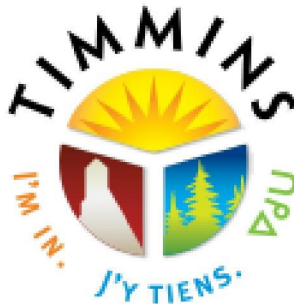


**CORPORATION OF THE CITY OF TIMMINS
ENGINEERING DEPARTMENT**



**MANUAL OF ENGINEERING
AND DEVELOPMENT STANDARDS**

(formerly Manual of Engineering Procedure
in Subdivisions – Feb. 1986)



APRIL 2015

TABLE OF CONTENTS

APPLICATION.....	1
INTENT	2
RELATIONSHIP BETWEEN THE CITY, PROPONENT AND CONSULTANT.....	3
1. DESIGN AND SUPERVISION.....	3
2. RELOCATION OF SERVICES	3
3. ADDITIONAL WORKS REQUIRED.....	4
4. USE OF THE UTILITIES AND SERVICES	4
5. ENTRY BY MUNICIPAL EMPLOYEES OR AGENTS	4
6. GENERAL PROVISIONS.....	4
REFERENCE SPECIFICATIONS.....	6
SURVEY REQUIREMENTS	7
SOIL TEST AND REPORTS.....	8
DRAINAGE IMPROVEMENTS	9
ENVIRONMENTAL CONSIDERATIONS.....	10
DRAWINGS REQUIRED BY THE ENGINEERING DEPARTMENT.....	11
1. PRELIMINARY DRAFT PLAN	11
2. FINAL PLAN.....	11
3. PRELIMINARY SERVICES PLANS.....	11
4. CONSTRUCTION DRAWINGS.....	12
5. AS-CONSTRUCTED DRAWINGS & DIARY SHEETS	12
6. STANDARDS FOR PLANS.....	13
ROADWAYS, CURB AND GUTTER, AND SIDEWALKS.....	14
1. DESIGN	14

2. CONSTRUCTION	15
STORM SEWERS	17
1. DESIGN	17
2. CONSTRUCTION	19
3. MATERIALS	20
SANITARY SEWERS.....	21
1. DESIGN	21
2. CONSTRUCTION	22
3. MATERIALS	23
4. LATERAL CONNECTIONS.....	24
WATERMAIN	25
1. DESIGN	25
2. CONSTRUCTION	27
3. MATERIALS	28
STANDARD SPECIFICATIONS FOR LOT DRAINAGE.....	29
1. SCOPE OF WORK	29
2. REQUIREMENTS FOR DRAINAGE.....	29
3. PLANS TO BE SUBMITTED	29
4. APPROVAL OF PLANS.....	30
STANDARD SPECIFICATIONS FOR WATERCOURSES AND OPEN DRAINAGE CHANNELS.....	31
1. SCOPE OF WORK	31
2. INTENT.....	31
3. CALCULATIONS REQUIRED	31
4. CHANGES IN ALIGNMENT.....	31
5. EXISTING WATERCOURSES	31
6. PROPOSED OPEN DRAINAGE CHANNELS.....	32

7.	OUTLETS FOR STORM WATER RUNOFF.....	32
8.	DRAINAGE AREA.....	33
	STANDARD SPECIFICATIONS FOR STREET AND TRAFFIC SIGNS	34
1.	SCOPE OF WORK	34
2.	MATERIALS	34
3.	LOCATION OF SIGNS.....	34
4.	METHOD OF INSTALLATION.....	34
	STANDARD SPECIFICATIONS FOR STREET LIGHTING	35
1.	SCOPE OF WORK	35
2.	REQUIREMENTS OF LIGHTING	35
3.	PLANS TO BE SUBMITTED	35
4.	DESCRIPTION OF LIGHTS	35
5.	POLE DESCRIPTION.....	36
6.	CABLE DESCRIPTION.....	36
7.	APPROVALS FOR LIGHTING.....	36
	TRAFFIC IMPACT STUDIES.....	37
	INSPECTION AND TESTING.....	38
1.	SEWERS.....	38
2.	ROADWAYS, CURB AND GUTTER, AND SIDEWALKS.....	39
3.	WATERMAIN	39
4.	INITIAL INSPECTION (PRIOR TO ISSUANCE OF BUILDING PERMITS)	40
5.	PRE-PAVING INSPECTION	40
6.	SECONDARY INSPECTION (PRIOR TO OCCUPANCY).....	41
7.	FINAL INSPECTION.....	41

APPENDIX A - SPECIAL PROVISIONS

APPENDIX B - STANDARD DETAIL DRAWINGS

CORPORATION OF THE CITY OF TIMMINS, ONTARIO

MANUAL OF ENGINEERING AND DEVELOPMENT STANDARDS (FORMERLY THE SUBDIVISION MANUAL)

APPLICATION

These standards apply to all work including development in the City of Timmins and any other lands which are proposed for development and require services. The purpose of these requirements is to make fair and reasonable demands to ensure the best interests of the residents and the City are being protected.

“City” shall mean the Corporation of the City of Timmins

INTENT

These standards shall be read in conjunction with the Site Plan or Subdivision Agreement.

The effect of these standards and the Agreement shall be to secure the development of good quality and of a quality at least compatible with surrounding development. All work is to be done in a good and workmanlike manner in accordance with good engineering principles and trade practices.

The approval of plans, specifications, contracts or estimates by or on behalf of the City or the Manager of Engineering, shall not be deemed to limit the amount of work to be done or expenditure of money required to be made by the Owner. All such amendments to the plans, specifications, contracts and estimates, as are necessary to meet actual conditions in accordance with good engineering practices, shall be made and the Owner shall do and pay for the work in accordance therewith.

RELATIONSHIP BETWEEN THE CITY, PROPONENT AND CONSULTANT

1. DESIGN AND SUPERVISION

The City, as eventual owners of proposed services in new developments, requires Proponents to retain a firm Consulting Engineers registered by the Professional Engineers of Ontario and approved by the City, to be responsible for the design and full-time supervision of the construction of these services. The inspector shall provide the City Engineering Department with weekly inspector reports including color photos and test results.

All contracts shall be submitted to the Manager of Engineering for approval before they are permitted.

Where the City is a contributor to any work, tenders shall be called and the City shall have the right to insist that unbalanced or informal tenders not be accepted.

The City shall have the right to require the installation of the infrastructure to be extended to the full limits of the development and or property.

The Manager of Engineering shall have the right to require the installation of services be accelerated to such extent as they direct on any street or part of a street on which 60% or more of the lots have building permits issued on them.

The Manager of Engineering shall also have the right to require that completion of the works delayed, when, in their opinion, the affect of completing them would be to subject them unduly heavy use during construction or to undue deterioration for other reasons.

The Services for the development shall be designed for the actual site conditions and good engineering practices will dictate the work which shall be carried out. All sanitary sewer, water, and storm water facilities shall be designed in accordance with the latest M.O.E guidelines or City of Timmins standards (more stringent requirement shall apply).

2. RELOCATION OF SERVICES

The owner shall pay the cost of relocating any existing services or utilities made necessary by reason of subdivision of the land, and shall likewise pay the cost of moving any services or utilities installed in connection with the development of the subdivision which are located in the driveways or so close thereto in the opinion of the Manager of Engineering as to interfere with the use of the driveway. Where possible, the City will give advance notice of the work.

3. ADDITIONAL WORKS REQUIRED

If at any time, from time to time during the development of the subdivision, the Manager of Engineering is of the opinion that additional works in or adjacent to the development are necessary to adequately provide any public services, the Owner shall construct, install or perform such additional works at the request of the Manager of Engineering.

4. USE OF THE UTILITIES AND SERVICES

The works herein referred to may be used by the City or other authorized persons for the purposes for which such works are designed: such use shall not be deemed as acceptance of the works by the City and such use shall not in any way relieve the Owner of their obligations in respect of the construction and maintenance of the works so used.

5. ENTRY BY MUNICIPAL EMPLOYEES OR AGENTS

Employees or agents of the City may enter the said lands at any reasonable time, from time to time, for the purpose of making adjustments, inspections or repairs and such entry and adjustments, inspections or repairs shall not be deemed an acceptance of any of the said works by the City nor any assumption by the City of any liability in connection therewith, nor a release of the Owner from any of their obligation under this Agreement.

6. GENERAL PROVISIONS

Notwithstanding anything else herein or in the Subdivision or Site Plan Agreement, the Owner agrees:

- a) All streets abutting on the lands to be covered by the new Registered Plan and to be used for access during the construction if damaged will be restored immediately by the Owner. If the Owner fails to do this work on reasonable notice, the City may go in and do it at the Owner's expense. All vehicles making delivery to or taking materials from the lands in the said new Plan shall be adequately covered and not unreasonably loaded so as to not scatter refuse, rubbish or debris on the said streets abutting. Where more than one access may be had to the Development, the Manager of Engineering may prohibit the use of one or more, but not all, for the delivery or removal of materials.
- b) The Owner will take all necessary steps as directed, from time to time, by the Manager of Engineering to control dust, weeds, noise and any other nuisance.
- c) Where there are existing buildings or structures in the Plan, the same shall be demolished and removed within six (6) months of the registration of the Plan unless the City agrees that it or they remain, in which event, such alterations and renovations as the City required shall be made within the same time limit.

- d) No building shall be moved onto any lot in the subdivision unless approved by the City and in accordance with Zoning and Building By-laws of the City of Timmins.
- e) The cost of installing all services abutting all land owned by or to be purchased by the City or Boards of Education or any other municipally funded organization shall be paid for by the Owner except as may be agreed.

REFERENCE SPECIFICATIONS

The following City of Timmins Standard Specifications is referred to in the Manual of Engineering Standards and shall form a part of these standards:

- Standard Specifications for Storm Sewers
- Standard Specifications for Sanitary Sewers
- Standard Specifications for Watermains and Appurtenances
- Standard Specifications for Concrete Curb and Gutter
- Standard Specifications for Concrete Sidewalks
- Standard Specifications for Asphalt Pavement
- Standard Specifications for Excavation and Granular Fill
- Standard Specifications for Sodding of Boulevards
- Geometric Design
 - Transportation Association of Canada (TAC Manual)
 - MTO Manual
- Ministry of the Environment (MOE)
 - Design Guidelines for Sewage Works
 - Guideline for the Design of Water Distribution System
- Any other applicable regulations, or legislations

➔ Specifications shall be available for purchase from the City of Timmins

ENGINEERING DEPARTMENT
236 ALGONQUIN BOULEVARD EAST
TIMMINS, ONTARIO
P4N 1B2

Cost to purchase:
Book \$150.00

SURVEY REQUIREMENTS

Two or more Bench Marks related to a Geodetic B.M. by precise leveling shall be established in every development and shall be recorded on all plans submitted to the City Engineering Department.

All survey data shall be tied to NAD 83 Horizontal Control.

All elevations and horizontal control shown on any plans submitted digitally and hard copy to the City.

All required easements or blocks shall be obtained and registered by the owner at no cost to the City.

SOIL TEST AND REPORTS

Where it is evident that rock will be encountered, the elevation of the rock shall be profiled in detail, with soundings taken to establish the elevation of rock covered with overburden on the street allowance. *(The rock profile taken along the center line of the street allowance shall be superimposed on the Preliminary Service Plans and Profiles).* In all other areas where the ground conditions may be questionable, the Consultant shall have soil tests done by an approved soils investigation company to ensure suitable bedding design for the underground services. The City reserves the right to extend the scope of the soils report, depending on soil conditions on any particular case. Typical street cross-sections found in the appendix are minimum guidelines of typical cross-sections. A reduction in the depth of excavation will be dependent of the soils report and is at the discretion of the Manager of Engineering. A reduction in depth of excavation will only be allowed when existing soils are free draining, non-frost susceptible granular materials.

DRAINAGE IMPROVEMENTS

The proponent will be required to contribute to downstream drainage improvements. The amount of contribution will be determined by the City and provisions made in the Subdivision/Site Plan Agreement dealing with this matter.

The Consultant will, as part of his drainage studies, submit plans showing the existing downstream system based on actual existing conditions determined by field measurements and studies, proposed downstream improvements, proposed development and future upstream development.

Unless otherwise noted the proponent shall design for pre-development flows and incorporate all required storm water management.

A Storm Water Management (SWM) plan shall be required for all new developments. The Municipality follows the recommendations of the Ontario Ministry of Environment as outlined in the Stormwater Management Practices Planning and Design Manual, March 2003 or the latest revision shall be used in the design of the storm water facility and shall comply with all relevant government agencies and to the satisfaction of the Engineering Department.

The minimum control required is to maintain post-development peak runoff at pre-development levels. A Storm Water Management Design Brief shall be submitted to the Engineering Department at the time of the drawings are submitted for review.

ENVIRONMENTAL CONSIDERATIONS

All development shall meet the requirements of the Environmental Protection Act, the Environmental Assessment Act (Ontario Regulation 205), the Federal Fisheries Act, and the Provincial Policy Statement under Section 3 of the Planning Act and all other applicable legislation.

DRAWINGS REQUIRED BY THE ENGINEERING DEPARTMENT

1. PRELIMINARY DRAFT PLAN

At the time of the initial application to the Council of the City of Timmins, an extra two (2) copies of the Draft Plan shall be submitted to the Planning Department to review and establish the feasibility of servicing and to make whatever comments may be necessary concerning the Plan. These plans shall show the proposed street layout and lots, and shall also include existing one (1) meter contours, all existing watercourses, rock outcrops and all lands owned by the proponent.

2. FINAL PLAN

Upon approval of the Draft Plan by the City of Timmins and the Plans Administration Branch of the Ministry of Housing, the Proponent shall have their property staked out on the ground and the final plan prepared (and registered after the Site Plan and/or the Subdivision Agreement has been signed). This final plan will serve as a basis for all preliminary surveys and construction drawings. A copy of this plan as a digital compatible ACAD version capable of reproduction must be submitted to the City.

3. PRELIMINARY SERVICES PLANS

After draft plan approval, the Proponent shall employ an Engineer or a firm of Engineering Consultants as described under the "Relationship Between the City, Proponent and Consultant" for the purpose of designing all services for the Development. The Consultant shall submit two (2) prints and 1 digital copy of each of the following drawings to the Engineering Department for checking.

- a) Plans and Profiles showing Roads, Sidewalks and Storm Sewers and the Design Data for Storm Sewers.

Scale: Horizontal	1:500
Vertical	1:50

- b) Plans and Profiles showing Sanitary Sewers and Watermains and the Design Data and Flow Areas for Sanitary Sewers.

Scale: Horizontal 1:500

Vertical 1:50

- c) Overall plans showing all Roads and Storm Sewers to be constructed as well as the lot drainage systems (directions of storm flow and drainage areas shall be shown and how the water will be discharged from the area to be developed). Proposed lot grades shall be shown at the front, midpoint and rear of each lot and direction of flow shall be indicated. The finished road grades shall be shown every 20 meters maximum, and at intersections and road grade changes. The top of grate elevations for all catchbasins shall be shown. The design drainage areas shall be indicated between each section of Storm Sewer (i.e. manhole to manhole) Scale 1:500. The existing topography shall be shown with contour intervals at one-half (0.5) meters.
- d) Overall Plan showing layout of proposed watermain system and the overall design drainage area for the Sanitary Sewer System. Scale 1:1000
- e) General Plan of the Subdivision showing location of proposed street lights, stop signs and street name signs. Scale 1:1000

4. CONSTRUCTION DRAWINGS

The Consultant shall make all corrections to his drawings outlined by the Engineering Department and will re-submit for final approval. Four (4) complete sets of drawings will be required. One (1) set will be forwarded to the Ministry of the Environment. One (1) set will be returned to the Developer's Consultant bearing the stamp of approval by the City and the City will retain two (2) copies.

5. AS-CONSTRUCTED DRAWINGS & DIARY SHEETS

Upon the City's initial acceptance of the services, as-constructed details of all valves, curb stops, manholes, catchbasins and hydrants shall be prepared by the Consultant. Once construction is complete and before final acceptance has been granted by the City, the Consultant must supply one (1) complete set of as-constructed and digital plans, prints and diary sheets for the City's approval and eventual reference and use.

AS CONSTRUCTED DRAWINGS SHALL INCLUDE THE FOLLOWING INFORMATION AS A MINIMUM:

- a) All as-constructed elevations including watermain inverts and sewer main inverts for all main lines and all services.
- b) All pipe lengths between manholes and watermain lengths between valves
- c) All pipe sizes and materials
- d) All final grades
- e) Rock profiles, if rock is encountered
- f) All new building connections are to be shown and dimensioned in the plan view
- g) All lot grading plans with as-constructed swales

DIARY SHEETS SHOULD REPORT THE FOLLOWING:

- a) Daily report of sewer construction
- b) Daily report of pipeline construction
- c) Sewer service records

6. STANDARDS FOR PLANS

Plans and Profile Plans: City of Timmins Standard Plan and Profile paper: drawings to be 24" x 36" (D Size) and a digital copy, Auto CAD based. North arrow to the top or right and plan on top and profile on the bottom. Dimension and elevations shall be provided in metric units.

