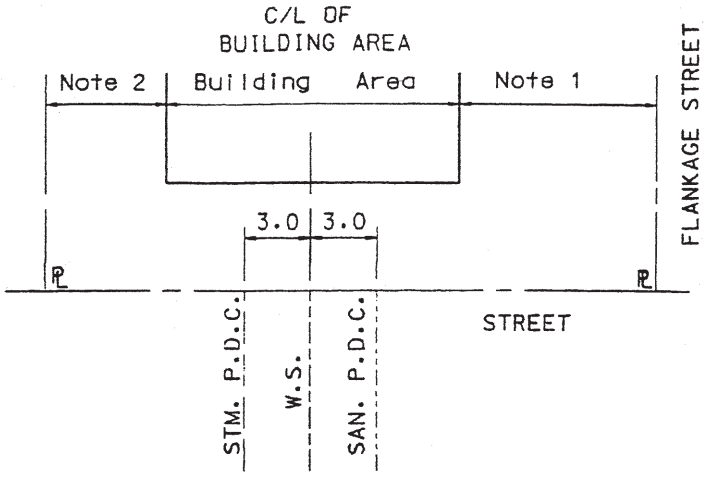
HYDRAULIC ELEMENTS GRAPH FOR CIRCULAR SEWERS

DATE: 2017-04

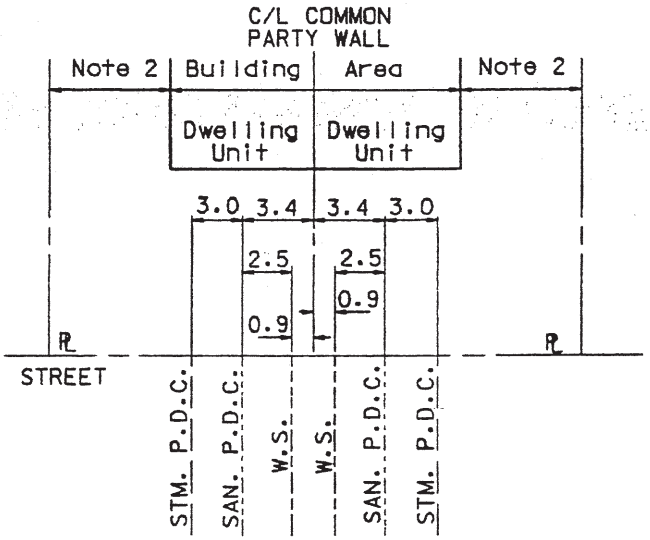
FIGURE 2.2



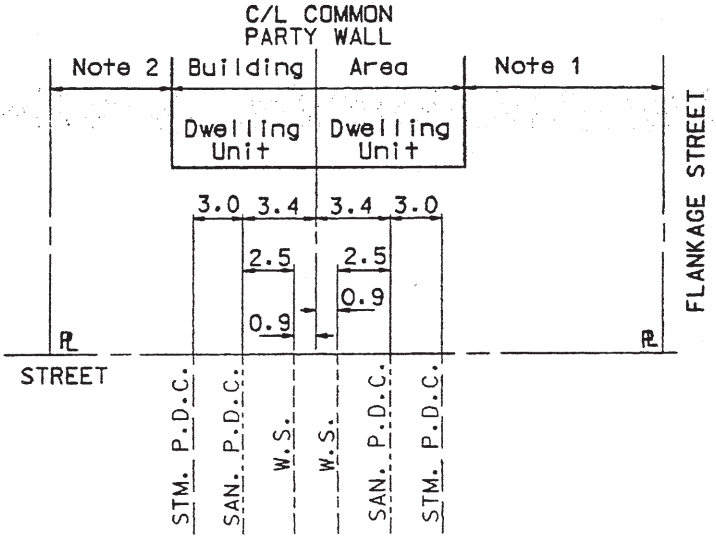
SINGLE



SINGLE CORNER LOT



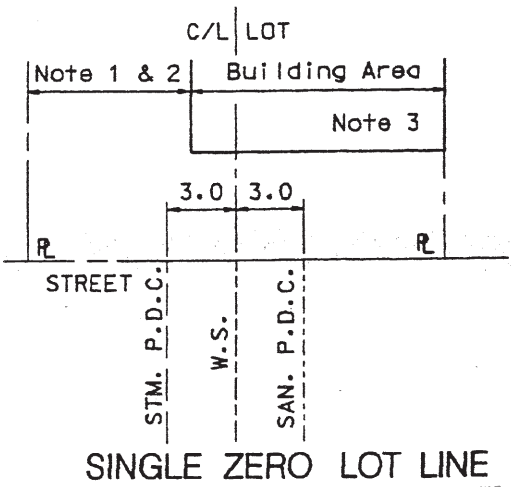
SEMI-DETACHED



SEMI-DETACHED CORNER LOT

NOTES:

1. External building setbacks to reflect current applicable zoning by-laws.
2. Internal building setbacks to reflect current applicable zoning by-laws.
3. If the building area is located on the opposite side of zero lot line lot, then show the services in reversed location (i.e. Sanitary and Storm).
4. Storm PDCs are required except where exempt by the drainage by-law.
5. STM. PDC - Storm Private Drain Connection
   SAN PDC - Sanitary Private Drain Connection
   WS - Water Service



SINGLE ZERO LOT LINE

All dimensions are in metres unless othewise shown.

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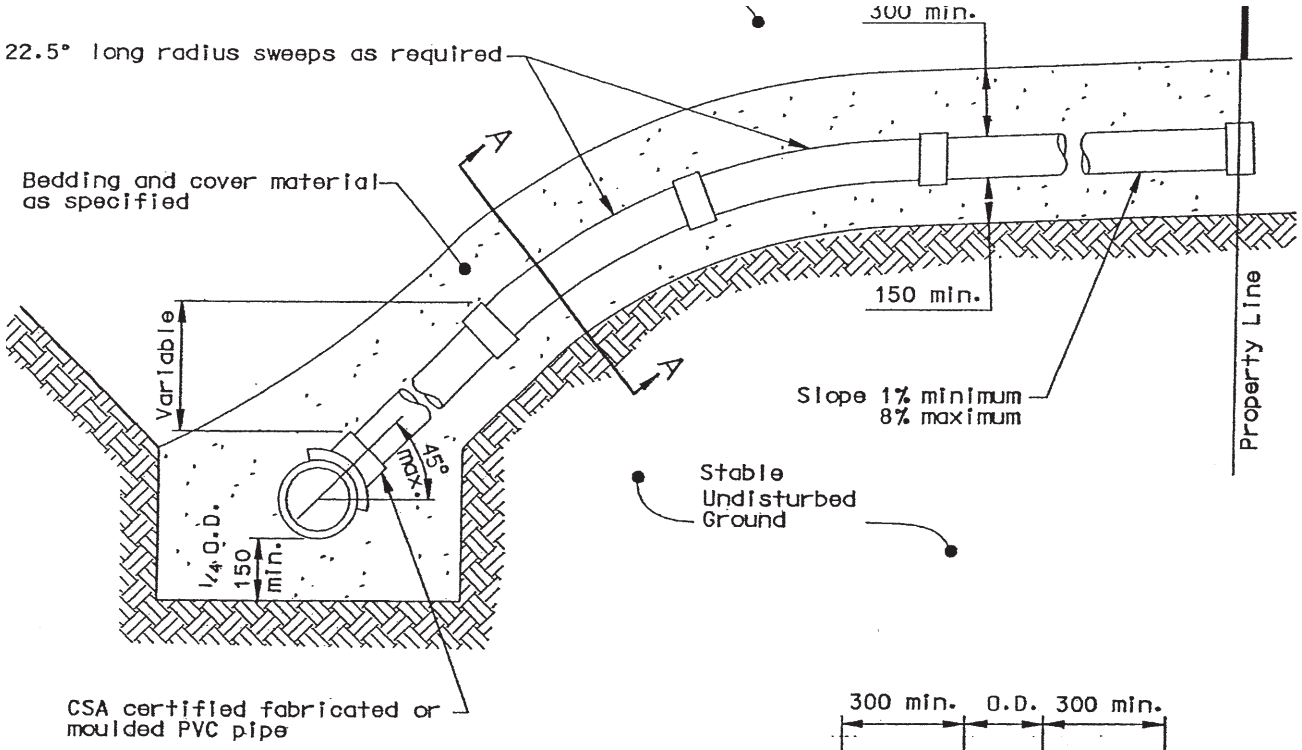
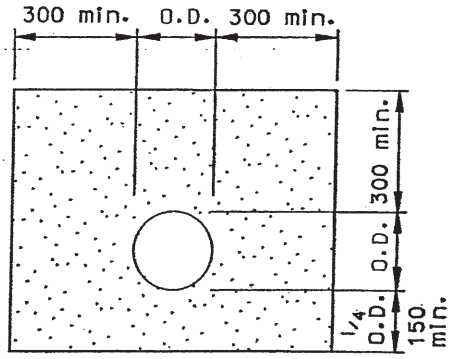
STANDARD SERVICING LOCATIONS FOR SINGLE FAMILY AND SEMI-DETACHED LOTS