A complete set of engineering plans is comprised of the following in this order:

1. Cover Sheet
2. Sanitary/Storm Drainage Areas
3. General Layout of Subdivision
4. Plan & Profile of Sanitary and Watermain
5. Lot Grading Plan
6. Plan & Profile of Storm Sewer and Road
7. Drop Curb & Street Light Layout
8. Standard Details

ROADWAYS, CURB AND GUTTER, AND SIDEWALKS

1. DESIGN

- a) The width of travelled road shall be 8.5 meters for a local residential street and for a local residential cul-de-sac. Collector streets shall be 9 meters wide. Arterial streets shall be 10.5 meters wide for two (2) lanes and 13.5 meters wide for four (4) lanes.

The street classification shall be determined by the Manager of Engineering. Special consideration shall be given to roadways in Commercial and Industrial areas and dimensions shall be established by the Manager of Engineering.

In some areas of the City, where 1.5 meters asphalt gutter banks are used in lieu of curb and gutters, the width of travelled road for a local residential street shall be 9 meters and therefore the overall asphalt surface width will be 12 meters (areas for use of gutterbanks shall be determined by the Manager of Engineering).

- b) Minimum radius at all intersections on local residential streets shall be 7.5 meters on collector streets 9 meters and on arterial and local industrial streets 10.5 meters. The radius at the end of cul-de-sacs (roadway only) shall be 13 meters. The corresponding radius of the R.O.W. must be 18 meters minimum
- c) All geometric design shall conform to the TAC Manual¹ or MTO Manual.
- d) The minimum road grade of all streets shall be 0.5%; the maximum grade on local residential streets shall be 10%, 6% on collector streets and 5% on arterial streets. The approach grade on intersecting streets shall be 2% maximum. Cross slopes shall be 3% maximum and 2% minimum. Where cul-de-sacs are to be used, runoff is to flow around the cul-de-sac in the gutter. In order to avoid ponding problems a grade of at least 1.5% must be present in the gutter. If this is not possible, a high point must be created in the gutter at some point around the cul-de-sac to split the direction of flow.
- e) Curb and gutter or asphalt gutter banks shall be required on all roadways.
- f) All sidewalks are to be continuous through driveway entrance.
- g) Sidewalk requirements within the right of way will be determined in consultation with the engineering department. Requirements will be based on pedestrian traffic being

¹ TAC MANUAL - Transportation Association of Canada, Geometric Design Guide for Canadian Roads, 1999 Edition with most recent updates.

generated and access for accessibility as well as for future projected requirements. Generally sidewalks at a minimum will be required on one side of the roadway.

2. CONSTRUCTION

- a) Construction of roadways, curb and gutter, and sidewalks shall be carried out in conformance with the City of Timmins Standard Specifications and Drawings.
- b) The Contractor for these works shall be approved by the Manager of Engineering.
- c) All roadways shall consist of at least 90 mm of Superpave 12.5 (50 mm of base course and 40 mm of surface course; after a min of one (1) year for surface course) laid on 150 mm Granular "A" base and 1760 mm of Granular "B" subbase. The roadway shall be constructed after underground services have been completed and after all service trenches have been backfilled and compacted to meet the City Specifications. Curb and gutters shall be installed after the subbase has been placed, compacted and approved. All manholes, catchbasins, valve boxes and other appurtenances shall be lowered to be flush with the surface course of asphalt.
- d) The boulevard from the edge of the finished roadway to the property line shall have a minimum 2% grade flow towards the curb and, in no case, shall driveway entrances exceed a 10% grade where the road has a normal crossfall. All boulevards shall be sodded or paved depending on the area and shall be determined by the Manager of Engineering.
- e) All construction works shall be carried out in strict conformance with the City of Timmins By-laws and Standard Specifications respecting street excavations, paving, curb and gutters, sidewalks, barricading and public safety.
- f) The Proponent may, upon approval of the Manager of Engineering apply the base coat of asphalt and construct the curbs (if applicable) on the roadways the same year as the services are installed if the granular road base and service trenches have been compacted in accordance with City Specifications. If the roadway is to be paved the following year the top 100 mm of Granular "A" must be replaced and compacted prior to asphalt being placed.

NOTE: Where applicable, concrete sidewalks shall be placed as follows:

- i. For streets with curb and gutters, the sidewalk shall be placed one (1) meter from the property line and for streets with asphalt gutter banks, the sidewalk shall adjoin the outside edge of the asphalt gutter bank. Follow SP RD-13, SP RD-43, OPSS 351, 353, 904 & 1002.

- ii. Sidewalks are to be 1.5 meters wide and 125 mm deep except at driveway entrances where they must be 150 mm deep for residential and 200 mm deep for commercial as indicated on OPSD 310.010.
- iii. For streets with curb and gutters, the sidewalk shall be depressed at all intersections and or pedestrian crossings.

STORM SEWERS

1. DESIGN

- a) On streets with curb and gutter, the storm sewer shall be located 3.5 meters from the property line unless otherwise authorized by the Manager of Engineering. In streets with asphalt gutter banks, the storm sewer will be located 7.5 meters from the property line.
- b) The minimum diameter of pipe for mainlines and leads shall be 300 mm. Minimum bedding requirements shall be Class B type as per City Standard Drawing 341 unless otherwise directed by the Manager of Engineering. (Type of bedding, type and class of pipe shall be noted on the plans.)
- c) The minimum cover from the proposed road surface to the top of a mainline pipe shall be 1.5 meters and the minimum cover for catchbasin leads shall be 1.2 meters. If the obvert of any storm sewer pipe cannot meet its minimum cover, the Standard Detail Drawing 343 shall be used for shallow storm sewers.
- d) Manholes shall be located not more than 90 meters apart. Manholes are required at all intersections, changes in grade, size, alignment and termination points.
- e) When a drop manhole will be required follow OPSS.
- f) Sewer invert drops at manholes:
 - i. Sewer runs through 90° : Drop = 60 mm
 - ii. Sewer runs through 45° : Drop = 30 mm Sewer
 - iii. Straight through: Drop = grade of sewer
- g) Pipe size changes – where pipe size changes occur at manholes, the obverts of the pipes shall be at the same elevation.
- h) Outlets for storm sewers must be shown extending into the City's drainage system. All PVC culverts and outlet pipes to be equipped with concrete end protection, as per City of Timmins Standards.
- i) All roof water shall be discharged onto splash pads on the ground and directed to the street.
- j) Catchbasins shall not be more than 90 meters apart (each side of the road considered separately) and shall not be more than 90 meters from any high point. Double

catchbasins or special catchbasins with enlarged grates and curb openings shall be used at low points if required. Special inlet catchbasins at a reduced spacing will be required on steep grades. The design of a storm sewer draining an intersection should intercept all drainage runoff before it reaches the intersection and allow for all existing or future storm sewers. All catchbasins leads shall connect to the sewer main at a manhole or other catchbasins unless otherwise approved. No more than two catchbasins shall be interconnected in any given location. 150 mm diameter polyethylene pipe as OPSS 405.05.03 c/w geotextile sock and clearstone as per Detail "A" – Standard Detail Drawing #261 subdrains are to be connected to all catchbasins as directed by the Manager of Engineering.

- k) Culverts under roads shall be designed to accommodate a storm with a five year return period. All PVC and PE pipes shall require a concrete headwall. Culverts with spans greater than 3.0m shall be prepared by a professional engineer who specializes in bridge design.
- l) Back of lot drainage systems in the form of swales must be shown along with all necessary outlets and easements. The minimum grade for the swale is 0.5 %.
- m) The Proponent must provide easements for whatever storm outlets may be required. The minimum width of easements for underground systems must be 6 meters.
- n) Storm sewer connections shall be provided to the lot line for lots which abut storm sewer mainlines. The location and number of connections is to be approved by the Manager of Engineering. The connections are to be 100 mm in diameter minimum. The storm sewer connection at property line shall be placed in the middle of the lot and be painted blue. Service connections should be plugged at the property line with watertight caps or plugs.
- o) The minimum velocity in sewers flowing full shall be 0.8 m/sec. and the maximum velocity shall be 6 m/sec.
- p) The roughness coefficient of "N" for all smooth-walled pipes using either Kutters or Mannings formula shall be 0.013.
- q) To calculate the quantity of storm water runoff, the rational method $Q=AIC(2.75)$ shall be used where :
 - "Q"- is the peak runoff rate in cubic meters/second
 - "A" – is the area drained in hectares
 - "I" – is the average rainfall intensity in m/hour

“C” – is the runoff coefficient which depends on the characteristic of the area drained

→Runoff Coefficient “C” shall be used as follows:

- | | | |
|------|--|-----|
| i. | Residential areas, parks, school areas, etc. | 0.5 |
| ii. | Industrial areas | 0.7 |
| iii. | Commercial areas | 0.9 |

→Average Rainfall Intensity “I” – Design Storm Frequency shall be used as follows:

- i. Residential and Commercial areas
 - a) 5 years for local streets
 - b) 10 years for rural areas
 - c) Regional storm for major systems

Storm Sewers must be designed to accommodate flows from all areas which, in the opinion of the Manager of Engineering require an outlet through the proposed development.

- r) The Consultant shall complete the MOE application form for approval of the sewer system and the City of Standard Storm Sewer Design Forms (enclosed) for storm sewers and shall submit them along with 3 sets of plans to the City Engineering Department to be forwarded to the Ministry of the Environment for final approval. The Proponent shall pay all applicable fees for approval.

2. CONSTRUCTION

- a) Construction of storm sewers and appurtenances shall be carried out in conformance with the City of Timmins Standard Specifications for Storm Sewers.
- b) The Contractor for this work shall be approved and listed on the City of Timmins Approved Contractors list for Water and Sewer Work.
- c) Manholes and catchbasins shall be constructed initially to the grade of the temporary roadway then raised when final roadway construction is carried out.
- d) No natural watercourses shall be blocked or utilized for development purposes unless provisions are made to allow complete drainage capacity without inconvenience to others or to provide storm sewers capable of storm runoff capacity as approved by the Manager of Engineering. In no case will discharge by diversion ditches or storm drainage systems be allowed to escape to ditches or watercourses of lesser capacity, nor shall riparian rights be interfered with in any manner.

- e) The City of Timmins Standard Inspection Form # 126 must be completed by the Consultant and signed by the City representative on site.
- f) A camera inspection of all storm sewers, including catchbasin leads must be done and the City of Timmins is to be provided with a DVD copy (electronic copy) and a hard copy of the inspection report outlining the condition of the sewer, which shall be submitted for the review of the Engineering Department.

3. MATERIALS

Materials shall be as specified in the City of Timmins Special Provisions. See Appendix.

SANITARY SEWERS

1. DESIGN

- a) The Sanitary Sewer shall be located at the center line of the road allowance unless otherwise authorized by the Manager of Engineering.
- b) The minimum allowable size of sewer shall be 200 mm. Minimum bedding requirements shall be Class "B" type as per City Standard Drawing 341R2 and 343R1 (latest revision), unless otherwise directed by the Manager of Engineering. (Type of bedding, type and class of pipe shall be noted on plans).
- c) The crown of the sewer shall be 500 mm below the invert of the watermain for common trench. The minimum cover from the proposed surface to the top of pipe shall be 2.4 meters for separate trench installation. The minimum cover therefore, for common trench installation with the watermain is 2.8 meters plus diameter of the watermain.
- d) Manholes shall be located a maximum distance of 90 meters apart. Manholes are to be located at all junction changes in grade, size, alignment and termination points.
- e) A drop manhole will be required if a drop in excess of 610 mm occurs between any invert and the lowest invert in the manhole, as per OPSD drawings 1003.010, 1003.020, 1003.030 and 1003.031. (MOE guidelines for sewage works)
- f) Sewer invert drops at manholes:
 - i. Sewer runs through 90⁰: Drop = 60 mm
 - ii. Sewer runs through 45⁰: Drop = 30 mm
 - iii. Sewer straight through: Drop = grade of sewer
- g) All manholes exceeding 5.0 meters in depth must have a safety platform as per OPSD 404.020 and OPSD 404.021.
- h) When future connections are likely to be made to a manhole, a 1.25 meter length of pipe of proper size shall be installed in the manhole and sealed with a standard plug.
- i) Sanitary sewer outlets to existing or proposed City sewer mains shall be installed as designated by the Manager of Engineering. The Proponent shall provide whatever easements may be required for this purpose, and shall construct the necessary sewers thereon to the point of interception with existing or proposed City sewers.

- j) Single sanitary sewer connections shall be provided from main sewer line to lot line for all lots in a subdivision. Minimum 125 mm P.V.C. pipe shall be used in residential areas. All house connections including semi-detached shall be single 125mm connections. The sanitary sewer connection at property line shall be painted red. Service connections should be plugged at the property line with watertight caps or plugs.
- k) The minimum velocity allowed for sanitary sewers flowing full is 0.6 m/sec. and the maximum allowable is 3 m/sec. In cases where the flow depth under peak flow is less than 0.3 of the diameter of the pipe, the actual peak flow velocity should be calculated using hydraulic elements chart and the slope increased to achieve adequate flushing velocities.
- l) The roughness coefficient of "N" for all smooth-walled pipes using either Kutters or Mannings formula shall be 0.013.
- m) The quantity of sewage flow for a residential area shall be calculated on the following basis:
 - i. The predicted population per hectare shall be determined by the City of Timmins Manager of Engineering. No reduction shall be made for streets, parks, etc.
 - ii. The design flow of sewage including infiltration shall be assumed to be 2.3×10^{-5} m³/sec. per capita for sanitary sewers unless otherwise authorized by the Manager of Engineering. This figure includes a peaking factor of 4.
 - iii. The design flow of sewage for commercial and industrial developments shall be approved by the Manager of Engineering.
 - iv. Allowance shall be made in the designed capacity and elevation of the sewers to provide for future sewage outlet requirements from outside the subdivision.
- n) The Consultant shall prepare the MOE application forms for approval of the sewer system and the City of Timmins Standard Sanitary Sewer Design Forms (enclosed) and shall submit them along with 3 sets of plans to the City Engineering Department and to the Ministry of the Environment for final approval. The Proponent shall pay all applicable fees for approval.

2. CONSTRUCTION

- a) Construction of sanitary sewers and appurtenances shall be carried out in conformance with the City of Timmins Standard Specifications for Sanitary Sewers.

- b) The Contractor for this work shall be approved and listed on the City of Timmins Approved Contractors list for Water and Sewer Work.
- c) Manholes are to be constructed initially to the grade of the temporary roadway then raised when the final roadway construction is carried out.
- d) The permissible rate of infiltration or exfiltration of the sewers, its appurtenances and connections shall not exceed 27 liters per mm inside diameter of pipe per kilometer over a twenty-four (24) hour period. If the rate of infiltration or exfiltration exceeds the allowable figure, the entire sewer shall be inspected and dug up, if necessary, to locate the deficiency. The Manager of Engineering shall decide, depending on ground water conditions, which test shall be used and the length of pipe over which the test shall extend. The Owner shall be required to supply all necessary labour, equipment and water to perform these tests. The City of Timmins Standard Infiltration Test Form # 125 and Inspection Form # 126 must be completed by the Consultant and signed by the City representative on site. In any plastic sewer pipe installation, the Contractor shall be required to pass through the pipe a ball, plug or other suitably designed device of not less than 95% of the minimum permissible internal diameter of the pipe as defined in the Standard to which the pipe is made. The ball, plug or device shall be pulled through manually through the pipe not sooner than 24 hours after the completion of backfilling. Failure of this test renders the installation unacceptable.
- e) A camera inspection of all sanitary sewers must be done and the City of Timmins is to be provided with a DVD copy (electronic copy) and a hard copy of the inspection report outlining the condition of the sewer, which shall be submitted for the review of the Engineering Department.

3. MATERIALS

Materials shall be as specified in the City of Timmins Special Provisions. See Appendix.

4. LATERAL CONNECTIONS

Laterals shall be designed using

$$E^1 = 1.0 \times 10^6 \text{ Pa}$$

$$K = 0.110$$

125 mm service laterals of PVC may be used; however the maximum dimension ratio acceptable is 28.

- i. Joint Tightness – The pipe shall be assembled in accordance with the manufacturer's recommendation. Sealing rings shall meet A.S.T.M. F477-76.
 - a) House Connections shall be constructed in accordance with the specifications and standard drawings using the appropriate saddles or tees and shall be concrete pipe or PVC pipe.
 - b) Manhole frames and covers shall conform to the City of Timmins Standard Specifications and Drawings.
 - c) Manholes shall be precast according to the City of Timmins Standard Specifications and Drawings.

WATERMAIN

1. DESIGN

- a) Separation from sewers – Except in rock, all sewer and watermains shall maintain a horizontal clearance of 2.5 meters. Where sewer and watermains in areas of rock are under a common trench installation with the sanitary sewer shall be located one (1) meter from the sewer. The vertical separation between the invert of the watermain and the crown of the sanitary sewer shall be no less than 500 mm. Pressure pipe to be used for the sanitary sewer when the 2.5m clearance cannot be achieved. The minimum cover allowed between the proposed ground surface and the top of the watermain shall be 2.4 meters. If the vertical separation of 500 mm cannot be maintained, then a horizontal clearance of 2.5 meters must be provided between the watermain and the sanitary sewer unless otherwise approved by the Manager of Engineering.

A horizontal clearance of 2.5 meters must also be maintained from any storm sewer.

Watermains should cross above sewers wherever possible. Wherever a watermain crosses above or underneath a sanitary or storm sewer, a vertical clearance of 500 mm must be maintained between the outside of the watermain and the outside of the sewer.

- b) The minimum size of the watermain for residential areas shall be 150 mm. Feeder mains of greater diameter shall be installed where present of foreseeable future development warrants such installations. Minimum bedding requirements shall be Class “B” type as per City Standards Drawing 340 and 341 unless otherwise directed by the Manager of Engineering. (Type of bedding and type and class of pipe shall be noted on plan.)
- c) Dead-ends must be minimized by looping of all mains. Where dead-end mains occur, (eg. Cul-de-sacs), they shall be provided with a fire hydrant at the extreme end of the main.
- d) Hydrants with valves shall be spaced at intervals not greater than 110 meters and shall be located 1.7 meters from street line in streets consisting of asphalt gutter banks or 0.5 meters from street line in streets consisting of curb and gutter.
- e) Valves and valve boxes shall be installed at all intersections and in line with the property line of the intersecting street and up to 200 meters apart (maximum). Every hydrant shall be isolated from another by the installation of main line valves.

f) Connections shall be provided from the main to every lot in the subdivision. Curb stops shall not be installed under driveways. Service boxes shall be provided and installed at street line. Minimum services requirements in residential areas shall be as follows:

- i. Single service 19 mm
- ii. Double connection 25 mm (semi-detached only)
- iii. Four-plex 38 mm

All water service connections shall be in accordance with the requirements of the latest revision of the Ontario Building Code Act – Part 7 as amended. All other services shall be designed by a Professional Engineer in accordance to applicable codes, including the plumbing code.

Size, location and number connections for commercial and industrial areas shall be approved by the Manager of Engineering.

Any private main systems being connected to a City of Timmins main must meet all AWWA Standards and City of Timmins Standards for new mains, unless otherwise approved by the Manager of Engineering.

- g) The watermain shall be extended to the limits of the street allowance within the Development and/or to an approved existing watermain in order to maintain a looped system. The actual connection to the existing watermain shall be done by the City forces at the expense of the Proponent.
- h) The hydraulic design of the water distribution system should be based on the Projected Twenty Year Maximum Daily Flow plus the Fire Flow for the area (population) under consideration or the projected maximum hourly rate whichever is greater.
- i) The average day demand for a residential area is 450 liters per capita per day.
- j) The fire demand is based on the 1999 publication “Water Supply for Public Fire Protection, a Guide to Recommended Practice” prepared by Public Fire Protection Survey Services, Insurance Bureau of Canada (latest revision will govern).
- k) The consumption for the maximum day demand is 180% of the average day demand.
- l) The consumption for the maximum hourly demand is 270% of the average day demand.
- m) Normal static pressure of 410 KPa to 510 KPa must be maintained in the distribution system.
- n) A minimum of residual water pressure of 140 KPa is required during Fire Flow demand.

- o) Pipe design must be based on Hazen-Williams formula with **C=100**.
- p) The design flow for commercial and industrial developments shall be approved by the Manager of Engineering. This will be based on the existing pressures and volumes in that vicinity and shall be the responsibility of the proponent for the new development. Individual connections shall be provided for fire and domestic service with a shut off valve at City Property.
- q) The Consultant shall have complete M.O.E. application forms for the watermain installation and shall submit them along with 3 sets of plans to the City Engineering Department. The City of Timmins reviews and approves Drinking Water applications under the authority of Drinking Water Works Permit. The City will conduct a technical review of the application to ensure that the design is in accordance with City Engineering Standards and the M.O.E.'s. No construction will be allowed to start prior to this signed and verified Form. The Proponent shall pay all applicable fees for approval.

2. CONSTRUCTION

- a) Construction of the watermain shall be carried out in conformance with City of Timmins Standard Specifications for Watermains and Appurtenances.
- b) The Contractor for these works shall be approved and listed on the City of Timmins Approved Contractors list for Water and Sewer Work.
- c) Valve boxes shall be set initially to the grade of the temporary roadway and then raised when the final roadway construction work is carried out.
- d) After the grading of boulevards has been completed, all main valve and service valve boxes shall be located and repaired if necessary and adjusted to finished grade. Hydrants shall be adjusted where necessary by adding extensions to the barrel at the hydrant base to place the ground line flange 100 mm minimum above finished grade.
- e) All watermains must successfully pass the pressure and leakage tests to be conducted by the Proponent under the direction of the Consultant and the City. The City of Timmins Watermain Hydrostatic Test Report (OPSS 441 latest revision) must be completed by the Consultant and signed by the City representative on the site.
- f) Prior to the start of construction, the Developer shall submit a detailed disinfection procedure, sealed by a Professional Engineer licensed in the Province of Ontario, for approval that meets the requirements outlined in the 400 Series-Special Provision WAT-

11. If a conflict/discrepancy between the AWWA Standard C651 and the Special Provision WAT-11 the most stringent requirement shall apply.

3. MATERIALS

Materials shall be as specified in the City of Timmins Special Provisions. See Appendix.

STANDARD SPECIFICATIONS FOR LOT DRAINAGE

1. SCOPE OF WORK

The work described in these specifications consists of the grading of all lots and blocks of lands to provide adequate surface drainage.

2. REQUIREMENTS FOR DRAINAGE

Reference should be made to the City of Timmins Standard Drawing 265 Lot Grading Details. All lots and blocks of land shall be graded in such a manner that:

- i. Adequate surface drainage is provided over the entire lot of block
- ii. All surface water is directed away from the building
- iii. Rear lot drainage is required whereby one-half of the lots drain towards the front and the other portion towards the rear

Where swales are used to carry surface runoff, these swales shall be constructed in a neat and workmanlike manner and in such a way that no erosion of the soil shall occur.

All surface drainage must be carried to an approved outlet.

3. PLANS TO BE SUBMITTED

In a development, a grading control plan to a scale of 1:500 showing the following is to be submitted to the Manager of Engineering for approval (see Section Drawings Required by the Engineering Department)

- a) Roads, lots and their numbers as shown on the proposed Registered Plan
- b) Proposed storm sewer system including catchbasin locations and top of grate elevations.
- c) Finished road elevations at the center line of each road at a spacing of 20 meters or less and at all street intersections and road grade changes.
- d) In a subdivision the highest finished ground elevation for each lot as well as the front and rear corner locations of the lot.
- e) The direction of flow of water for all rear lot drainage and other swales. Finished grade spot elevations along all swales, ditches and at appropriate intervals on large sites such as parking lots and open space areas.
- f) The plan shall also show the drainage design areas used to determine the size of each section of storm sewer from manhole to manhole.

- g) Location and details of any major swale
- h) Location and details of any storm sewer outlets
- i) Location and size of any easements required in the Development
- j) Existing topography with contour intervals at one-half (0.5) meters. And all existing natural drainage courses on the land to be developed

4. APPROVAL OF PLANS

Approval of drainage plans by the Manager of Engineering in no way relieves the Owner of their responsibility to ensure that the lot drainage carried out is effective in providing adequate surface drainage. Should the grading prove to be unsatisfactory, in the opinion of the Manager of Engineering, the Owner shall make the necessary changes to provide for effective discharge of all surface water.

STANDARD SPECIFICATIONS FOR WATERCOURSES AND OPEN DRAINAGE CHANNELS

1. SCOPE OF WORK

The work describes in these specifications consists of the work required to construct an open drainage channel or to improve an existing watercourse which is to be used to carry storm water runoff.

2. INTENT

The intent of these specifications is to ensure that any open drainage channel which is constructed, or any natural watercourse which is to be used, for carrying off of storm water, is of sufficient capacity and design in order that problems will not arise in the future with regards to the runoff of storm water.

3. CALCULATIONS REQUIRED

Calculations for the estimate of storm water runoff are to be determined by the Proponents Consultant and reviewed and approved by the City for the areas of lands draining into the watercourse or proposed drainage channel, using the appropriate runoff coefficients, considering the whole catchment area to be developed according to the City Zoning By-law and Official Plan, and considering all government agency requirements.

The minimum control required is to maintain post-development peak runoff at pre-development levels.

4. CHANGES IN ALIGNMENT

In general, diversions of natural watercourses will not be permitted unless these are in the nature of improvements to the existing watercourse and only upon approval by the Mattagami Region Conservation Authority and/or any other authority having jurisdiction.

5. EXISTING WATERCOURSES

Where existing watercourses within the Development are to be used as outlets to storm sewers or as parts of the natural drainage system within and through the Development, the City requires:

- a) Calculations showing the estimate of storm runoff in accordance with Clause 3.
- b) Plan and Profile of the existing watercourse.
- c) Calculations showing that the watercourse is adequate to handle the storm runoff with respect to capacity, velocity and erosion protection. Where the existing watercourse is

inadequate to handle the estimated storm runoff, improvements must be made. These improvements must be approved by the City with respect to capacity, erosion protection, structural adequacy and aesthetic adequacy. Structural details, cross-sections and material specifications of the proposed channel are required.

Regardless of whether or not major improvements are required, the existing watercourse shall be improved to the extent that:

- a) All debris, both in the watercourse and on the embankments is removed.
- b) Small trees and brush which would tend to impede the free flow of water are to be eliminated.
- c) The watercourse and the surrounding area and embankment are to be neat and tidy in appearance and not to be aesthetically detrimental to the surrounding development.

6. PROPOSED OPEN DRAINAGE CHANNELS

Where it is proposed to construct an open drainage channel to act as an outlet for the storm water runoff, the City requires:

- a) Calculations showing the estimate of storm water runoff in accordance with Clause 3 of this section.
- b) Plan and Profile of the proposed drainage channel.
- c) Structure details, cross-sections and material specifications of the proposed channel.
- d) Calculations showing that the proposed drainage channel is adequate to handle the storm water runoff with respect to capacity, velocity and erosion protection.

In general, since these open drainage channels are expected to carry water only at certain times throughout the year, the channels shall be lined with concrete, gabions or other approved material subject to the approval of the Manager of Engineering.

The channels shall be constructed in accordance with good engineering practice and shall not constitute a hazard to the residents of the City.

7. OUTLETS FOR STORM WATER RUNOFF

All outlets for storm water runoff both within the Development and outside the Development shall be adequate to handle the estimated storm water runoff.

Should any outlet within the Development prove inadequate, it should be improved in accordance with Clause 5.

Should any proposed outlet outside the Development prove to be inadequate, improvements as approved by the Manager of Engineering shall be carried out. Such improvements shall generally conform to the requirements of Clause 5 and shall be directed to ensure that the discharge of storm water runoff into these outlets will not create problems with regard to flooding and soil erosion at any point along the outlet. The nature of any improvement is therefore directed to ensure the safe discharge of storm water runoff in order that abutting owners along the outlet will not be subjected to any hazard or inconvenience.

Where improvements are required to the proposed outlets that lie outside the Development, the Owner must obtain the necessary permission and easements from the owners of the lands to enter upon these lands for the purpose of carrying out such improvements.

8. DRAINAGE AREA

When designing a storm sewer system and making calculations with respect to the adequacy of any watercourse, drainage channel or outlet, the whole catchment area to be served by sewer, watercourse drainage channel or outlet shall be considered whether or not such catchment area lies within the proposed Development.

STANDARD SPECIFICATIONS FOR STREET AND TRAFFIC SIGNS

1. SCOPE OF WORK

The work described in these specifications consists of the supply and installation of street and traffic signs.

2. MATERIALS

Street name plates shall conform to the City of Timmins Standard both in material and design.

Traffic signs shall consist of “**STOP**” signs as shown in the “*Manual of Uniform Traffic Control Devices*”

3. LOCATION OF SIGNS

Street name plates showing the names and emergency 911 numbers of both intersecting streets shall be placed on diagonal corners of each intersection as specified.

Traffic signs shall be placed at each intersection in accordance with the Traffic By-law for the City of Timmins as amended to include the streets within the Plan of Subdivision.

4. METHOD OF INSTALLATION

All signs shall be securely attached to 64 mm I.D. extra strong iron posts which shall extend a minimum of 1.2 meters below the grade. The height of the street name plates shall be 2.1 meters above finished center line grade of the street. The location of the sign shall be determined by the Manager of Engineering. Traffic signs shall be securely attached to 64 mm I.D. extra strong iron posts and shall be installed in accordance with regulation in the “*Manual of Uniform Traffic Control Devices*”.

STANDARD SPECIFICATIONS FOR STREET LIGHTING

This section is under review and consultation and confirmation of requirements with the Engineering Department shall be required.

1. SCOPE OF WORK

The work described in these specifications consists of the lighting of all streets to the satisfaction of the Director of Public Works and Engineering.

2. REQUIREMENTS OF LIGHTING

All Subdivision lights will be installed as per the following:

- a) 100 Watt High Pressure Sodium lamps at a maximum spacing of 60 meters for all residential streets
- b) 150 Watt High pressure Sodium lamps at a maximum spacing of 60 meters for main arterial streets or where required by the City.
- c) The primary and secondary cable shall be located in the same trench at a distance of either 3 meters or 0.6 meters from the property line in streets with asphalt gutter banks.
- d) Street lights shall be located 1.7 meters from the street line in streets with asphalt gutter banks and 0.5 meters from the street line with curb and gutter.

3. PLANS TO BE SUBMITTED

A general plan of the Subdivision (scale 1:1000) must be submitted to Hydro One and to the Manager of Engineering showing the location of all existing utilities and the location of all proposed underground services, transformers and street lights.

4. DESCRIPTION OF LIGHTS

Luminaires – high pressure Sodium (100 & 150 Watt), unless otherwise specified, complete with integral ballast, controller, slip fitter hood. Suitable for concrete pole mounting.

Approved Manufactures

Electrical Power Accessories, Brampton, Ontario
Powerlite Devices, Toronto, Ontario
General Electric
Other manufacturers having similar specifications

5. POLE DESCRIPTION

Poles shall be spun concrete and round for direct burial as per the following: (Refer to Standard Drawing 280)

- a) Poles for 100 Watt high Pressure Sodium luminaires must be 8.9 meters long, including Davit, with a mounting height of 7.4 meters.
- b) Poles for 150 Watt High Pressure Sodium luminaires must be 10.4 meters long, including Davit, with a mounting height of 8.9 meters.

Approved Manufacturers

Barrat Spun Concrete Poles, Niagara Falls, Ontario
Stress Crete Limited, Burlington, Ontario

6. CABLE DESCRIPTION

All cables shall be of such material so as to conform to the Electrical Code for this type of installation and subject to approval of Hydro One.

7. APPROVALS FOR LIGHTING

All approvals for street lighting shall be approved by Hydro One and the Director of Public Works and Engineering.

TRAFFIC IMPACT STUDIES

The Engineering Department will require all developments on the connecting link to provide a traffic study report. It also reserves the right to request a traffic study on any road based on the nature of the proposed site use.

The following shall be included as a minimum when preparing a Traffic Impact Study report:

- a) Project description
- b) Study area should consist of at a minimum, intersections adjacent to the site
- c) Proponent is responsible for collecting traffic data (data to be current to within the last 5 years)
- d) Existing conditions including traffic, current land use, roadway geometrics, transit routes, etc...
- e) Development traffic
- f) Proposed transportation system modifications
- g) Proposed traffic control devices
- h) Pedestrians and cyclists network – identify how internal and external linkages will be accommodated

The report shall identify all system geometric and operational modifications as necessary. The proponent will be responsible for all necessary modifications.

INSPECTION AND TESTING

Full-time inspection on all construction work on City right of ways and subdivisions services will be required by the Engineering Department.

The engineering firm that is hired to provide supervision for and inspect all work carried out in the development will report to the Engineering Department. They shall provide weekly written reports complete with photos on work progress and construction methods; maintain daily diary recording and special instructions. Carry out final inspection at the conclusion of construction at the end of the maintenance period and as part of the final inspection.

Provide final inspection and report prior to acceptance and takeover by the Municipality and that all work is complete and was completed in accordance with the City of Timmins standards.

1. SEWERS

- a) All pipes and accessories shall be inspected by the Consultant's Filed Representative for damage in transit. No defective material shall be delivered to the job site. Any material subsequently damaged shall be removed from the job site immediately.
- b) The Owner may be ordered by the Consultant to have all pipe inspected by an accredited Inspection Company before being delivered to the job, and stamped with their approved mark. The Consultant may order tests made of any materials delivered to the job and may reject materials pending the result of tests. Cost of all tests and inspections shall be borne by the Owner.
- c) A camera inspection of all sanitary and storm sewers must be done and the City of Timmins is to be provided with a DVD copy (electronic copy) and inspection book of this inspection.
- d) Infiltration testing shall be performed on the sanitary sewer, at the Owner's expense, as outlined in the City of Standard Specifications for Sanitary Sewers. Standard Infiltration Test Form # 125 is to be completed prior to approval.
- e) Compaction tests must be performed on the backfill at the Owner's expense, to ensure that the specified Standard Proctor values are obtained. Copies of the test results are to be submitted to the City.
- f) Sieve Analysis of bedding material must be performed, at the Owner's expense, to ensure that granular materials comply in all respects to Ontario Provincial Standard Specification No. 1010 or any revision thereof. Copies of the test results are to be submitted to the City.