DATE: 2017-04

FIGURE 2.3





SECTION A – A

NOTES:

1. PDC risers are required for sewer depths greater than or equal to 4.5m
2. The minimum inside diameter for Sanitary and Storm PDCs is 100mm.
3. The minimum clearance between a PDC and a sewer or watermain (outside wall to outside wall) is 0.5 m as per MOECC Procedure F-6-1.
4. Pre-fabricated tees shall be used for all service sewer mains for new subdivisions prior to assumption.
5. Saddle connections may be used when connecting new services to an existing sewer main.
6. No sanitary PDC connections to maintenance holes are permitted.
7. Where horizontal or vertical bends are required long radius sweeps shall be used. Short bends are not acceptable.

All dimensions are in millimetres unless otherwise shown.

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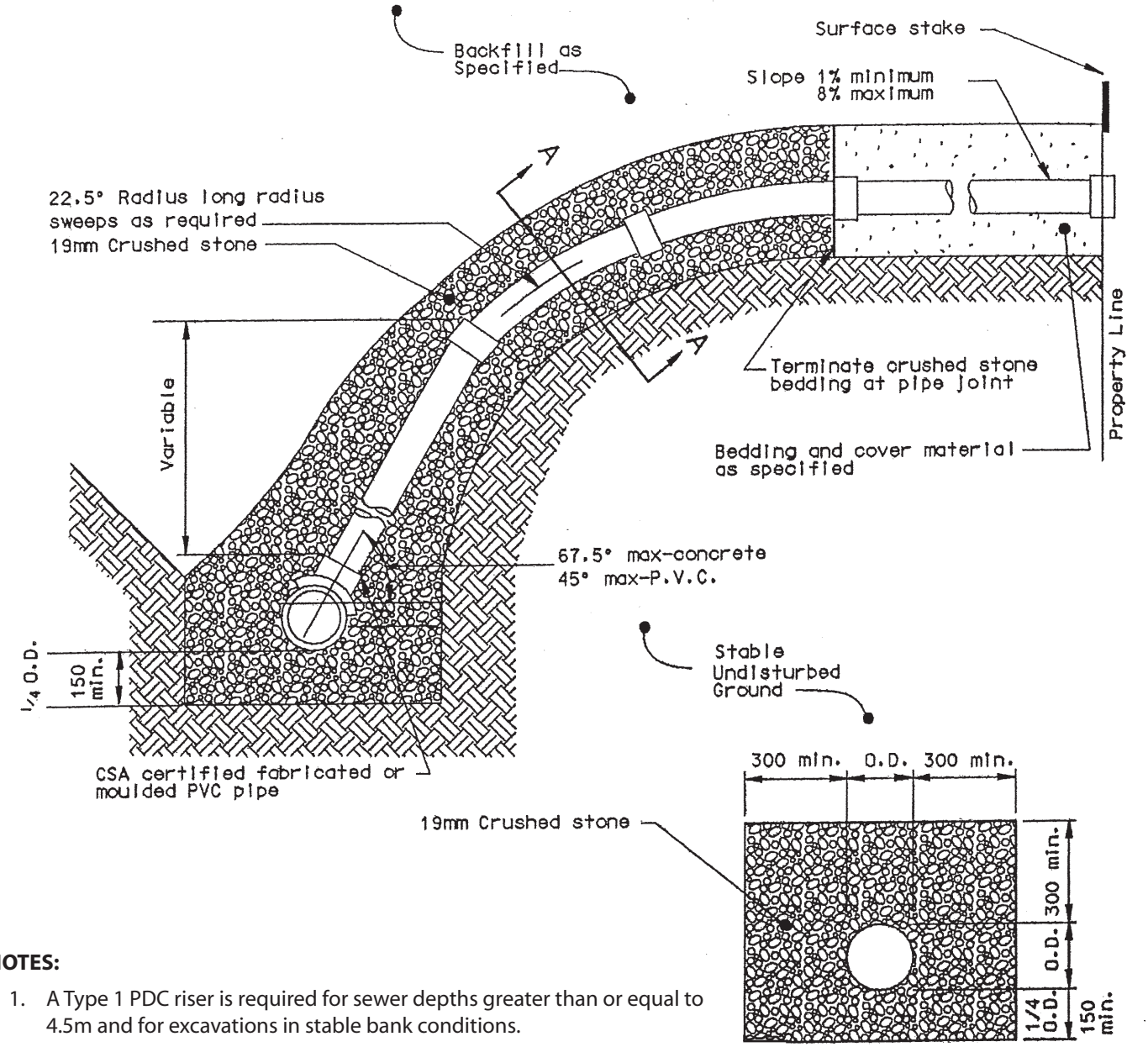
PRIVATE DRAIN CONNECTION (RESIDENTIAL)

DATE: 2017-04

FIGURE 2.4



SECTION A-A

NOTES:

1. A Type 1 PDC riser is required for sewer depths greater than or equal to 4.5m and for excavations in stable bank conditions.
2. The minimum inside diameter for Sanitary and Storm PDC is 100mm.
3. Prefabricated tees shall be used for all service connections on new sewer main construction, including sewer mains for new subdivisions prior to assumption.

   Saddle connections may be used when connecting new services to an existing sewer main.
4. No sanitary PDC connection to maintenance holes are permitted.
5. Where horizontal or vertical bends are required long radius sweeps shall be used. Short bends are not acceptable.

All dimensions are in millimeters unless otherwise shown.