2. ROADWAYS, CURB AND GUTTER, AND SIDEWALKS

- g) Sieve Analysis of bedding material must be performed, at the Owner's expense, to ensure that granular materials comply in all respects to Ontario Provincial Standard Specification No. 1010 or any revision thereof. Copies of the test results are to be submitted to the City.
- h) Concrete tests as per ACI, including slump, air and compressive strength shall be performed, at the Owner's expense, to ensure that the strength and quality specified in the associated Standard Specifications regarding sidewalks and curb and gutter is maintained. Copies of the test results are to be submitted to the City.
- i) Compaction tests must be performed on the road base, at the Owner's expense, prior to paving to ensure that the granular backfill has been compacted to the "City Specifications". Copies of the test results are to be submitted to the City.
- j) An asphalt mix design must be approved by the City prior to the laying of asphalt. Asphalt extraction tests are to be carried out in accordance with the latest OPSS Specifications to ensure that the asphalt concrete conforms to the City Specifications.
- k) The City may carry out, from time to time, random tests (both for depth and gradation) on granular base materials and asphalt as an additional check on tests taken by the Consultant.
- l) All Ditches/Swales shall be clean and flow correctly.

3. WATERMAIN

- m) All pipes and appurtenances shall be inspected by the Consultant's Filed Representative for damage in transit. No defective material shall be delivered to the job site. Any material subsequently damaged shall be removed from the job site immediately.
- n) The Owner may be ordered by the Consultant to have all pipe inspected by an accredited Inspection Company before being delivered to the job, and stamped with their approved mark. The Consultant may order tests made of any materials delivered to the job and may reject materials pending the result of tests. Cost of all tests and inspections shall be borne by the Owner.
- o) Compaction tests must be performed on the pipe bedding and bedding, at the Owner's expense, to ensure that the specified Standard Proctor values are obtained. Copies of the test results are to be submitted to the City.
- p) Sieve analysis of granular materials, at the Owner's expense, must be performed to ensure that all materials comply in all respects to Ontario Provincial Standard Specification No. 1010 or any revisions thereof. Copies of the test results are to be submitted to the City.

- q) All watermains must successfully pass the pressure and leakage tests to be conducted by the Owner under the direction of the Consultant and the City. Watermain Leakage Test Form No. 130 is to be completed prior to approval.
- r) Before any portion of the watermain is to be placed into service, the system being connected must meet all AWWA Standards and City of Timmins Standards for new mains. The costs of disinfection and associated work shall be borne by the Proponent. A report complete with all testing and confirmation that disinfection procedure has been adhered to shall be provided to the Manager of Engineering to be reviewed and approved prior to acceptance of turning on the watermain.
- s) All fire hydrants, mainline valves and service valves are to be operated by the City to ensure satisfactory performance.

4. INITIAL INSPECTION (PRIOR TO ISSUANCE OF BUILDING PERMITS)

An initial inspection shall be performed under the direction of a City Official with the assistance of the Consultant's on-site representative. This inspection shall precede the issuance of any building permits in order to determine what deficiencies, if any, are existing.

Each individual Development Agreement shall state to what extent services are required, in order for building permits to be issued. In any case, the initial inspection shall involve:

- a) Visual inspection of the sanitary and storm systems.
- b) Camera inspection of all sanitary sewers. Copy to be given to the City of Timmins – Engineering Department.
- c) Visual inspection of road, curb, boulevards, sidewalk and ditches.
- d) Inspection of the operation of the watermain system and appurtenances (i.e. curb stops, hydrants etc.)
- e) Pressure testing and sterilization of watermain system.
- f) Any other tests as dictated by the Subdivision or Site Plan Agreement itself.

5. PRE-PAVING INSPECTION

The City requires that prior to paving the base course of any roadway, be it before the issuance of building permits (depending on the individual Subdivision or Site Plan Agreement), an inspection between a City Official and the Consultants Field Representative be performed on the roadway's Granular "A" base. This inspection will involve compaction tests as well as an overall visual inspection of the road base.

6. SECONDARY INSPECTION (PRIOR TO OCCUPANCY)

A secondary inspection shall be performed under the direction of a City Official with the assistance of the Consultant's on-site Representative. This inspection shall precede occupancy of any building and shall involve the inspection of the services and shall include dye testing for proper connections required for occupancy as outlined by the individual Subdivision or Site Plan Agreement.

A list of deficiencies shall be made and if the conditions of the services are satisfactory to the Manager of Engineering, the City shall assume the services for regular maintenance operations "only". (i.e. garbage pick-up, snow plowing etc.)

A certificate from the Director of Public Works and Engineering shall be issued. The Owner must be responsible to guarantee and maintain the services for a period of two (2) years following the issuance of the certificate. As-built drawings as described in Section As-Constructed Drawings and Diary Sheets shall be provided to the City at this time.

7. FINAL INSPECTION

Following the two (2) year period of guarantee and maintenance, a final inspection shall be held by one City Official and a Representative of the Consultant. This inspection shall involve the investigation of previous deficiencies, as well as determining further deficiencies which may have arisen during the two-year period of guarantee and maintenance. The City will also inspect each and every curb-stop prior to the issuance of final acceptance.

Within the warranty period the Proponent shall be responsible for making any repairs to any appurtenances. Any emergency repair work performed by City forces prior to final acceptance will be charged to the Proponent.

APPENDIX A

City of Timmins Special Provisions

SPECIAL PROVISIONS

INDEX

ASPHALT PAVEMENT

ASP-01	HOT MIX SP 12.5 & 19 ASPHALT (ROADWAY AND GUTTER BANK)	JAN. 2015
ASP-02	CORING OF BITUMINOUS PAVEMENT	MAR. 2010
ASP-03	CORING OF REJECTABLE HOT MIX	MAY 2009
ASP-04	GRANULAR "A" & GRANULAR "B" TYPE I (ASPHALT PAVING CONTRACT ONLY)	JAN. 2015
ASP-05	SURFACE RESTORATION	MAY 2013
ASP-06	ASPHALT PULVERIZING	APR. 2003
ASP-07	GRINDING	MAY 2013
ASP-08	WATER FOR DUST SUPPRESSION	MAR. 2010
ASP-09	POT HOLE PATCHING	APR. 2012
ASP-10	PLACEMENT OF GRINDINGS	FEB. 2015
ASP-11	EDGE RAMPING OF CONCRETE CURBS	JAN. 2015
ASP-12	ASPHALT ROADWAY TEMPORARY MARKINGS	MAR. 2015

GENERAL

GEN-01	DELETED	
GEN-02	DELETED	

ROAD CONSTRUCTION

RD-01	EARTH EXCAVATION	MAR. 2014
RD-02	MINOR EXCAVATION	MAR. 2012
RD-03	GRANULAR "A"	APR. 2011
RD-04	GRANULAR "B" TYPE I	FEB. 2010
RD-05	DELETED	
RD-06	WATER FOR DUST SUPPRESSION	FEB. 2006
RD-07	19mm CLEARSTONE	FEB. 2013
RD-08	DELETED	
RD-09	DELETED	
RD-10	LANDSCAPE GRADING	MAR. 2014
RD-11	DELETED	
RD-12	REMOVE, SALVAGE/ REPLACE PAVING STONES, PATIO SLABS & DRIVEWAY CURBS	FEB. 2013
RD-13	CONCRETE SIDEWALK	FEB. 2014
RD-14	CONCRETE STEPS	FEB. 2013
RD-15	CONCRETE RETAINING WALL	MAR. 2011
RD-16	CONCRETE EDGE STRIP	MAR. 2010
RD-17	CONCRETE BRIDGING, CRADLING AND ENCASING	APR. 2003
RD-18	CONCRETE CURB AND GUTTER REPLACEMENT AND APPURTENANCES	MAR. 2011

ROAD CONSTRUCTION (CONTINUED)

RD-20	60mm PAVING STONE SIDEWALK & DRIVEWAY INCLUDING BEDDING SAND	APR. 2005
RD-21	RESTORATION OF DRIVEWAYS	FEB. 2014
RD-22	DITCHING	APR. 2003
RD-23	DELETED	
RD-24	POLYSTYRENE INSULATION	APR. 2003
RD-25	ROCK EXCAVATION (TRENCH)	FEB. 2004
RD-25-A	PRE-BLASTING SURVEY	FEB. 2014
RD-26	DELETED	
RD-27	50mm ASPHALT RESTORATION	MAR. 2010
RD-28	90mm ASPHALT RESTORATION	MAR. 2010
RD-29	50mm ASPHALT OVERLAY	MAR. 2010
RD-30	REMOVE, PREPARE AND PATCH 50mm HL4 ASPHALT	APR. 2003
RD-31	REMOVING, RELOCATING AND INSTALLATION OF PARKING METERS	APR. 2003
RD-32	ASPHALT REMOVAL	MAR. 2014
RD-33	COMPOSITE SURFACE REMOVAL	APR. 2003
RD-34	DELETED	
RD-35	TREE REMOVAL	APR. 2007
RD-36	REMOVAL OF EXISTING STREET LIGHT	APR. 2003
RD-37	GRANULAR "B" – TYPE II	FEB. 2010
RD-38	DELETED	
RD-39	DELETED	
RD-40	REMOVAL OF UNSUITABLE TRENCH MATERIAL (0mm to 300mm)	FEB. 2004
RD-41	TOPSOIL, HYDROSEED AND SOD	FEB. 2013
RD-42	REGRADE AND PREPARE ROADWAY FOR ASPHALT AND CONCRETE WORK IN PHASE II	MAR. 2006
RD-43	CONCRETE CURB	FEB. 2013
RD-44	50mm MINUS ROCKFILL (QUARRIED)	SEPT. 2009
RD-45	150mm MINUS ROCKFILL (QUARRIED)	SEPT. 2009
RD-46	WELL POINT DEWATERING	MAR. 2014
RD-47	CONCRETE CURB AND GUTTER IN PHASE II	MAR. 2014
RD-48	SUPPLY AND INSTALL PAVING STONE AND DRIVEWAY CURBS	MAR. 2011
RD-49	SHOULDER REGRADE FOR SURFACE TREATMENT	FEB. 2013

STORM AND SANITARY SEWER

SEW-01	REMOVAL OF CULVERTS	APR. 2003
SEW-02	STRUCTURE RELOCATION	MAR. 2006
SEW-03	CAST IN PLACE STRUCTURE	JAN. 2011
SEW-04	DELETED	
SEW-05	DELETED	
SEW-06	MANHOLES, CATCHBASINS AND DITCH INLETS	FEB. 2014
SEW-07	STORM SEWER MATERIALS	MAR. 2012

STORM AND SANITARY SEWER (CONTINUED)

SEW-09	SUBDRAINS	MAR. 2011
SEW-10	RIP RAP WITH GEOTEXTILE	APR. 2003
SEW-11	RESET TOP OF GRATES OF EXISTING CB'S AND MH'S	MAR. 2004
SEW-12	SANITARY SEWER CONNECTIONS AND RECONNECTIONS	MAR. 2011
SEW-13	RECONNECTION TO EXISTING SANITARY OR STORM PIPE	FEB. 2010
SEW-14	SANITARY SEWER MATERIALS AND SUPPLIER	MAR. 2011
SEW-15	STORM AND SANITARY SEWER CAMERA INSPECTION	FEB. 2013
SEW-16	BREAK INTO STRUCTURE	APR. 2003
SEW-17	BREAK INTO BENCHING	APR. 2005
SEW-18	RELOCATE WATER SERVICES TO PROPERTY LINE	FEB. 2007
SEW-19	STORM SEWER RECONNECTIONS TO CONCRETE STORM SEWER	MAY 2007
SEW-20	ASBESTOS CEMENT PIPE REMOVAL AND DISPOSAL	MAR. 2011
SEW-21	INSTALLATION OF 750mm STORM SEWER	MAY 2012
SEW-22	SANITARY SEWER BY-PASS PUMPING	FEB. 2013
SEW-23	PARGE HOLES IN STRUCTURE (200mm to 450mm)	MAR. 2014
SEW-24	STRUCTURE WORK PAYMENT	FEB. 2015

WATERMAIN

WAT-01	PVC WATERMAINS	MAR. 2014
WAT-02	INSTALLATION OF WATERMAIN	FEB. 2014
WAT-03	WATER SERVICE THAWING ABILITY TEST	FEB. 2010
WAT-04	DELETED	
WAT-05	WATERMAIN DIVERSION	APR. 2003
WAT-06	FIRE HYDRANT INSTALLATION	FEB. 2011
WAT-07	FIRE HYDRANT REMOVAL	APR. 2005
WAT-08	FIRE HYDRANT RELOCATION	JAN. 2011
WAT-09	WATER SERVICE CONNECTIONS AND RECONNECTIONS	JAN. 2011
WAT-10	PLUG ABANDONED WATERMAIN/SEWER PIPES	MAR. 2004
WAT-11	DISINFECTION OF WATERMAINS	FEB. 2013
WAT-12	DELETED	
WAT-13	ANODE	MAR. 2012
WAT-14	MAIN LINE WATER VALVES - DENSO TAPE RUST PROTECTION	FEB. 2015

Refer to OPSS 310, 1001 and OPSS MUNI 1101 & 1151

Compacted Thickness of Asphalt Pavement

- One course - 50mm (SP 12.5)
- Two courses - 50mm base (SP 19), 40mm top (SP 12.5)
- Three courses - 50mm base (SP 19), 50mm second (SP 19), 40mm top (SP 12.5)

All existing asphalt driveways, boulevard, sidewalks, etc. abutting the roadway shall be paved with 50mm of SP 12.5 hot mix asphalt as per the contract drawings. Payment shall be made under the "Gutter Bank" Item.

Prior to paving, locate and raise all valve boxes to finished grade.

A tolerance of minus 10mm and plus 5mm shall be applied on the thickness of the finished asphalt product. If the asphalt is thinner than 10mm less than that specified, the Contractor shall be required to remove and replace the asphalt as directed by the Contract Administrator. If the Contractor places the asphalt at a thickness 5mm more than that specified; the excess quantity of asphalt shall be deducted proportionally from the final payment as directed by the Contract Administrator. The thickness of the finished asphalt product will be determined by coring. If the cores indicate that the thickness of the asphalt is not within the allowable tolerance, the roadway shall be cross-sectioned to determine the extent of reconstruction or asphalt deduction required.

Overlapping of asphalt at the gutter line shall not be allowed.

For those streets indicated in "Schedule C" the Contract Administrator shall issue written notices to the Paving Contractor for each street stating the dates when each is ready to be paved. If asphalt is not placed within three (3) calendar days of this notice, the Contractor shall restore the roadway to the required grade and cross-section at no cost to the Corporation.

OPSS 310 is amended in that automatic screed controls are not required. The first paragraph of Subsection 310.07.07 is deleted and replaced by the following:

"Paving shall not be carried out if, in the opinion of the Contract Administrator, the roadbed is frozen. In case of disagreement, the Contractor has the option of demonstrating, at his own expense and to the satisfaction of the Contract Administrator, that the roadbed is frost-free."

Cancellation of the Surface Course Trial Area

No surface course trial area shall be required.

Asphalt Cement

Asphalt cement shall comply with Appendix Table A-1, *Grade Selection for Ontario*, OPSS MUNI 1101. The Contractor shall supply the asphalt cement for this contract with a penetration grade of PG 52-34.

Mix Design

Job mix formulas shall be made by the Contractor having a stability for Ontario Traffic Category "C" and "D". Mix design shall be according to the requirements specified in the Tables in OPSS MUNI 1151.

Measurement for Payment

Measurement shall be made in tonnes conforming to OPSS 102.

Basis of Payment

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment, and material required to do the work.

Coring of Bituminous Pavement

The Contractor shall obtain and deliver core samples of pavement to the Contract Administrator. The samples shall be delivered to a designated point within the contract limits or to a laboratory at the hot mix plant site.

Warrant

All mix types where the tender quantity is 2,500 tonnes or more are covered by this Special Provision except as follows:

- No pavement samples required from Gutterbank

Sampling Frequency

Sampling frequency is based on the amount of pavement of each type of hot mix placed in one day, henceforth, referred to as a Lot.

LOT SIZE	NO. OF CORES
Less than 100 tonnes	3
101 - 300 tonnes	4
301 - 700 tonnes	5
Greater than 700 tonnes	6

Sample Size

Each core shall have a nominal diameter of 150mm and shall consist of the full layer being sampled and at least one underlying layer if one is present.

Sampling Procedure and Delivery of Samples

1. Upon completion of each lot, the Contract Administrator shall give the Contractor the random location of each core to be taken from that lot. The location of the cores shall be determined as follows:
 - a) a random number shall be selected from a random number chart
 - b) the station of the random core shall be found by multiplying the length of construction by the random number and adding to the station at the start of construction
 - c) the offset of the core shall be found by multiplying the width of construction by the random number and is measured from the left edge of construction

2. The Contractor shall extract the cores the next regular work day following the completion of the lot, label them as shown in paragraph 5 and deliver them the same day to the City of Timmins Laboratory. These cores shall be sent by the City to an **Approved Laboratory** for testing.
3. Care shall be taken to ensure that cores are not damaged during coring or in transit. If a core is damaged a replacement core shall be extracted at a location selected by the Contract Administrator.
4. All core holes shall be refilled the same day with hot mix and compacted to conform to the adjoining undisturbed pavement.
5. The sample shall be accompanied with identification indicating:
 - a) contract no.
 - b) date
 - c) mix type
 - d) street name
 - e) lot no.
 - f) station location
 - g) offset from centreline of roadway

Compliance with Specifications

The cores shall be used to determine compliance for compaction and lift thickness. Any cores set aside for testing at a later date shall not be used in the acceptance of the mix.