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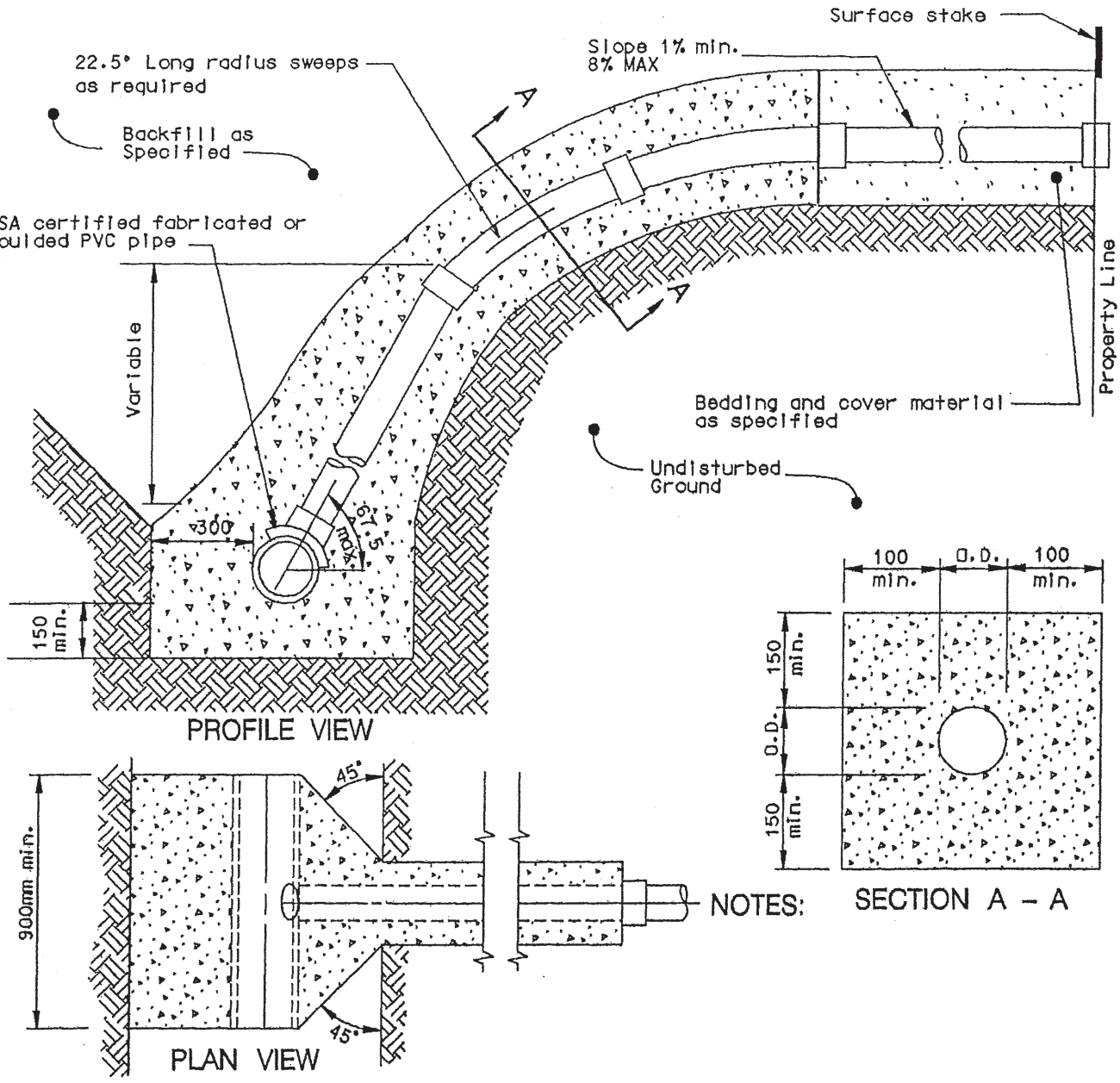
PRIVATE DRAIN CONNECTION RISER - TYPE 1 (RESIDENTIAL)

67.5° MAXIMUM CONCRETE PIPE, 45° MAXIMUM PVC - STABLE BANK CONDITIONS

DATE: 2017-04

FIGURE 2.5



NOTES:

1. A Type 2 PDC riser is required for sewer depths greater than or equal to 4.5m and for excavations in bank conditions.
2. The minimum inside diameter for Sanitary and Storm PDC is 100mm.
3. Prefabricated tees shall be used for all service connections on new sewer main construction, including sewer mains for new subdivisions prior to assumption.
4. Saddle connections may be used when connecting new services to an existing sewer main subject to municipal approval.
5. Concrete strength shall be 20 MPA.
6. Where horizontal and vertical bends are required, long radius sweeps shall be used. Short bends are not acceptable.
7. No sanitary PDC connections to maintenance holes are permitted.

All dimensions are in millimetres unless otherwise shown.

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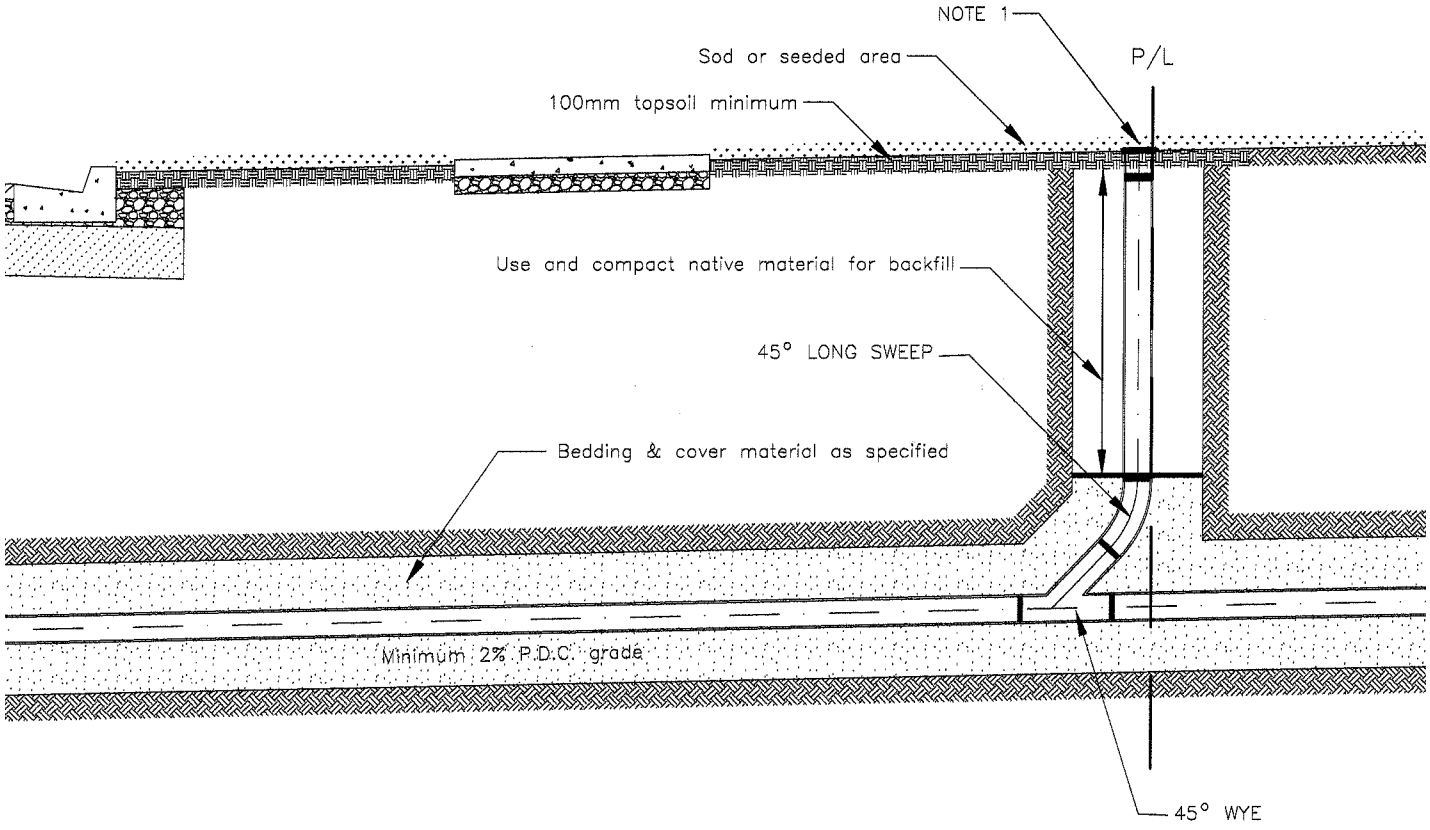
PRIVATE DRAIN CONNECTION RISER - TYPE 2 (RESIDENTIAL)

67.5° MAXIMUM - UNSTABLE BANK CONNECTIONS

DATE: 2017-04

FIGURE 2.6

1. The pipe diameter of the cleanout pipe shall equal the pipe diameter
   of the P.D.C.
2. The minimum inside diameter for sanitary P.D.C. cleanout is
   100mm.
3. Approved prefabricated wyes and long radius sweeps shall be used for
   all P.D.C. cleanout connections.
4. Where applicable, approved end caps are required at property line
   to complete the P.D.C. installation. They shall be braced to
   withstand pressure testing when required.