Basis of Payment

Payment at the contract price for the appropriate hot mix item shall include full compensation for all labour, equipment, and material to do the above work.

Scope

This Special Provision requires the Contractor obtain pavement cores to determine quantity and quality of rejectable mixture.

Sampling Frequency

Ten cores, at locations selected by the Contract Administrator, shall be taken whenever a hot mix acceptance test falls in the rejectable zones shown in the table below. Where small quantities of hot mix are involved, the Contract Administrator may elect to have fewer cores taken.

Material	Characteristics	Acceptable Zones %	Borderline Zones %	Rejectable Zones %
Surface Course Mixes	+4.75mm	± 5.0	± 5.1 to +7.5 - 5.1 to - 7.5	+7.5 - 7.5
	- 75 µm	± 2.0	+ 2.1 to + 3.0 - 2.1 to - 3.0	+ 3.0 - 3.0
Binder and Levelling Course Mixes	+ 4.75mm	± 7.0	+ 7.1 to + 10.0 - 7.1 to - 10.0	+ 10.0 - 10.0
	- 75 µm	± 2.0	+ 2.1 to + 3.0 - 2.1 to - 3.0	+ 3.0 - 3.0
All Mixes	Asphalt Cement	± 0.30	+ 0.31 to + 0.50 - 0.31 to - 0.50	+ 0.50 - 0.50

Sample Size

Each core shall have a nominal diameter of 150mm and shall consist of the full layer being sampled.

Sampling Procedure

1. The Contractor shall extract the cores at the locations selected by the Contract Administrator, label them as shown in Paragraph 3 below, and deliver the cores the same day to the City of Timmins Engineering Office. These cores shall be sent by the City of Timmins to an Approved Laboratory for testing.
2. All core holes shall immediately be refilled with hot mix and then compacted to the same density as the adjoining undisturbed pavement.

3. The cores shall be accompanied with identification indicating:

- contract number
- mix type
- core number (or lot number)
- station location
- offset from center line of highway
- date

Payment

Payment at the contract price for the appropriate hot mix item shall include full compensation for all the labour, equipment and material to do the above work; except, if the testing fails to identify any material that falls in the rejectable zones, City shall pay the Contractor \$40.00 for each core cut as directed.

Refer to OPSS 314.

For roadways that are to be paved the same year as they are excavated, the finished Granular "A" surface shall not deviate more than 10mm from the specified grade and cross-section. The granular base shall be maintained to this tolerance until the surface is paved.

If an asphalt lift or surface treatment is not placed within five (5) working days after final grading of the granular base (to be approved by the Contract Administrator) and the roadway then loses its shape from wear and weather, the Paving Contractor shall restore the roadway to the desired shape at no extra cost to the City.

Water used to achieve the compaction required shall be included in the price of the granular material.

Payment for Granular "A" shall not be made until the final road grades and cross-sections have been approved by the Contract Administrator.

Payment for Granular "B" shall not be made until Granular "A" base has been constructed and approved by the Contract Administrator.

Measurement for Payment

Measurement shall be made in tonnes conforming to OPSS 102.

Basis of Payment

Payment at the contract price for the above item(s) shall be full compensation for all labour, equipment and material required to do the work.

Refer to OPSS Form 301.

The Contractor shall be required to loosen the existing roadway to a depth of 100mm and shape to the specified grade and cross-section prior to the placement (when required) of Granular "A" material. If the existing roadway material is unacceptable to the Contract Administrator or is in excess, it shall then be removed by the Contractor.

Surface restoration shall be performed by a grader of tandem drive with a minimum operating power of 100 H.P.

The surface of a roadway having been restored once and to the satisfaction of the Contract Administrator, shall be deemed ready for placement of the asphalt lift(s). The finished surface shall not deviate more than 10mm from the specified grade and cross-section. If an asphalt lift is not placed after this operation and the roadway then loses its shape from wear and/or weather, the Contractor shall restore the roadway to the desired shape at no extra cost to the City. The cost of re-sectioning the roadway by the City's survey crews shall be paid for by the Contractor as extra work performed by the City's survey section.

Measurement for Payment

The area of roadway surface actually restored shall be measured in square metres.

Basis of Payment

Payment at the contract price per square metre and shall be full compensation for all labour, equipment, and material required.

Asphalt pulverizing shall consist of processing existing bituminous pavement and underlying granular in place.

Surface restoration shall follow asphalt pulverizing and shall be paid separately as outlined elsewhere.

While processing the existing pavement, the Contractor shall ensure that the existing pavement and granular base course are thoroughly mixed to the specified depth of 150mm.

The processing shall be carried out such that all mixed materials pass the 25.6mm sieve and not more than 75% passes the 4.75mm sieve.

The pulverizing shall be completed to the same station for the full pavement width prior to closing down operations each day.

Measurement for Payment

Measurement for pulverizing is the horizontal area in square metres calculated using the length and width specified.

Basis of Payment

Payment at the contract price shall be full compensation for all labour, equipment and material required to do the work.

The asphalt pavement shall be removed to an average depth of 50mm. The maximum depth of removal in any specific location shall be determined at the time of construction.

For two lane highways, grinding shall be done to essentially the same station for the full pavement width prior to shutdown at the end of the day.

For multi-lane highways, grinding shall be done to essentially the same station for the full pavement width for a specific direction prior to shut down at the end of the day.

The surface remaining after grinding shall have a constant and continuous crossfall matching the intended surface course crossfall. The surface remaining after grinding shall have an even texture, free of grooves and/or ridges, in all directions.

Ramping the edges and manholes are required when paving does not take place on the same day.

The reclaimed asphalt pavement material shall not remain on the roadway after completion of the day's operation. Reclaimed material to be hauled, graded, and compacted at a site to be determined by the Contract Administrator.

Measurement for Payment

The area of roadway grinded shall be measured in square metres. Payment shall be to the nearest 0.1 square meter.

Basis of Payment

Payment at the contract price to the nearest 0.1 square metre shall be full compensation for all labour, equipment, and material required to complete the work.

Refer to OPSS 506.

Water shall be applied when and as directed by the Contract Administrator. If the Contractor is unable to place water within four (4) hours of the Contract Administrator's instructions, the water will be provided by other agencies and back charged to the Contractor.

Measurement for Payment

The water tank shall be measured and its volume computed in cubic meters. Payment shall be to the nearest 0.1 cubic meter.

Basis of Payment

Payment for the above item shall be full compensation for all labour, equipment, and material required to do the work.

Refer to OPSS 307, 309, 1153.

Pot holes shall be filled with cold mix.

Measurement for Payment

All holes to be patched. Average size for a pot hole is estimated at 0.1 square meters. Each patch, no matter how small, shall be paid as 1 each.

Basis of Payment

Payment at the contract price, for the above item, shall be full compensation for all labour, equipment, and material required to do the work.

Grindings shall be placed at a thickness of between 150mm to 200mm. A grader of a minimum operating weight of 14,000kg shall be present during the dumping of material. A single smooth drum vibratory roller of minimum weight of 9,200kg shall be supplied at the request of the City of Timmins only once all of the grindings have been placed and properly graded to allow for compaction of the grindings. The City of Timmins shall not make payment for any hours packer is present on site before the above is achieved. The placement of grindings shall be considered one project in its entirety.

Basis of Payment

Payment shall be based on Time and Material basis (as specified in OPSS.MUNI 100) and be paid out of a cash allowance. This item shall be compensation, in full, for all labour, equipment, and materials necessary to complete the work.

Refer to OPSS 310, 1001 and OPSS MUNI 1101 & 1151

Edge ramping shall be required whenever basecoat is placed on a roadway having concrete curbs and topcoat is not to be placed that same year.

Edge ramping is to be placed to the top of the concrete curb, approximately, 40mm in height and 300mm in width.

Where sections of concrete curb (typically 2.0 meters in length), have not been placed due to structures (catchbasins or manholes), an asphalt curb shall be constructed to the general dimensions of a concrete curb, allowing for sloping on the face and back of the asphalt curb.

Asphalt Cement

Asphalt cement shall comply with Appendix Table A-1, *Grade Selection for Ontario*, OPSS MUNI 1101. The Contractor shall supply the asphalt cement for this contract with a penetration grade of PG 52-34.

Mix Design

Job mix formula shall be made by the Contractor having a stability for Ontario Traffic Category "C". Mix design shall be according to the requirements specified in the Tables in OPSS MUNI 1151

Measurement for Payment

Measurement shall be made in tonnes conforming to OPSS 102.

Basis of Payment

Payment at the contract price for the above item shall be full compensation for all labour, equipment, and material required to do the work.

Contractor shall provide temporary roadway lane markings after grinding and paving operations in which existing lane markings are no longer visible. This provision should be considered when the scope of work encompasses more than one lane of roadway.

Basis of Payment

Payment at the contract price for the above item shall be included in the price of asphalt and grinding.

Refer to OPSS 180, 206 and 351.

All driveways abutting the roadway excavation shall be fitted as per the contract drawings, and the earth excavation involved shall be paid under this item.

No more than one street block shall be closed off at any time for this particular operation.

Total excavation shall not exceed 60m at any time (includes pipe trenches and earth excavation).

Granular "B" and all driveways shall be graded and capped with minimum of 100mm of Granular "A" within 60m of the furthest excavation point prior to 4:00 p.m. each Friday or a penalty of \$1,000.00 shall apply for each calendar day of non-compliance.

Clean uncontaminated roadbed granulars shall be salvaged and re-used as pipe bedding, cover, or Granular "B", providing it meets specifications.

All excavated materials from City of Timmins projects, shall be hauled to the Deloro Landfill site and shall be co-ordinated with the Sanitation Dept. All applicable tipping fees shall apply. After landfill hours contractor shall find alternate dump site of their choice.

All excavated materials which are not required or are unsuitable for use in this contract, nor required by the Owner, shall be hauled, dumped, and spread by the Contractor in the locations supplied by the Contractor and approved by the Contract Administrator; the cost of which shall be deemed to be included in the bid unit price per cubic metre of earth excavation. The Contractor must maintain access to these sites. However, if in the opinion of the Contract Administrator, the sites are not accessible for dumping, the Contractor must dispose of all excavated materials in other areas supplied by the Contractor.

Payment for earth excavation will not be made until the Granular "B" subbase has been constructed and approved by the Contract Administrator.

Measurement for Payment

Measurement for payment shall be in cubic metres and deductions shall be made for overbuilding.

Basis of Payment

Payment at the contract price, per cubic metre, for this item shall be full compensation for all labour, equipment, and material required to complete the work.

Minor excavation up to 300mm deep shall be required in areas as determined by the Contract Administrator.

Driveways shall be paid under the Earth Excavation item.

Measurement for Payment

Measurement shall be made in square metres.

Basis of Payment

Payment at the contract price, per square metres, for minor excavation shall be full compensation for all labour and equipment to complete the work. The work is to include shaping to proposed granular elevations. If Granular "B" is required, it shall be paid under the Granular "B" item.

Refer to OPSS 314 & 1010. (Except for Payment Purposes)

If an asphalt lift is not placed within five (5) working days after final grading of the granular base (to be approved by the Contract Administrator) and the roadway then loses its shape from wear and weather, the Paving Contractor shall restore the roadway to the desired shape at no extra cost to the City.

Payment for Granular "A" shall not be made until the final road grades and cross-sections have been approved by the Contract Administrator.

Plan quantity shall be the entire Granular "A" contained within the roadway cross-section i.e. top of gutterbank or back of sidewalk. All driveway fit points shall be included.

Measurement for Payment

Measurement for payment is by plan quantity. Adjustments to the plan quantity shall be by measurement in square metres.

Refer to OPSS 314 & 1010.

Granular B Type I shall be from non quarried source only.

The Contractor shall advise the Contract Administrator when Granular "B" is to proposed grade and fully compacted. The Contractor shall sign the Road Release form attached to communicate with the Contract Administrator that the Granular "B" is to proposed grade and compacted.

If Granular "B" is lower than the specified grade then the Contractor has an option of placing additional Granular "B" and having the road re-sectioned, or placing Granular "A" for which he will not be paid under the "Granular B" or "Granular A" Items.

The steel plates for all structures shall be brought to Granular "B" grade prior to notification to the Contract Administrator for checking cross-sections.

Measurement for Payment

Measurement for payment is by the tonne.

Refer to OPSS 1860.

The filter fabric should be rolled directly over the native soil. An overlap of at least 300mm must be incorporated. The backfill should be end dumped onto the fabric. Equipment must not be driven directly on the filter fabric until at least 300mm of backfill has been applied. The requirement of either Class I or Class II Geotextiles shall be determined for each individual street and indicated on the Contract Drawings.

Measurement for Payment

Measurement of the actual surface area covered by the filter fabric shall be made to the nearest square metre.

Basis of Payment

Payment at the contract price per square metre of filter fabric shall be full compensation for all labour required to place the fabric as specified, all materials and supplies, and for all other operations which may be required to complete the installation.

*Deleted
(refer to OPSS 1860)*

Refer to OPSS 506.

Water shall be applied when and as directed by the Contract Administrator. If the Contractor is unable to place water within four (4) hours of the Contract Administrator's instructions, the water will be provided by other agencies and back charged to the Contractor.

Refer to OPSS MUNI 1004.05.02

19mm clearstone used to replace unsuitable material must be approved by the Contract Administrator prior to use.

Measurement for Payment

Measurement shall be in cubic metres.

Refer to OPSS 1004.05.07.

Drainstone used to replace unsuitable material as pipe bedding must be approved by the Contract Administrator prior to use. It shall be of similar gradation as clearstone.

Measurement for Payment

Measurement shall be in cubic metres to the neat lines for the depth below design pipe bedding grade approved by the Contract Administrator and the width of pipe bedding shown on the drawing.

Basis of Payment

Payment at the contract price for the above item shall be full compensation for all labour, equipment, and material required to do the work.

Refer to OPSS 570 (570.01 to 570.07 inclusive) and OPSS 572 (572.01 to 572.07 inclusive).

Application of the seed and hydraulic mulch on these areas is as per above with the following revision:

- Section 572.07, 01, and 04 is revised by changing the concentration of primary seed from 100 kg to 200 kg per 10,000 square metres.

Measurement for Payment

The approved area hydroseeded shall be measured accurate to the nearest decimeter.

Basis of Payment

Payment at the contract price to the nearest square metre (m²) shall be full compensation for all labour, equipment, and material to do the work.

Refer to OPSS 206, 802, and 803.

Where specified on the contract drawings, roadside boulevards shall be graded to the elevations and widths indicated, unless otherwise approved. If additional material is required to meet the proposed elevations, it shall be free of roots, vegetation or other debris. The Contractor shall grade and compact, to a uniform surface, the areas to be graded in such a way that surface drainage will flow into the storm sewer system as indicated.

Measurement for Payment

The actual area of grading shall be measured in square metres.

Basis of Payment

Payment shall be made at the contract price per square meter and shall be full compensation for supplying, loading, hauling, spreading, and compacting the material required.

Payment shall be made to the nearest square metre.

Screened Topsoil

Prior to delivery to site, all topsoil shall be screened through 150mm, 50mm, and 4.75mm sieves.

Placement of Topsoil

Topsoil shall be spread to a uniform depth of 50mm.

Placement of Sod

Refer to OPSS 571.07 and 571.08.

Rolling Sod

All unstaked sod shall be rolled with approved 70-80kg sod roller.

Watering Sod

Sod shall be sufficiently watered the day the sod is placed and for three (3) consecutive days after the placement of sod so as to ensure the topsoil is wet.

Should the Contractor demonstrate that the sod has been watered as specified, the Owner will then assume all such newly sodded areas.

If the sod is not watered, on any of the three (3) consecutive days after the placement of sod, then the Contractor shall be responsible for an additional three (3) days.

Measurement for Payment

The actual area topsoiled and sodded shall be measured in square metres (m²).

Basis of Payment

Payment at the contract price for the tender item "Topsoil and Sodding (staked) or (unstaked)" shall be compensation in full for all labour, equipment, and material to do the work, including rolling and screening topsoil.

*Deleted
(refer to SP RD-41, OPSS 571)*

Refer to OPSS 355.

The work involved in the item shall include the salvage, regrading, and replacing of private driveways affected by construction. The work shall include but not limited to the following:

1. Remove and stockpile paving stones/patio slabs neatly away from the affected construction area as approved by the Contract Administrator.
2. Remove and stockpile precast concrete or wooden curbs neatly without damage away from the construction area.
3. Regrade the granular subbase either by excavation or by minor surface regrading as required.
4. If granular "A" base is required, it shall be paid under the Granular "A" Item.
5. Place salvaged curbs and paving stones to the new gradient approved by the Contract Administrator.
6. Replace the materials damaged by removal.
7. Saw cut paving stones as required to fit.

The Contractor shall include the placement of bedding sand to the specified thickness, compacting the stones to a uniform gradient and sweeping bedding sand to the stone joints.

Measurement for Payment

Area covered by paving stones shall be measured in square metres.

Basis of Payment

Payment at the contract price for the above tender item shall be full compensation for all labour and equipment to complete the work.

Refer to OPSS Form 351, OPSS MUNI 904 & 1002.

OPSS Form 351 is amended to include the following:

The Concrete Sidewalk shall conform to CSA A23.1-04, Table 1, 2, 4 & 20

- *class of exposure: C2*: non-structurally reinforced (i.e., plain) concrete exposed to chlorides and freezing and thawing (examples: steps, sidewalks, curbs and gutters)
- *maximum water to cementing materials ratio: 0.45*
- *minimum specified compressive strength and age: 32 MPa @ 28 days*
- *air content: 6.5% ± 1.5* (14-20 mm nominal maximum sizes of coarse aggregate)
- *allowable curing regimes: curing type 2, 7 days at $\geq 10^{\circ}\text{C}$ for a time necessary to attain 70% of the specified strength*

Aggregates must meet OPSS 1002 – April 2011

Polypropylene multi filament fibres with a dosage of 0.75kg/m^3 and a size of 20mm shall be added to the concrete as reinforcement.

Material used for sidewalk granular base shall be Granular "A" of 150mm depth. To be paid under the "Granular A" Item.

A typical sidewalk shall have a thickness of 125mm. At a residential entrance it shall have a minimum thickness of 150mm and of a commercial or institutional building shall have a minimum thickness of 200mm and be extended 2 meters beyond curb cut on each side.

Curing shall be done as per OPSS MUNI 904 – Clause 904.07.10.01 & 904.07.10.03 & 904.07.10.05

Burlap and Water for first 48 hours and then directly followed by an application of Curing Compound.

Items to Submit:

1. Mix design as per OPSS MUNI 1350 – November 2008
2. Certificate of Ready Mixed Concrete Production Facilities
3. Certification that aggregates will not, nor have the potential to, react with cement to result in deleterious expansion in the concrete
4. Certification that deleterious substances in aggregate are within limits specified in CSA A23.1-04, Table 12 – Limits for Deleterious Substances and Physical Properties of Aggregates
5. Certification that proposed performance mix will produce concrete meeting the requirements of the Specifications

In Phase 1, the Contractor shall ramp up the sidewalk with granular "A" to provide for safe usage to the satisfaction of the Contract Administrator. Installation and removal of all such ramps shall be included in the sidewalk cost.

Warranty

Contractor shall warranty the concrete sidewalk for two (2) years.

Policy for Acceptance of Concrete Work

Initial Acceptance

- a) sidewalk slabs with cracks larger than 6mm shall be replaced
- b) sidewalk slabs with more than one crack of any size shall be replaced
- c) sidewalks with differential settlement of 20mm or more shall be replaced
- d) sidewalk slabs with spalled surfaces shall be replaced
- e) sidewalk slabs with a crack of any size which has concrete breaking or spalling away at the edges of the crack shall be replaced
- f) sidewalk slabs with a corner broken off may be saw cut and repaired at this stage
- g) curbs and/or gutters which have spalled may be patched at this stage

Final Acceptance

- a) items no. "a" and no. "f" for "Initial Acceptance" will also apply for "Final Acceptance"
- b) sidewalk slabs with a corner broken off shall be replaced
- c) curbs and/or gutters which have spalled shall be replaced

Any work which was repaired for "Initial Acceptance" and has deteriorated shall be replaced.

Payment

Include all labour, equipment and material for concrete sidewalk. The price per square metre, measured in the field shall include preparation, grading, and compaction for new base.

Refer to OPSS 352.

- Concrete steps shall be required at some walkway entrances.
- Construct concrete steps where directed by the Contract Administrator
- Construct concrete steps in accordance with OPSD 512.010 & 512.011. Handrails are not required.

OPSS 352 is amended to include the following:

The Concrete Steps shall conform to *CSA A23.1-04, Table 1, 2, 4 & 20*

- *class of exposure: C2: non-structurally reinforced (i.e., plain) concrete exposed to chlorides and freezing and thawing. (Examples: steps, sidewalks, curb and gutters)*
- *maximum water to cementing materials ratio: 0.45*
- *minimum specified compressive strength and age: 32 MPa @ 28 days*
- *air Content: 6.5% ± 1 (14-20 mm nominal maximum sizes of coarse aggregate)*
- *allowable curing regimes: curing type 2, 7 days at $\geq 10^{\circ}\text{C}$ for a time necessary to necessary to attain 70% of the specified strength*
- Slump 70mm ± 20mm

Aggregates must meet *OPSS 1002 – April 2011*

Curing shall be done as per *OPSS MUNI 904 – Clause 904.07.10.01, 904.07.10.03 & 904.07.10.05*

Burlap and Water for first 48hours and then directly followed by an application of Curing Compound.

Measurement for Payment

Measurement for payment shall be in cubic metres for the concrete placed, based on the neat lines called for in the Contract.

Basis of Payment

Payment shall be made at the contract price, per cubic metre, for concrete steps and such payment shall be compensation in full for all labour, equipment, and material required to complete the work. Excavation for the concrete steps and backfill is included in this Item.

Warranty

Contractor shall warranty the concrete steps for two (2) years. In the event of any spalling, contractor to remove and replace all concrete and restore adjacent damaged areas.

Refer to OPSS MUNI 904 & 1002.

The Contractor shall be required to excavate and construct the retaining wall to the grades and location shown.

OPSS MUNI 904 is amended to include the following:

The Concrete Retaining Wall shall conform to *CSA A23.1-04, Table 1, 2, 4 & 20*

- *class of exposure: C2: non-structurally reinforced (i.e., plain) concrete exposed to chlorides and freezing and thawing. (Examples: steps, sidewalks, curb and gutters)*
- *maximum water to cementing materials ratio: 0.45*
- *minimum specified compressive strength and age: 32 MPa @ 28 days*
- *air Content: 6.5% ± 1 (14-20 mm nominal maximum sizes of coarse aggregate)*
- *allowable curing regimes: curing type 2, 7 days at ≥ 10°C for a time necessary to necessary to attain 70% of the specified strength.*

Aggregates must meet *OPSS 1002 – April 2004*

Curing shall be done as per *OPSS 904 – Clause 904.07.10.06 – Curing Formed Surfaces Burlap and Water for first 48hours and then directly followed by an application of Curing Compound.*

Measurement for Payment

Measurement for payment shall be in cubic metres for the concrete placed, based on the neat lines called for in the Contract.

Basis of Payment

Payment shall be made at the contract unit price, per cubic metre, for retaining wall and such payment shall be compensation in full for all labour, equipment, and material required to complete the work. Excavation for the retaining wall structure and backfill is included in this Item.

Warranty

Contractor shall warranty the concrete retaining wall for two (2) years. In the event of any spalling, contractor to remove and replace all concrete and restore adjacent damaged areas.

Refer to OPSS 353.

- Provide edge strip to the size indicated on the drawings including reinforcing.
- Include the cost of polyethylene plastic and expansion joints adjacent to buildings and structures in the price for the concrete edge strip.
- Provide expansion joints at 6m intervals in concrete edge strips.
- Extend reinforcing into curb and gutter minimum 600mm.
- Where directed by the Contract Administrator, extend the concrete edge strip to buildings.
- Where the width from the front of the concrete edge strip to the building exceeds 300mm, extend concrete to the building.
- Provide double expansion joints between concrete edge strip and buildings.

OPSS Form 353 is amended to include the following:

The Concrete Edge Strip shall conform to *CSA A23.1-04, Table 1, 2, 4 & 20*

- *class of exposure: C2: non-structurally reinforced (i.e., plain) concrete exposed to chlorides and freezing and thawing. (Examples: steps, sidewalks, curb and gutters)*
- *maximum water to cementing materials ratio: 0.45*
- *minimum specified compressive strength and age: 32 MPa @ 28 days*
- *air Content: 8% ± 1 (14-20 mm nominal maximum sizes of coarse aggregate)*
- *allowable curing regimes: curing type 2, 7 days at ≥ 10°C for a time necessary to necessary to attain 70% of the specified strength.*

Aggregates must meet *OPSS 1002 – April 2004*

Curing shall be done as per *OPSS 353 – Clause 353.07.08.03 – A) Burlap and Water*
NO CURING COMPOUNDS SHALL BE USED.

Measurement of Payment

Measurement for payment shall be in metres, horizontally, over the center line of the concrete edge strip.

Basis for Payment

Payment for the above tender item shall be full compensation for all labour, equipment and material to do the work.

Concrete edge strip shall be up to 300mm in width, any concrete poured outside the 300 mm width shall be paid by the square meter (m²) under the "Concrete Sidewalk" Item.

Warranty

Contractor shall warranty the concrete edge strip for two (2) years. In the event of any spalling, contractor to remove and replace all concrete and restore adjacent damaged areas.

Refer to Standard Detail Drawing 346.

All concrete to be used in this item shall be 20 MPa (minimum).

Measurement for Payment

This item shall be measured for each support system incorporated into the work as directed by the Contract Administrator.

Basis of Payment

Payment for each support system shall be considered to be payment in full for the supply of all labour, equipment, and material required to complete the work to the satisfaction of the Contract Administrator.

Refer to specifications OPSS 353, 510, 802, 803, 310, 314 and 1002

OPSS 353 is amended to include the following:

The Concrete Curb & Gutter shall conform to *CSA A23.1-04, Table 1, 2, 4 & 20*

- *class of exposure: C2: non-structurally reinforced (i.e., plain) concrete exposed to chlorides and freezing and thawing. (Examples: steps, sidewalks, curb and gutters)*
- *maximum water to cementing materials ratio: 0.45*
- *minimum specified compressive strength and age: 32 MPa @ 28 days*
- *air Content: 6.5% ± 1 (14-20 mm nominal maximum sizes of coarse aggregate)*
- *allowable curing regimes: curing type 2, 7 days at ≥ 10°C for a time necessary to necessary to attain 70% of the specified strength.*

Aggregates must meet *OPSS 1002*

Curing shall be done as per *OPSS 353 – Clause 353.07.08.03*

Burlap and Water for first 48hours and then directly followed by an application of Curing Compound.

General

1. Remove existing curb where indicated to OPSS 510.
2. Sawcut and remove existing pavement to the limits set out by the Contract Administrator.
3. Cut and remove existing sod to the limits set out by the Contract Administrator.
4. Remove and salvage paving stones to the limits set out by the Contract Administrator.
5. Provide compacted Granular "A" as required to underside of curb grade approved by the Contract Administrator.
6. Construct forms to the grade lines approved by the Contract Administrator.
7. Prior to pouring concrete, forms must be inspected by the Contract Administrator. Allow 24 hours notice to the Contract Administrator or his designated representative for this inspection.
8. Place and cure concrete in accordance with OPSS 353.
9. Provide Granular "A" as required and compact prior to placement of HL4 hot mix asphalt course where required to OPSS 314.
10. Place 90mm HL4 hot mix asphalt restoration where required in two lifts not exceeding 50mm to OPSS 310.
11. Provide topsoil and sod where required to match new curb and existing lawn grade to OPSS 802 and 803.
12. Replace paving stone where required to match new curb and existing pavers.
13. Do not remove curb that will not be replaced within 7 calendar days.
14. Adjust catchbasins to fit new curb elevations.

Measurement for Payment

Measurement of concrete curb and gutter shall be made in metres along the flow lines of the gutter whether straight or circular. Measurement shall include the space occupied by set backs, gutter outlets, and frames and grates.

Basis of Payment

Payment at the contract price per linear metre shall be full compensation for all labour, equipment, and material to complete the work.

Warranty

Contractor shall warranty the concrete curb and gutter for two (2) years. In the event of any spalling, contractor to remove and replace all concrete and restore adjacent damaged areas.

Section 1004.05.06.01 of OPSS Form 1004 is revised as follows:

- Gabion stones shall be well graded in size from 150mm to 300mm in maximum dimensions.
- Gabion walls installed with geotextile behind it shall use Marafi 350 or a geotextile approved equal.

Measurement for Payment

Measurement shall be in cubic metres based on the nominal dimension of the gabion units used. Where gabion excavation overlaps excavation required for other work, the measurement shall be made as specified with no deductions for overlaps.

Basis of Payment

Payment at the contract price shall be full compensation for all the labour, equipment, and material required to complete the work for installation of gabion wall including cutting the gabions to the profile of the pipe and geotextile behind the wall and around the pipe, as shown on drawings.

Refer to OPSS 501, SP RD-21.

General

Where indicated on the contract drawings, a base shall be prepared for the bedding sand. This is to include 150mm of Granular "A" Type 2 compacted to 100% Standard Proctor Density to within \pm 10mm of design grade. Payment of Granular "A" - Type 2 shall be made under its respective item in the Form of Tender.

Materials

Bedding sand shall be well graded sand suited to concrete manufacture, passing a 4.75mm sieve.

<u>SIEVE NO.</u>	<u>% PASSING</u>
4.75mm	100
2.36mm	80 - 100
1.18mm	50 - 85
0.60mm	25 - 60
0.30mm	10 - 30
0.15mm	5 - 15
0.075mm	0 - 10

Filling sand shall pass a 1.18mm sieve and have some 10% of silty material.

Interlocking precast concrete pavers shall be of the "cobblestone" type as manufactured by D. Barnett & Co., Lafarge, or Oaks Precast. The colour is to be multi-covered blend of 40% brown and 60% salmon. Pavers 60mm thickness.

Installation

The sand bedding shall be spread loose and screeded in a uniform layer to a depth determined in the field such that following the compaction of the paving stone surface, the bedding sand layer shall not exceed 40mm.

Paving units shall be placed on the uncompacted screeded sand in the prescribed laying pattern. The units shall be placed to achieve gaps nominally 2 to 4mm wide between adjacent units. Where required, all units must be cut using an approved concrete saw to ensure an accurate fit. Paving stones shall not be cut to a size of less than one third full stone size. After laying the paving units, they shall be compacted to achieve consolidation of the sand bedding and brought to design elevations by not less than two (2) passes of suitable plate compactor.

The compactor shall be a high-frequency low-amplitude mechanical flat plate vibrator having a plate sufficient to cover a minimum of 12 paving units. Compaction shall proceed as closely as possible following laying of paving units. Sand for joint filling shall then be spread over the surface. This sand should be broomed to fill joints. At least one pass of the plate vibrator is required to achieve compaction of the joint filling sand.

Should the Contractor wish to propose an alternative installation method, this method shall be in writing. The Contractor assumes full responsibility for any approved alternative installation method. Alternative installation method must be approved in writing by the Contract Administrator.

Measurement of Payment

The area covered by the paving stones shall be measured accurate to the nearest decimeter.

Basis of Payment

Payment at the contract price to the nearest square meter shall be full compensation for supplying and spreading all required materials and placing and compacting the paving units.

All driveways shall be restored with equivalent or better materials. It shall match its existing granular subbase and have a minimum of 150mm granular "A".

If the driveway is of asphalt construction, the asphalt cement shall comply with Appendix Table A-1, *Grade Selection for Ontario*, OPSS MUNI 1101. The Contractor shall supply the asphalt cement with a penetration grade of PG 52-34. This special provision is intended only to describe payment of the asphalt. Payment for granular materials will be made under its respective item.

If the driveway is of concrete construction, refer to OPSS 350, 360, MUNI 904 and 1002

The Concrete Driveway shall conform to *CSA A23.1-04, Table 1, 2, 4 & 20* and with the City of Timmins Concrete Specification.

In Phase I, the Contractor shall provide to the satisfaction of the Contract Administrator, access and usage of walkways and driveways until the completion on the Phase II work.

Installation and removal of all such ramps shall be included in the granular "A" item.

Driveway area consists of area outside the earth excavation limit i.e. outside back of gutterbank or back of sidewalk.

Basis of Payment

Payment for the restoration of driveways shall be made under each respective item.

Refer to OPSS Form 206.

The Contractor shall be required to haul, dump, and spread all the excess excavated material in the locations approved by the City.

Measurement of Payment

Payment shall be in meters to the nearest 0.1 m.

Basis of Payment

Payment shall be made at the contract unit price per lineal meter for "Ditching" and such payment shall be compensation, in full, for all operations herein described.

Refer to OPSS 570, 572.

Prior to delivery to the site, all topsoil shall be screened through 150mm, 50mm, and 4.75mm sieves.

Placement of TopSoil

The topsoil shall be spread to a uniform depth of 50mm.

Application of seed and hydraulic mulch on these areas is as per OPSS 570 and OPSS 572 with the following revision: Section 572.07, 01 and 04 is revised by changing the concentration of primary seed from 100kg to 200kg for 10,000 square metres.

Measurement of Payment

The actual area topsoiled and hydroseeded shall be measured in square metres (m²).

Basis of Payment

Payment shall be made at the contract price for "Topsoil and Hydroseeding" shall be compensation in full for all labour, equipment, and material required to do the work.

DOW Chemical Polystyrene H140 extruded sheets (.61m x 2.44m) shall be placed as shown by Standard Detail Drawing #380 and in areas and thickness as designated on the Contract Drawings.

Measurement for Payment

Measurement shall be made by the lineal metre of insulation placed.

Basis of Payment

Payment shall be made at the unit price bid, per lineal metre, for either the 100mm or 50mm placement as stated in the Form of Tender. For any non-standard width installations, payment shall be based on a percentage increment in accordance with the change in width beyond the standard.