Note 1

a) Cleanout Hard (Rigid) Surface Installation: Use cast iron cap and intall flush with surface.
   Cleanout 4" – EMCO#DF44 – SKU 6463049
   Cleanout 6" – EMCO#DF66 – SKU 6463052

b) Cleanout Soft Surface (Grass) Installation: Use standard plastic cap, with peak flush with grass surface.
   4" bds threaded adapter EMCO#SKU 6012213
   4" bds threaded plug EMCO#SKU 6015263
   6" bds threaded adapter EMCO#SKU 6010059
   6" bds threaded plug EMCO#SKU 6010084

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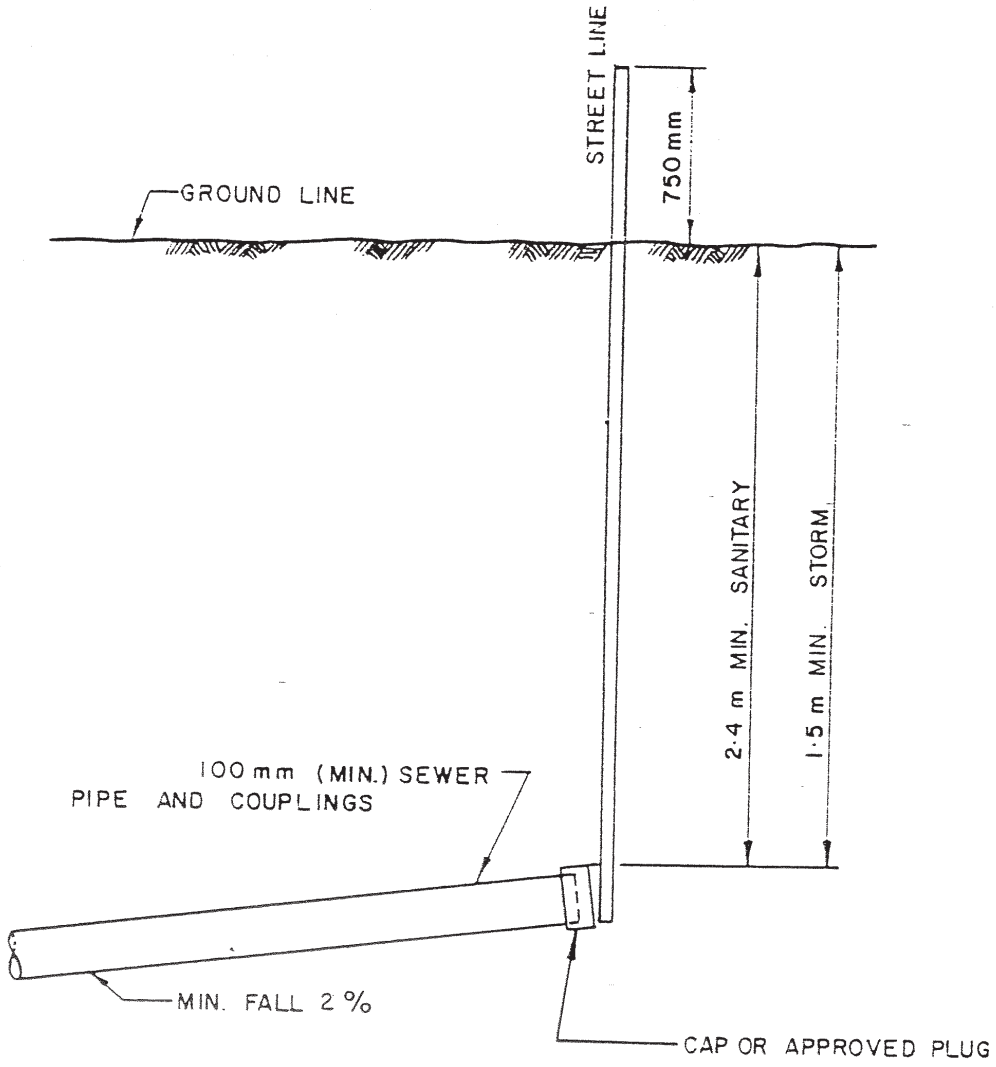
PRIVATE DRAIN CONNECTION CLEANOUT
(RESIDENTIAL)

DATE: 2017-04

FIGURE 2.7



NOTES:

1. The pipe diameter of the cleanout pipe equals the pipe diameter of the PDC.
2. The minimum inside diameter for sanitary PDC cleanout is 100mm.
3. Approved prefabricated tees shall be used for all PDC cleanout connections.
4. Where applicable, approved and plugs are required at property line to complete the PDC installaions. They shall be braced to withstand pressure testing when required.
5. When cleanout is required to service the PDC between proeprty line and the sewer main it shall be constructed as a '*reverse image*' of the drawing above.

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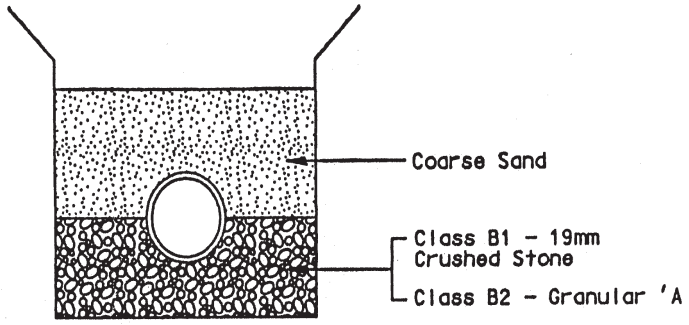
PRIVATE DRAIN CONNECTION MARKER (RESIDENTIAL)