The unit price shall be full compensation for supplying all materials including granular material for placing the expanded polystyrene, as specified and for all other operations which may be required to complete the installation.

Refer to OPSS 120.

The Contractor shall excavate the rock based on the actual lines given on Standard Drawing No. 256.

The Contractor shall place Granular "B" – Type 1 from the top of the specified bedding to the top of the rock trench. Granular "B" to be paid under the Granular "B" Item.

Measurement for Payment

Measurement shall be computed from field measurement of cross-sections taken after earth over burden has been removed and shall be based on the actual lines shown on City Standard Drawing No. 256.

Basis of Payment

Payment at the contract price, per cubic meter, for rock excavation (trench) shall be full compensation for all labour, equipment, and material necessary to complete the work as per Consulting Engineer's recommendations including mobilization and demobilization of the equipment.

Refer to OPSS 120.

Pre-Blasting Survey and Monitoring

The Contractor shall engage a Professional Consulting Engineer, licensed in Ontario, at the Contractor's expense herein referred to as the Consulting Engineer. The Consulting Engineer shall:

- a) Conduct pre-blasting survey of all homes on the street within the contract limits and all premises potentially affected by Contractor's blasting operations and submit three (3) copies to the Engineer before commencing construction. The pre-blasting survey report shall include, as a minimum, the following information:
 - Type of structure, including type of construction, and the date, if possible, when built.
 - Any differential settlements: visible cracks in walls, floors, and ceilings shall be identified and described, including a diagram, if applicable, room-by-room.
 - Any other apparent structural or cosmetic damage or defect must also be noted.
 - The report shall use positive dimensions whenever practical to do so, instead of general terms, e.g. "sagging 1 to 2 cm" as opposed to "sagging badly".
 - Clear quality photographs, as deemed necessary for proper recording of significant concerns.

The standard inspection procedure shall include the provision of an explanatory letter to the building owner with a formal request for permission to carry out an inspection.

- b) Make written recommendations on all blasting operations and blasting vibration monitoring and submit three (3) copies to the Manager of Engineering prior to commencing construction. The report shall include the maximum explosive charges that can be used at different locations throughout the area of rock excavation.

Further seismic readings shall be taken by the Consulting Engineer during blasting operations. The monitoring equipment shall be placed to obtain representative readings and a monitoring report shall be provided to the Manager of Engineering. As construction proceeds, the monitoring equipment shall be repositioned on an on-going basis.

In addition to the above, vibrations generated shall not exceed the vibrational peak particle velocity recommended by the Consulting Engineer.

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 Consulting Engineer.

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

The Contractor and Consulting Engineer shall visit the Owners of properties and buildings where test 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 Consulting Engineer shall determine the geographical limits of the pre-blasting survey and all property owners within that area shall be provided with the blasting schedule. In addition, all property owners shall be provided with a card, stating that a copy of the pre-blast survey, of their property shall be provided upon written request.

The Contractor shall not commence blasting operations until the Manager of Engineering has reviewed the pre-blasting report and is satisfied that the requirements of this special provision have been met.

The Consulting Engineer shall be an advisor to the Contractor and the acceptance of his reports and recommendations by the Owner shall, in no way, relieve the Contractor of any responsibility for damage or injury by blasting.

The Contractor shall follow the recommendation of the Consulting Engineer in all blasting operations and vibration monitoring, etc.

In addition to the liability insurance coverage required under Section 106.2 of the General Conditions, the contractor shall take out and keep in force until the date of acceptance of the entire work by the Engineer, insurance acceptable to the Engineer providing insurance coverage in respect of any one accident resulting from blasting operations to a limit of at least \$5,000,000 exclusive of interest and cost and shall name the Corporation as additional insured.

Blasting Mats

Where blasting methods are employed by the Contractor in the vicinity of buildings, structures or other properties subject to damage by flying material, the Contractor shall supply and place blasting mats or use such other methods as may be approved by the Engineer to prevent damage by air borne materials.

Measurement for Payment

The measurement for payment will be lump sum.

Basis of Payment

Payment at the contract lump sum price shall be full compensation for all labour, equipment, and material required including Consulting Engineer's reports, etc. to complete the work to the satisfaction of the Engineer.

Refer to OPSS 1359.

The unshrinkable fill is a Provisional Item, it may be used to fill the gap between the crossing of watermain and sanitary pipes or services.

Measurement for Payment

Measurement shall be to the nearest cubic metre.

Basis of Payment

Payment at the contract unit price, per cubic metre, shall be full compensation for the supply of all labour, equipment, and material to complete the work.

Refer to OPSS 310, OPSS MUNI.1101.

DESCRIPTION

Asphalt to be removed shall be sawcut straight, the subgrade compacted, and then paved with 50mm asphalt.

Asphalt shall be HL4 modified. Asphalt cement shall have a penetration grade of 150/200.

BASIS OF PAYMENT

Include all labour, equipment, and material to complete the above work in the contract price per square metre. Include the cost of removal of asphalt where it is required.

Refer to OPSS 310, 1001, 1003 and OPSS MUNI.1101.

- Asphalt shall be laid in single lifts not to exceed 50mm.
- Asphalt cement shall comply with Appendix Table A-1, *Grade Selection for Ontario*, OPSS MUNI. 1101.
- The Contractor shall supply the asphalt cement with a penetration grade of 150/200.
- This item shall include the preparation of the grade.

Measurement for Payment

Measurement for payment shall be in square meters of the finished surface.

Basis of Payment

Include all labour, equipment, and material. The price per square meter (m²) shall also include preparation of the grade.

Refer to OPSS 310 and OPSS MUNI. 1101.

1. Confirm area for overlay with Contract Administrator.
2. Treat 400mm area at perimeter of overlay with undiluted SS-1 emulsified asphalt at a rate of 0.35 kg/m².
3. Adjust all water valves in the overlay area prior to paving.
4. Place and compact overlay and grade to provide a smooth finish correcting geometric deficiencies on the surface of the existing asphalt.
5. Feather down edges of overlay area to provide a smooth transition between the overlay and the existing pavement.
6. Asphalt cement shall have a penetration grade of 150/200.

Measurement for Payment

Measurement for payment shall be in square metres.

Adjustment shall be made for significant areas of the patch exceeding or less than 50mm.

Basis of Payment

Payment at the contract price for the above item shall be full compensation for all labour, equipment, and material required to do the work.

Refer to OPSS 310 and 314.

- Confirm area to be patched with Contract Administrator.
- Sawcut asphalt of area to be patched.
- Remove all cold mix asphalt within the patch area.
- Place and compact Granular "A" to 50mm below finished grade where asphalt or cold mix removal exceeds 50mm.
- Where patch area is filled with granular materials, remove the granular materials in patch to 50mm below finished grade.
- Adjust any valve boxes within patch area to finished grade.
- Place and compact 50mm HL4 asphalt within patch in accordance with OPSS 310.
- The asphalt cement used in the mix design for this contract shall have a penetration grade of 150/200.

Measurement for Payment

Measurement for payment shall be of the horizontal area in square metres in place.

Basis of Payment

Payment at the contract price for removal, preparation, and patching of 50mm asphalt shall be full compensation for all labour, equipment, and material to do the work.

Removing Parking Meters

All parking meters and posts within the limits of construction shall be removed and salvaged. All parking meters shall be delivered to the City of Timmins Public Work's yard on Pine Street South.

All parking meter parts not required for relocation shall be delivered to the City of Timmins Public Work's yard on Pine Street South.

All parking meter parts designated by the Contract Administrator for relocation shall be retained and stored by the Contractor.

Relocating Parking Meters

Following excavation, grading, placement of edge strips, and sidewalk Granular "A", parking meter posts previously salvaged shall be cleaned of all concrete. Set each pole plumb in a 300mm dia. sono tube with pole base minimum 300mm below the base of the concrete sidewalk pavers. Fill sono with 20 MPa concrete. Position poles as directed by the Contract Administrator on site.

Installation of Parking Meters

Following excavation, grading, placement of edge strips and sidewalk Granular "A", new parking meter posts supplied by the City of Timmins shall be installed by the Contractor by setting each pole plumb in a 300mm diameter sono tube with pole base minimum 300mm below the base of concrete sidewalk pavers. Fill sono with 20 MPa concrete. Position poles as directed by the Contract Administrator on site.

Measurement for Payment

Remove Parking Meters - each parking meter post removed that is not relocated shall be counted under this item.

Relocate Parking Meters - each parking meter post relocated shall be counted under this item.

Installation of Parking Meters - each parking post supplied by the City of Timmins and installed by the Contractor shall be counted under this item.

Basis of Payment

Payment at the contract price shall be compensation in full for all labour, equipment, and material to complete the item.

Refer to OPSS 180 & 510.

Include all labour, equipment, and materials to remove all asphalt designated for removal to its full depth.

The Contractor shall salvage all asphalt and dispose of it at City of Timmins MacLean Drive snow dump (1.1km North of JV Bonhomme Blvd.) in the South-West corner of the dump.

The asphalt shall be free of boulders, steel, wood, concrete etc.

The salvaged material shall be reviewed by the Contract Administrator and the Contractor, if any debris, boulders, etc. are found, the Contractor shall, at his own expense, clean the asphalt of all foreign matter at the dump site. No payment shall be made for this item until it has been accepted by the Contract Administrator.

Asphalt included in composite surfaces shall be paid in composite surface removal and shall be deducted from asphalt removal.

Measurement for Payment

Measurement shall be as per plan quantity method, as specified in OPSS 510.09.02.

Refer to OPSS 180, 510.

General

Include all labour, equipment, and material to remove (up to 450mm of thickness) asphalt and concrete composite surface.

Dispose of concrete and asphalt outside the limits of the contract in a site provided by the Contractor and approved by the Contract Administrator (Engineer).

The Contractor shall obtain the specified notices and Property Owner's Release provided in OPSS 180 and deliver them to the owner as specified.

Sawcut existing concrete composite surface to its full depth at the limits of construction and at any fitpoints.

Measurement for Payment

As specified in OPSS 510.09.01 and 510.09.02.05.03.

Basis of Payment

In accordance with OPSS 510.10.

Payment shall include all labour, equipment, and material required to meet the Provisions of OPSS 180.

Include the cost of sawcutting of existing pavement at fitpoints and contract limits in the "Asphalt Removal" Item.

Refer to OPSS 180, 510.

General

Include all labour, equipment, and materials to remove the existing concrete retaining wall.

Dispose of concrete outside the limits of the contract in a site provided by the Contractor and approved by the Contract Administrator (Engineer).

The Contractor shall obtain the specified Notices and Property Owner's Release provided in OPSS 180 and deliver them to the owner as specified.

The concrete shall be removed to its full depth.

Measurement of Payment

This item is a lump sum item. No measurement shall be made.

Basis of Payment

Payment at the contract lump sum price shall be full compensation for all labour, equipment, and material required to do the work.

Trees shall be removed, including the roots of the trees and disposed of at the Contractor's dump site approved by the Contract Administrator.

Measurement for Payment

Measurement shall be for each tree removed.

Basis of Payment

Payment at the contract price for each tree removed shall be compensation in full for all labour, material, and equipment required to do the work.

Refer to OPSS 610.

Salvage and deliver all street light poles, davits, luminaries, and appurtenances to City of Timmins Public Work's yard.

Measurement and Basis of Payment

Payment shall be made at the contract price for each street light removed and shall be compensation in full for all work necessary to remove and salvage the street lights as specified.

Refer to OPSS 314.

Granular "B" Type II from quarried sources shall only used with prior approval from the Manager of Engineering – City of Timmins

Granular "B" - Type 2 shall be obtained from a PJV site or equivalent and approved by the Contract Administrator.

Granular "B" surface shall not deviate more than 30mm from the specified grade and cross-section. The granular base shall be maintained to this tolerance until Granular "A" is placed.

Granular "B" shall be placed and compacted in lifts not to exceed 350mm. The Contract Administrator shall be advised when the 1st lift is ready for compaction testing.

The Contractor shall advise the Contract Administrator when Granular "B" is to proposed grade and fully compacted. The Contractor shall sign the Road Release form attached to communicate with the Contract Administrator that the Granular "B" is to proposed grade and compacted.

If Granular "B" is lower than the specified grade then the Contractor has an option of placing additional Granular "B" and having the road re-sectioned, or placing Granular "A" for which he will not be paid under the "Granular B" or "Granular A" Items.

The steel plates for all structures shall be brought to Granular "B" grade prior to notification to the Contract Administrator for checking cross-sections.

Water used to achieve the compaction required shall be included in the price of the granular material.

Payment for Granular "B" shall not be made until Granular "A" base has been constructed and approved by the Contract Administrator.

Measurement for Payment

Measurement for Granular "B" – Type 2 shall be made in tonnes.

Basis of Payment

Payment shall be full compensation for all labour, equipment, and material required to do the work.

The Contractor shall substitute clearstone in place of Granular "A" when authorized by the Engineer in bad soil situations.

Measurement for Payment

The measurement shall be in linear metres.

Basis of Payment

Payment at the contract price, per linear metre, shall be the difference between using clearstone in place of Granular "A". The price difference shall include full compensation for the supply of all labour, material, and equipment necessary to complete the work.

The Contractor shall substitute clearstone in place of Granular "B" when authorized by the Engineer in bad soil situations.

Measurement for Payment

The measurement shall be in linear metres.

Basis of Payment

Payment at the contract price, per linear metre, shall be the difference between using clearstone in place of Granular "B". The price difference shall include full compensation for the supply of all labour, material, and equipment necessary to complete the work.

The Contractor shall remove unsuitable material from the trench and dispose of to an approved landfill site.

Measurement for Payment

The measurement shall be in cubic metres.

Basis of Payment

Payment at the contract price, per cubic metre, shall be full compensation for all labour, material, and equipment necessary to complete the work to the satisfaction of the Engineer.

Refer to OPSS 802 and 803.

Screened Topsoil

Prior to delivery to site, all topsoil shall be screened through a 25mm sieve.

Placing of Sod

Sod shall not be placed after September 15th.

The work shall be comprised of the following:

- provide all material, labour, and equipment to re-instate all granular "A" and final adjustment of asphalt fit points

Measurement for Payment

Payment for the above work will be a lump sum price.

Refer to OPSS 353, OPSS 1002

OPSS 353 is amended to include the following:

The Concrete Curb shall conform to CSA A23.1-04, Table 1, 2, 4 & 20

- *class of exposure: C2*: non-structurally reinforced (i.e., plain) concrete exposed to chlorides and freezing and thawing. (Examples: steps, sidewalks, curb and gutters)
- *maximum water to cementing materials ratio: 0.45*
- *minimum specified compressive strength and age: 32 MPa @ 28 days*
- *air Content: 6.5% ± 1* (14-20 mm nominal maximum sizes of coarse aggregate)
- *allowable curing regimes: curing type 2, 7 days at $\geq 10^{\circ}\text{C}$ for a time necessary to necessary to attain 70% of the specified strength.*

Aggregates must meet OPSS 1002 – April 2004

Curing shall be done as per OPSS 353 – Clause 353.07.08.03

Burlap and Water for first 48hours and then directly followed by an application of Curing Compound.

Items to Submit:

1. Mix design as per OPSS MUNI Prov. 1350 – April 2007
2. Certificate of Ready Mixed Concrete Production Facilities.
3. Certification that aggregates will not, nor have the potential to, react with cement to result in deleterious expansion in the concrete.
4. Certification that deleterious substances in aggregate are within limits specified in CSA A23.1-04, Table 12 – Limits for Deleterious Substances and Physical Properties of Aggregates.
5. Certification that proposed performance mix will produce concrete meeting the requirements of the Specifications

Measurement for Payment

Measurement of concrete curb and gutter shall be made in metres along the flow lines of the gutter whether straight or circular. Measurement shall include the space occupied by set backs, gutter outlets, and frames and grates.

Basis of Payment

Payment at the contract price per linear metre shall be full compensation for all labour, equipment, and material to complete the work.

Warranty

Contractor shall warranty the concrete curb and gutter for two (2) years. In the event of any spalling, contractor to remove and replace **all** concrete and restore adjacent damaged areas.

Refer to OPSS 314.

50mm Minus Rockfill surface shall not deviate more than 30mm from the specified grade and cross-section. The granular base shall be maintained to this tolerance until geotextile is placed.

50mm Minus Rockfill shall be placed and compacted in lifts not to exceed 350mm. The Contract Administrator shall be advised when the 1st lift is ready for compaction testing.

The Contractor shall advise the Contract Administrator when 50mm Minus is to proposed grade and fully compacted. The Contractor shall sign the Road Release form attached to communicate with the Contract Administrator that the 50mm Minus is to proposed grade and compacted.

If 50mm Minus is lower than the specified grade then the Contractor has an option of placing additional 50mm Minus and having the road re-sectioned, for which he will not be paid.

Water used to achieve the compaction required shall be included in the price of the granular material.

This material shall meet the following gradation requirements:

50mm Minus Rockfill	
Dimension	% Passing by Weight
53mm	100
37.5mm	95-100
26.5mm	80-100
19mm	70-90
9.5mm	50-80
4.75mm	35-65
2mm	20-47
425µm	10-30
150µm	5-15
75µm	0-5

Measurement for Payment

Measurement for 50mm Minus Rockfill shall be made by the tonne.