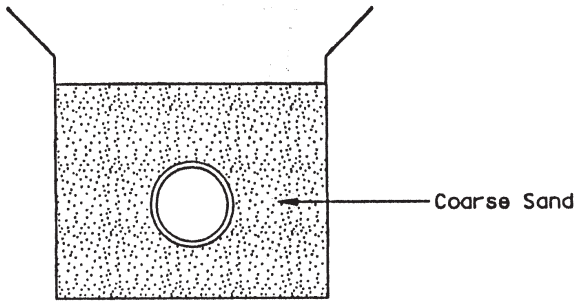
DATE: 2017-04

FIGURE 2.8

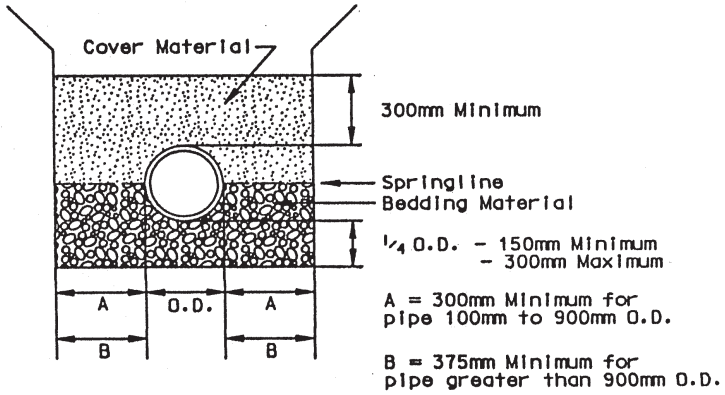
RIGID PIPE - CLASS B



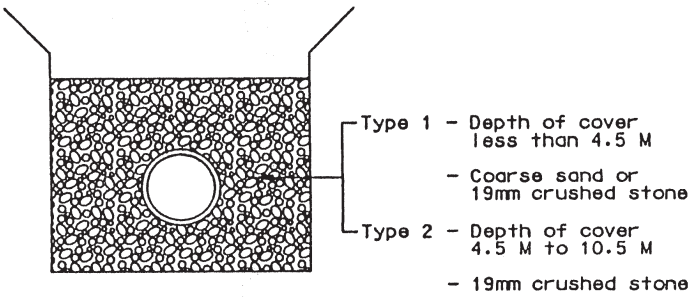
RIGID PIPE - CLASS C



TRENCH DIMENSIONS FOR ALL PIPE SEWERS



FLEXIBLE PIPE



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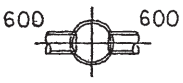
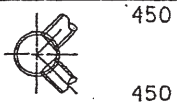
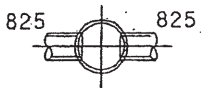
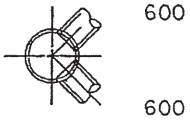
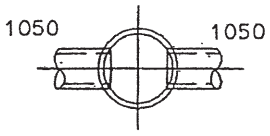
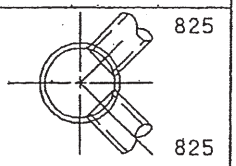
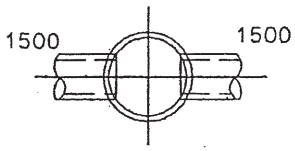
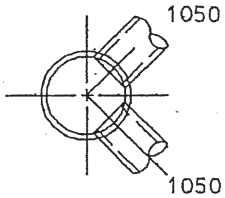
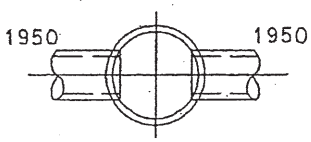
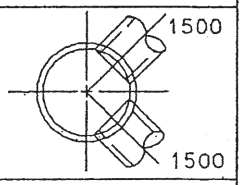
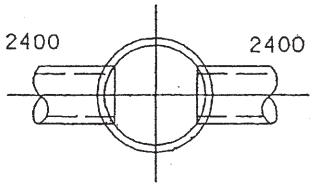
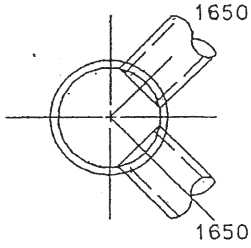
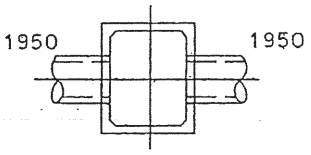
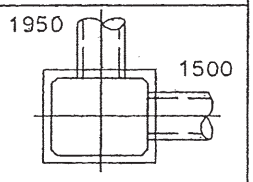
BEDDING STANDARD FOR RIGID AND FLEXIBLE PIPE

DATE: 2017-04

FIGURE 2.9

MAINTENANCE HOLE INSIDE DIAMETER (mm)	MAX. PIPE SIZE FOR STRAIGHT THROUGH INSTALLATION (mm)	MAX. PIPE SIZE FOR RIGHT ANGLE INSTALLATION (mm)
1200		
1500		
1800		
2400		
3000		
3600		
3000 x 2400		

NOTES:

1. All dimensions are for concrete pipe
2. All dimensions are in millimeters
3. Knockouts for small diameter catch basins lead sizes 300mm or less could be provided in addition to what is shown.
4. Information taken from the Ontario Concrete Pipe Association (O.C.P.A.)

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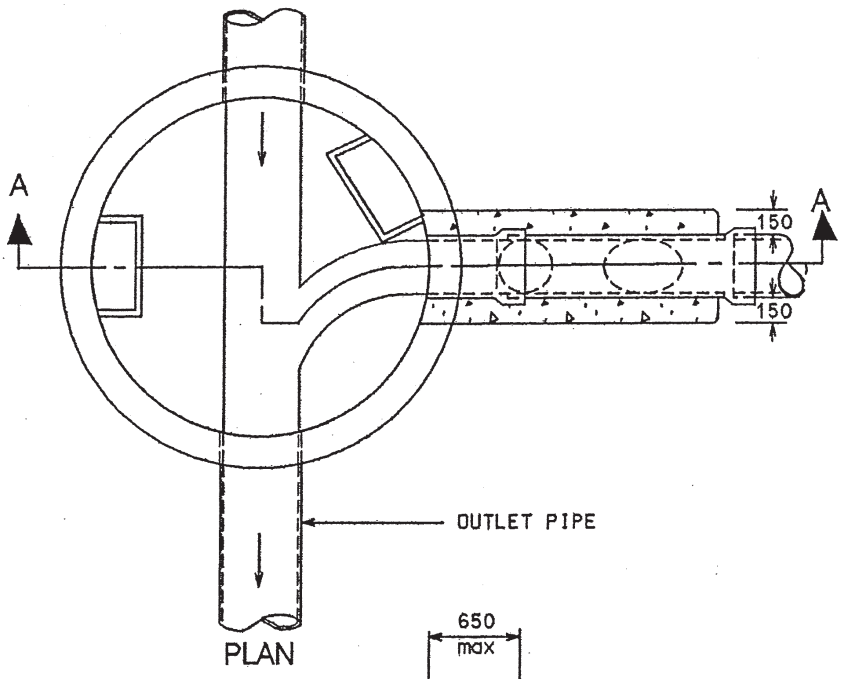
MAXIMUM PIPE SIZES FOR PRECAST MAINTENANCE HOLES

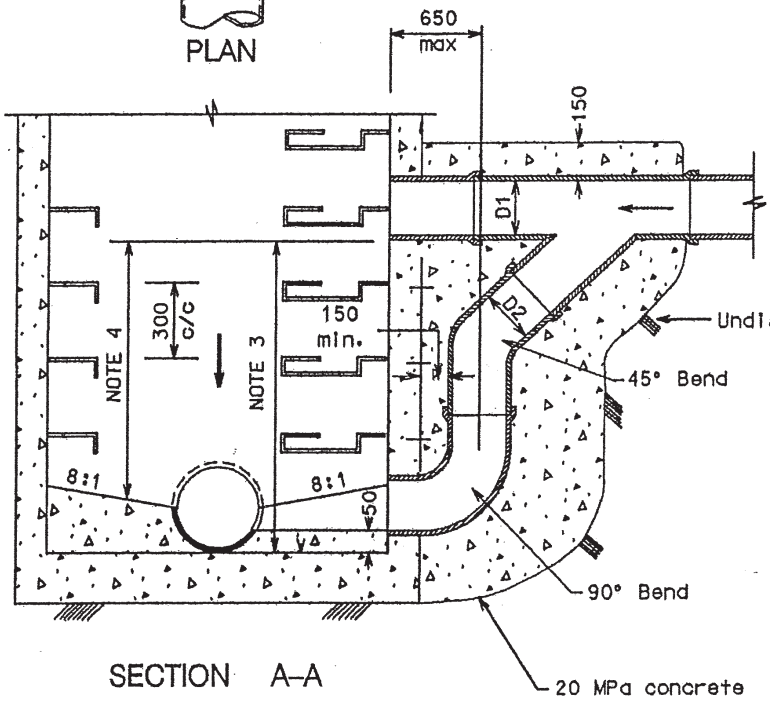
DATE: 2017-04

FIGURE 2.10

A. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN



PLAN



SECTION A–A

NOTES:

1. Drop structure to be completely encased in a minimum 150mm of 20MPa concrete and secured to the maintenance hole with 450mm long, 13mm dia., threaded rods and drilled expansion anchors down both sides of the drop pipe at 300mm c/c.

2. For pipe sewer sizes 200mm to 450mm (inside pipe diameter) D1=D2. For pipe sewer sizes equal to or greater than 525mm cia., D2=450mm dia.

3. Drop structures shall be constructed when the differences upstream and outlet sewers in the maintenance hole is equal or greater than 600mm for sanitary sewers and 900mm for storm sewers.

4. When the difference in elevation between the upstream invert and the top of the benching exceeds 1.50m, an additional set of steps are required adjacent to the overflow pipe for maintenance operations.

5. Maintenance hole steps shall be located to avoid conflict with an inletting or out letting sewer pipe. Access to maintenance hole must be above the benching platform.

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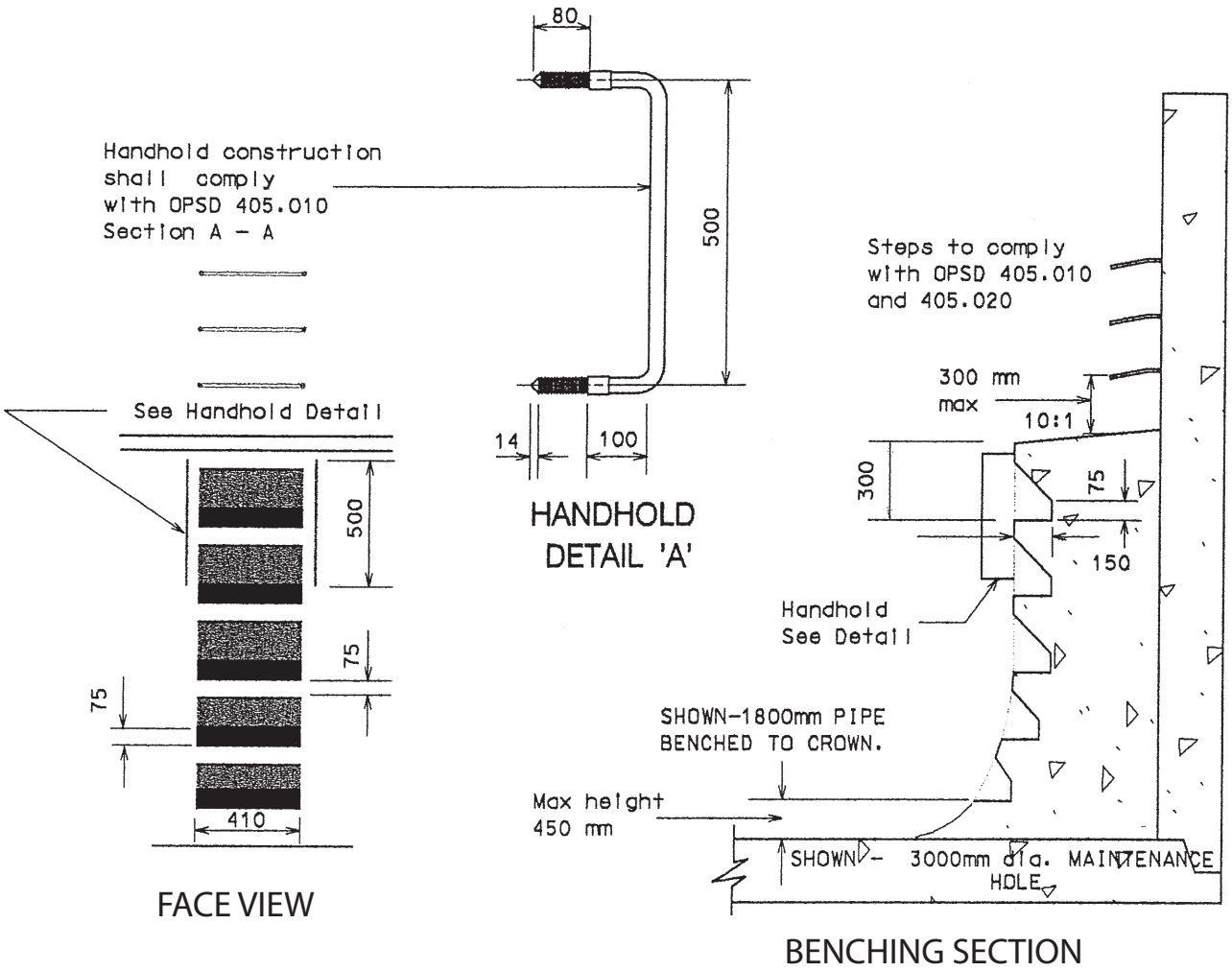
MAINTENANCE HOLE DROP STRUCTURE

WYE

DATE: 2017-04

FIGURE 2.11



NOTES:

1. Steps are required in benching for pipe diameters:
   a) Greater than 900mm - benching to springline;
   b) Greater than or equal to 450mm - benching to crown.

2. Handholds shall be constructed in accordance with DETAIL 'A'.

3. Handholds are required for pipe diameters greater than or equal to 1500mm dia when benching to crown.

4. Additional handholds may be required for pipe diameters greater than 1950mm - benching to crown.

5. Step dimensions are typical.

6. Maintenance hole steps shall be located to avoid conflict with an inletting or out letting sewer pipe. Access to maintenance hole must be above benching platform.

All dimensions are in millimetres unless otherwise shown.

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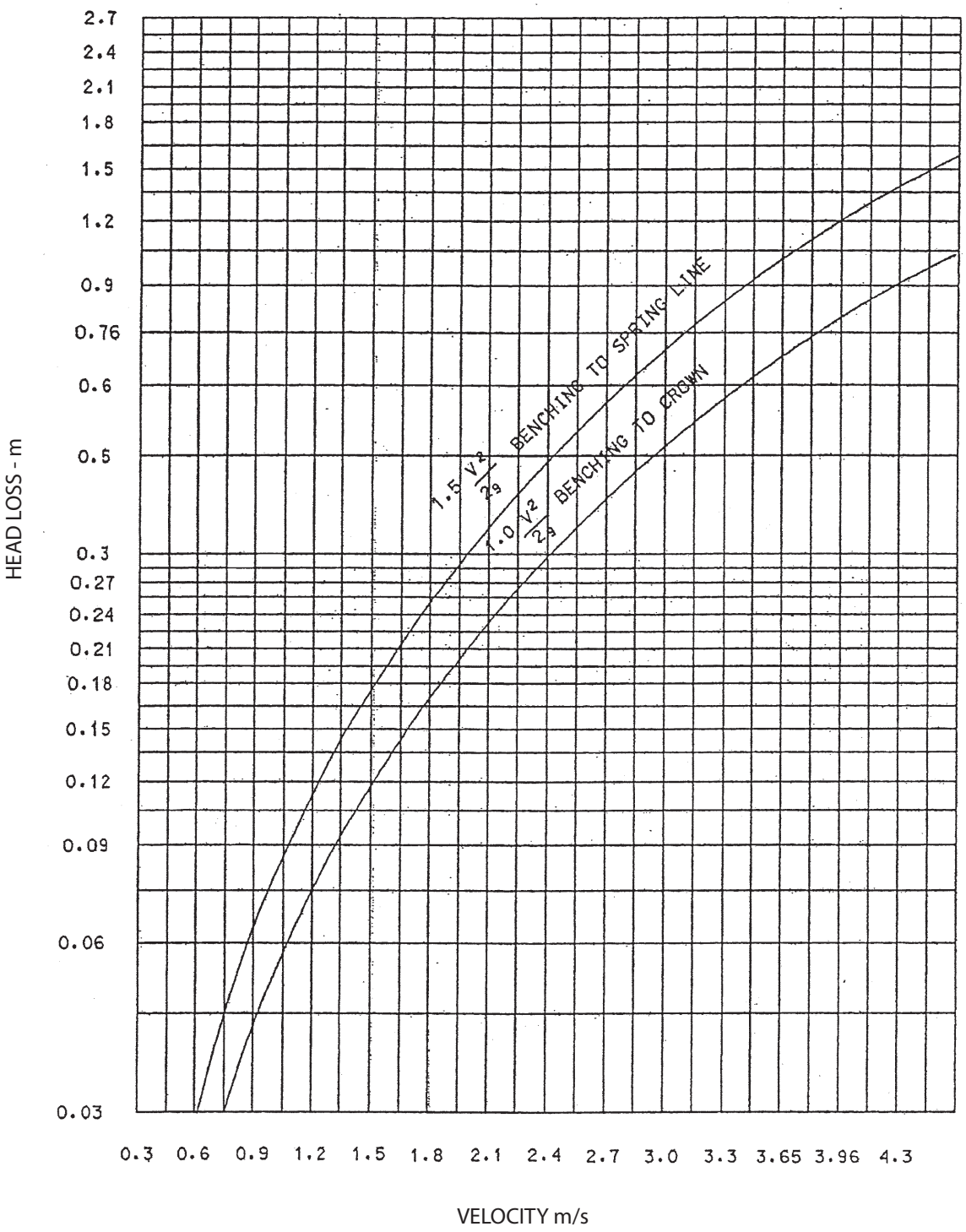
STEPS IN MAINTENANCE HOLE BENCHING

DATE: 2017-04

FIGURE 2.12



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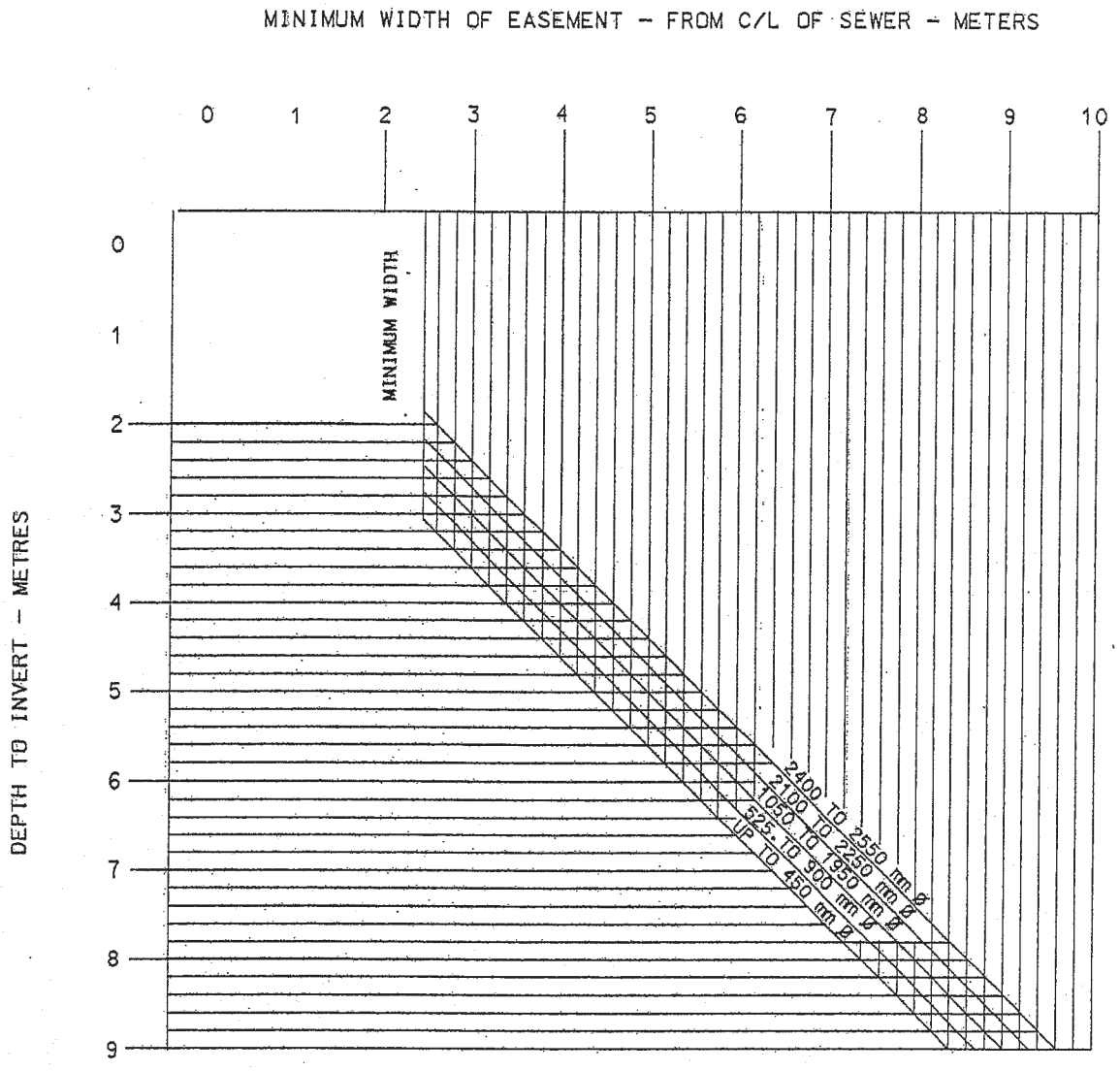
HEAD LOSSES IN MAINTENANCE HOLES

DATE: 2017-04

FIGURE 2.13



NOTES:

1. Minimum easement width measured from C/L of sewer pipe e.g.: 675mm dia., sewer with invert 3.9m below finished surface elevation - width of easement required = 3.6m each side or a total width of 7.2m.

2. Through fields, open space, etc., 9.1m minimum - 3.0m on one side of sewer C/L and 6.1m on the other side, or at least 3.0m wider than the minimum width obtained from this chart. As required by Municipal Engineer.

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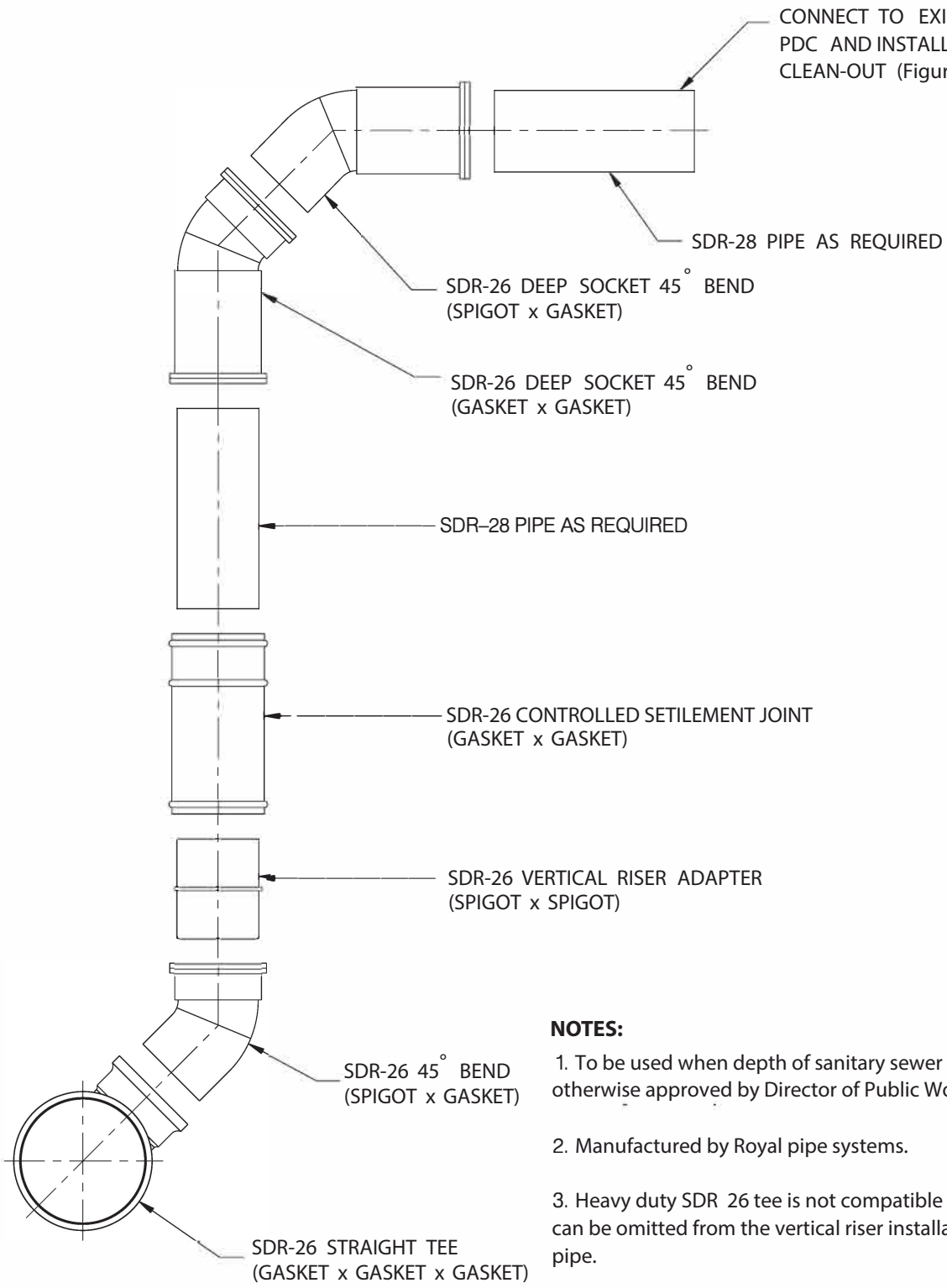
MINIMUM EASEMENT WIDTH

DATE: 2017-04

FIGURE 2.14



NOTES:

1. To be used when depth of sanitary sewer is greater than 4.50m or otherwise approved by Director of Public Works and Engineering.

2. Manufactured by Royal pipe systems.

3. Heavy duty SDR 26 tee is not compatible with profile pipe. SDR 26 tee can be omitted from the vertical riser installation when using profile pipe.

4. Clean out (Figure 2.12) required to be installed at connection point to existing PDC in retro fit conditions.

5. PDC vertical riser diameter to be 150mm.

6. Bedding system per Figure 2.10.

All dimensions are in millimetres unless otherwise shown.

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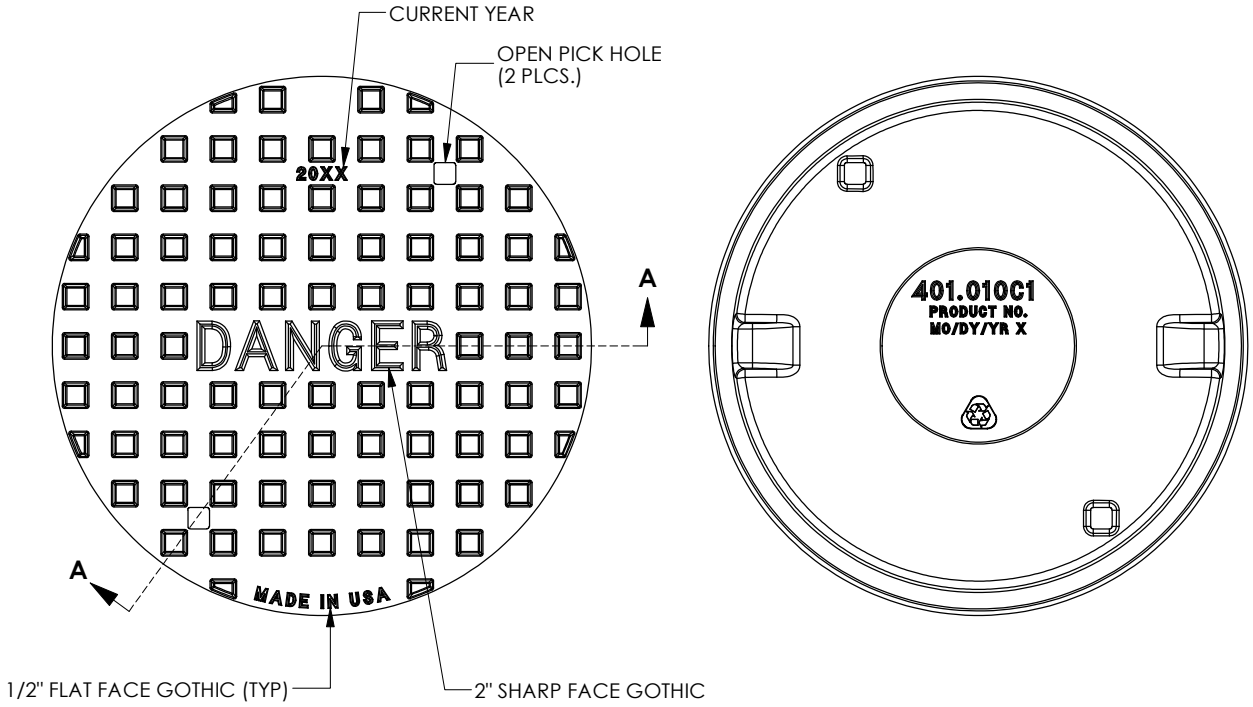
PDC VERTICAL RISER INSTALLATION

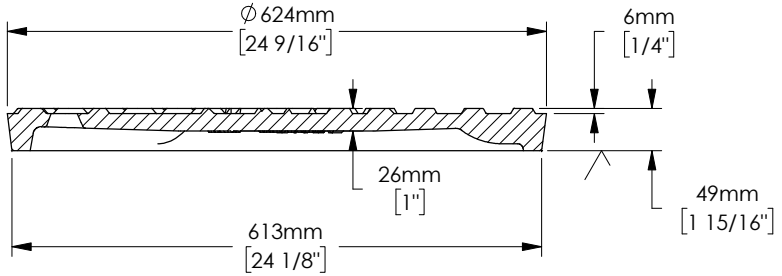
DATE: 2017-04

FIGURE 2.15



Design Features

-Materials
Gray Iron (CL35B)
-Design Load
Heavy Duty
-Open Area
n/a
-Coating
Undipped
-√ Designates Machined Surface



SECTION A-A

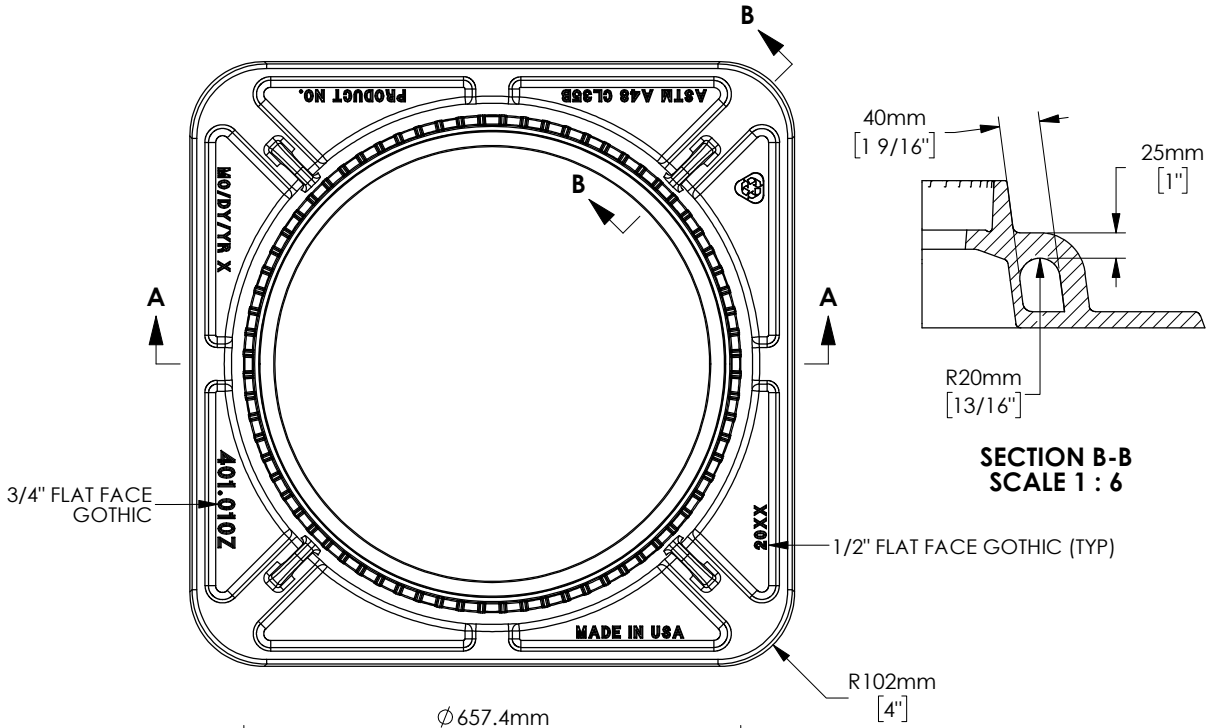
FIGURE 2.16a

middlesex centre
in the centre of it all

TYPICAL MANHOLE FRAME AND COVER

DATE: 2018-01

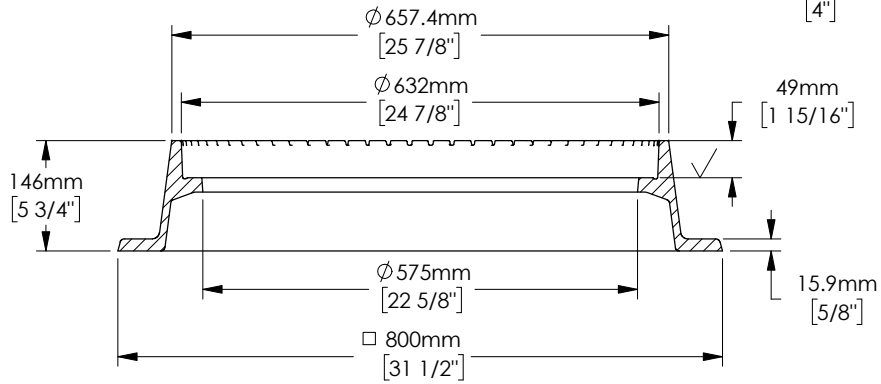
FIGURE 2.16a



SECTION B-B
SCALE 1 : 6

Design Features

-Materials
Gray Iron (CL35B)
-Design Load
Heavy Duty
-Open Area
n/a
-Coating
Undipped
-√ Designates Machined Surface



SECTION A-A

FIGURE 2.16b

middlesex centre
in the centre of it all

TYPICAL MANHOLE FRAME AND COVER

DATE: 2018-01

FIGURE 2.16b