Basis of Payment

Payment shall be full compensation for all labour, equipment, and material required to do the work.

Refer to OPSS 314.

150mm Minus Rockfill shall be placed and compacted in lifts not to exceed 350mm. The Contract Administrator shall be advised when the 1st lift is ready for compaction testing.

Water used to achieve the compaction required shall be included in the price of the granular material.

This material shall be non-acid generating, comprised of hard, inorganic granular particles and meet the following gradation requirements:

150mm Minus Rockfill	
Dimension	% Passing by Weight
150mm	100
75mm	50-100
25mm	10-100
9.5mm	0-65
4.75mm	0-35
850µm	0-5

Measurement for Payment

Measurement for 150mm Minus Rockfill shall be made by the tonne.

Basis of Payment

Payment shall be full compensation for all labour, equipment, and material required to do the work.

Refer to OPSS 517.

The use of this item will be determined by the Manager of Engineering if conventional dewatering systems such as pumps are not effective.

Measurement for Payment

Payment for this item shall be on a time and materials basis. The Contractor shall provide all documentation to justify costs. The Contractor's costs shall be paid as per the Markup in the General Conditions.

Refer to OPSS 180, 310, 314, 353, 510, 802, 803
| OPSD 600.040, SP RD-18, SP RD-32, SD 209

The work to be carried out under this item shall include the following:

- sawcut cutting, removal and disposal of any asphalt, concrete and granular materials
- all materials required to complete the installation of the proposed concrete curb and gutter
- adjustment of all grates, frames, lids and valves

Measurement for Payment

Measurement for payment shall be in linear metres.

Basis of Payment

Payment at the contract price, per unit, shall be full compensation for the supply of all labour, equipment, and materials to complete the construction of the concrete curb and gutter as shown on the plan or directed by the Contract Administrator.

Refer to OPSS 355.

The work involved in the item shall include the grading and placing of private driveways affected by construction. The work shall include but is not limited to the following:

1. Supply new paving stones ensuring that the same or the closest match of colour, style and size available is used in the restoration of said driveway/walkway.
2. Remove and stockpile precast concrete or wooden curbs neatly without damage away from the construction area.
3. Grade the granular subbase either by excavation or by minor surface regrading as required.
4. If Granular "A" base is required, it shall be paid under the Granular "A" Item.
5. Place paving stones to the new gradient approved by the Contract Administrator.
6. Replace the materials damaged by removal.
7. Saw cut paving stones as required to fit.

The Contractor shall include the placement of bedding sand to the specified thickness, compacting the stones to a uniform gradient and sweeping bedding sand to the stone joints.

Measurement for Payment

Area covered by paving stones shall be measured in square metres.

Basis of Payment

Payment at the contract price for the above tender item shall be full compensation for all labour and equipment to complete the work.

The Contractor shall monitor the roadway surface after the final application of the surface treatment. Once all of the loose surface rock has been dispersed to the shoulder, the Contractor shall regrade.

Measurement for Payment

The measurement for payment shall be lump sum.

Salvage

All salvageable culverts removed shall be hauled away by the Contractor and stockpiled at either the Tisdale Public Work's Shop or the Timmins Public Work's Shop, whichever is the closest.

Where culverts are deemed unsalvageable by the Contractor, he shall contact the Contract Administrator to verify the condition prior to any material being disturbed. If any material is disturbed, the Contractor shall not be paid for the removal of the culvert. Culverts which are deemed salvageable and damaged by the Contractor shall be replaced at no charge to the Owner.

Measurement for Payment

The removal of culverts shall be measured, horizontally, in linear metres.

Basis of Payment

Payment at the contract price, per linear metre, shall be full compensation for the disposal of debris for salvage as directed by the Contract Administrator, for the removal and disposal of any appurtenances (i.e. concrete or wood end walls), for all earth excavation incidental, for the subsequent disposition of the excavation material, and for the backfilling of the resulting trenches, holes, and pits. Imported granular backfill shall be paid for in accordance with the specification for that particular material.

Refer to OPSS 408.

Excavate/Salvage

- remove and place catchbasins, manhole structures, frames, and grates as shown on the Drawings or as instructed by the Contract Administrator
- adjust structures to final grades with a minimum of one (1) adjustment unit
- connect proposed piping to relocated structures

Measurement for Payment

Measurement shall be for each structure relocated.

Basis of Payment

Payment at the contract price shall be compensation in full for all labour, equipment, and material required to do the work.

Refer to OPSS MUNI 904.

General

- excavate for structure to the lines and grades shown
- provide 150mm Granular "A" below base of structure
- connect poured in place manhole around existing pipes and proposed pipes as indicated
- backfill structure with compacted Granular "B" to a minimum of 300mm on vertical sides
- supply and install frame and grate specified
- supply and install manhole steps to OPSD 405.01 - solid rectangular aluminium
- backfill all other areas with acceptable native materials compacted
- concrete strength shall be 30 MPa
- reinforcing bar steel strength shall be 300 MPa

Basis of Payment

Payment at the contract lump sum price for cast-in-place structure shall be compensation for all labour, equipment and materials required to do the work.

Refer to OPSS 408.

The work to be carried out under this item shall include the adjustment of any Corporation-owned manhole and/or catchbasin structure as directed by the Contract Administrator. Adjustment of manholes and catchbasins shall include those structures to be raised or lowered by a height not exceeding 300mm. The adjustment shall be accomplished by removing and salvaging the existing frame and grate and adding or removing adjustment units to permit a minimum of three (3) adjustment units to the required level. Use precast grade rings or approved manhole bricks or reinforced concrete suitable to carry AASHTO H20 live loads. Parge on the outside and not on the inside of the structure.

Measurement for Payment

Measurement shall be by the number of structures adjusted.

Basis of Payment

Payment at the contract price per unit shall be full compensation for the supply of all labour, equipment, and materials to adjust the catchbasins and/or manholes as directed by the Contract Administrator including any excavation required, the supply, placing and compaction of granular backfill, the removal and salvaging of the frame and grate, roughening of the upper surface of the existing concrete, removal and disposal of bituminous and concrete pavement, placing of concrete or bricks on structure, resetting and grouting the frame and grate, and for all other items of work and materials incidental to the satisfactory completion of this work.

Refer to Section 408.10 of OPSS 408.

Refer to OPSS 408.

The work to be carried out under this item shall include the lowering of any Corporation-owned manhole and/or catchbasin structure as directed by the Contract Administrator. The adjustment shall be accomplished by removing and salvaging the existing frame and grate and breaking down the manhole or catchbasin to permit a minimum of three (3) adjustment units to the required level. Use precast grade rings or approved manhole bricks or reinforced concrete suitable to carry AASHTO H20 live loads.

Measurement for Payment

Measurement shall be by the number of structures adjusted.

Basis of Payment

Payment at the contract price per unit shall be full compensation for the supply of all labour, equipment, and materials to lower the catchbasins and/or manholes as directed by the Contract Administrator including any excavation required, the supply, placing and compaction of granular backfill, the removal and salvaging of the frame and grate, roughening of the upper surface of the existing concrete, removal and disposal of bituminous and concrete pavement, placing of concrete or bricks on structure, resetting and grouting the frame and grate, and for all other items of work and materials incidental to the satisfactory completion of this work.

Refer to Section 408.10 of OPSS 408.

*Deleted
(refer to OPSS 408)*

Refer to OPSS 407, 408.

Frames and Covers

Manhole Frame and Covers

Manhole frame and grates shall be the "adjustable" by Mueller Canada, Model AJ633-SR or approved equivalent. The cover shall be as per OPSD 401.010 or latest version.

Minimum of 1 and maximum of 3 adjustment units shall be used.

Installation

Phase 1

Cover shall be set to 400mm below Granular "A" grade or to asphalt base course elevation where two (2) lifts of asphalt are prescribed.

Phase 2

Cover shall be set to finish asphalt grade.

Underside of frame shall be set to 350mm below finished asphalt grade (does not include allowance for adjustment units).

Catchbasin Frame and Covers

Catchbasin frame and covers shall be as per OPSD 400.020 or latest version.

Installation

Phase 1

Cover shall be set to 10mm below Granular "A" grade or to asphalt base course elevation where two (2) lifts of asphalt are prescribed.

Phase 2

Cover shall be set to finish asphalt grade.

Catch Basin /Manhole Frame and Covers

Where a catchbasin manhole is specified, the top shall be:

1. A herringbone open cover manhole frame and grate where placed with no curb and gutter
2. A catchbasin frame and grate when placed with curb and gutter
3. All covers shall indicate year of construction and sanitary or storm whichever is applicable

General

Payment for manholes shall not be made until each manhole has been parged.

All manholes including storm sewer and sanitary sewer manholes shall be benched.

All manholes, catchbasins, and ditch inlets shall be provided with frost straps except monolithic catchbasins.

Frame and grate shall not be placed on any structure until Granular "A" is approved for final grade. A steel plate cover, with a minimum 13mm thickness, shall be placed to Granular "B" grade in place of the frame and grate.

All new catchbasins not connected to sub-drains shall have a 1.0m sub-drain on each side along the gutterline.

Measurement for Payment

Measurement shall be by the number of manholes, catchbasins or ditch inlets installed.

Refer to Section 407.09 of OPSS 407.

Basis of Payment

Payment at the contract unit prices per manhole, catchbasin or ditch inlet shall be full compensation for the supply of all labour, equipment and materials including frost straps; for all excavation; for all timbering and shoring; for the disposal of unacceptable and surplus material; for the supply, placing and compacting of granular backfill; for the supply and placement of the manhole, catchbasin and ditch inlet frames and covers; for any connections to the existing sewer system; for benching and/or constructing inverts and for all other items of work and material incidental to the satisfactory completion of the work.

Refer to Section 407.10 of OPSS 407.

Refer to OPSS 410.

Materials

Storm Sewer Pipe up to 600mm Diameter

Ultra Rib PVC pipe or equivalent PVC pipe to be approved by the Engineer.

The pipe shall be smooth wall and have a minimum stiffness of 320 kPa @ 5% deflection in accordance with ASTM D 2412 and conform to CSA B182.4

Single service laterals shall be 100mm diameter and have a maximum dimension ratio of 28 unless otherwise shown on the contract drawings. Pipe stiffness (F/AY) shall not be less than 690KPa at 5% deflection when tested in accordance with A.S.T.M. D2412. The pipe shall have a locked-in gasket and integral bell. The pipe is to be made available in 4 metre laying lengths and is to be painted green.

Storm Sewer Pipe Larger than 600mm up to 1050mm Diameter

PVC SDR 35 Ringtite or equivalent PVC pipe to be approved by the Engineer.

The pipe shall be smooth wall and shall conform to CSA B182.2 and have a minimum stiffness of 320 kPa @ 5% deflection.

Storm Sewer Pipe Larger than 1050 Diameter

Concrete pipe design and specifications shall conform to CSA A257 and to be approved by the Engineer.

General

Payment for the 6m of 150mm diameter polyethylene Subdrain and geotextile wrap shall be included in the storm pipe item.

**SP SEW-08
FEBRUARY 2006
SALVAGE OF EXISTING
FRAMES AND GRATES
PAGE 1 of 1**

Salvage all materials for which this Special Provision is specified including catchbasin and manhole frames and grates for all structures removed.

Deliver all salvaged material to the Tisdale Public Works shop or the Timmins Public Work's Shop, whichever is closest.

Remove from site and dispose of all material which is deemed to be not salvageable by the Contract Administrator.

Refer to OPSS 405.

Subdrain inlets and outlets shall be taken to and connected to all new and existing storm structures which shall be "*all inclusive*" with the payment for this Item.

Subdrains shall be polyethylene pipe as per OPSS 405.05.03 c/w geotextile sock and clearstone as per Detail "A" – Standard Detail Drawing #261.

Measurement for Payment

The measurement for payment shall be in linear metres.

Basis of Payment

Payment at the contract price, per linear metre, for this item shall be full compensation for all labour, equipment, and material required to complete the work.

Refer to OPSS 511.

1. Broken concrete shall not be used as rip rap.
2. Geotextile shall be Marafi 350 or approved equal.
3. The Contractor shall screen all rip rap materials prior to use to eliminate all materials passing 100mm.

Measurement for Payment

Measurement for payment shall be in square meters of the finished surface of rip rap constructed as specified. No separate measurement shall be made for geotextile.

Basis of Payment

Payment at the contract price for rip rap with geotextile shall be full compensation for all labour, equipment, and material required to do the work.

Refer to OPSS 408.

The work to be carried out under this item shall include the resetting of any Corporation-owned manhole and/or catchbasin structure as directed by the Contract Administrator. The resetting shall be accomplished by removing and salvaging the existing frame and grate and replacing deficient or broken adjustment units. Use precast grade rings or approved manhole bricks or reinforced concrete suitable to carry AASHTO H20 live loads. Parge on the outside and not on the inside of the structure.

Measurement for Payment

Measurement shall be by the number of structures that have been reset.

Basis of Payment

Payment at the contract price per unit shall be full compensation for the supply of all labour, equipment, and materials to reset the catchbasins and/or manholes as directed by the Contract Administrator including any excavation required, the supply, placing and compaction of granular backfill, the removal and salvaging of the frame and grate, roughening of the upper surface of the existing concrete, removal and disposal of bituminous and concrete pavement, placing of concrete or bricks on structure, resetting and grouting the frame and grate, and for all other items of work and materials incidental to the satisfactory completion of this work.

Refer to Section 408.10 of OPSS 408.

Refer to OPSS 410.

Service Reconnections

For each existing service encountered during the construction of the proposed sanitary main, a new service of a size and class specified shall be installed in its place to property line. At property line or the street side of property line, the Contractor shall connect the existing service to the new service by means of an approved adapter or a pipe repair clamp to ensure a proper leak-proof connection.

Sanitary services shall be to a maximum depth based on the existing sanitary service at the property line. Furthermore, the service must be installed perpendicular to the main sanitary sewer.

The cost of removing the existing service to the property line is to be included in the reconnection item.

The Contractor shall not allow the interruption of any service to any building. The Contractor shall take care not to allow sewage to reverse flow or obstruct flow in any manner so as to cause flooding to any residence.

Pipe bedding shall be clearstone and cover material shall be bedding sand. Include payment for Bedding and Cover Material in the "Sanitary Sewer Connection and Reconnection" Items.

New sanitary services shall be left capped at property line.

Backfill

For the cost of backfilling with the native material, backfill shall be included in the pipe unit price.

Measurement for Payment

Shall be measured per unit reconnected.

Basis of Payment

General

Payment at the contract unit price(s) for the items of work listed in the schedule of prices shall be full compensation for the supply of all material, labour, and equipment necessary to complete the work as shown on the contract drawings and as specified herein.

The Contractor is to reconnect to an existing storm or sanitary system using a proper rubber coupler, i.e. Fernco. The coupler is to be attached to the pipes with stainless steel clamps of the approved size.

Measurement for Payment

Measurement shall be for each connection.

Basis of Payment

Payment at the contract price for each connection shall be full compensation for the supply of all material, labour, and equipment to complete the work.

Refer to OPSS 410.

Concrete Pipe - Sanitary Sewer

Reinforced concrete pipe shall be used for sewers larger than 600mm diameter and shall be manufactured in accordance with A.S.T.M. Designation C-76 for Classes III, IV and V. The pipe must be supplied only by manufacturers who have been pre-qualified by the Ministry of the Environment. The pipe must be jointed by flexible, watertight rubber gaskets as per A.S.T.M. Designation C-443.

Suppliers shall submit evidence of Ministry of the Environment pipe-qualification before supplying any pipe to the job site.

Quality control of the pipe material must be subject to the conditions as given in Section A-iii).

P.V.C. Pipe - Sanitary Sewer

Where shown on the contract drawings, P.V.C. pipe may be used and must conform to A.S.T.M. Designation 12454-B (originally 1120). P.V.C. pipe may only be used for pipe diameters 600mm and smaller. Unless specified, the maximum dimension ratio for pipe diameters 200mm to 600mm inclusive shall be 35, and pipe stiffness (F/AY) shall not be less than 320KPa at 5% deflection when tested in accordance with A.S.T.M. D2412. The pipe shall have locked-in gasket and integral bell joint features. The pipe is to be made available in 4 metre laying lengths. Sewer main pipe shall be color coded green.

Single service laterals shall be 125mm diameter and have a maximum dimension ratio of 28 unless otherwise shown on the contract drawings. Pipe stiffness (F/AY) shall not be less than 690KPa at 5% deflection when tested in accordance with A.S.T.M. D2412. The pipe shall have a locked-in gasket and integral bell. The pipe is to be made available in 4 metre laying lengths and is to be colour coded white.

All associated P.V.C. fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configurations suitable for the pipe.

MEASUREMENT FOR PAYMENT

The measurement for payment shall be in linear metres (per OPSS 410.09.01.01).

BASIS OF PAYMENT

Payment at the unit price tendered shall be considered to be payment in full for the supply of all labour, equipment, and material required to install the sewer pipes to the grades.

Requirements

The Contractor shall carry out camera inspections of entire sanitary sewer and storm sewer installation including catchbasin leads and provide a videotape and inspection book of this inspection to the City for approval. The Contractor shall video tape 10m both upstream and downstream of the new sewers. If sand and other debris is found then the Contractor shall flush and re-video the line up to the end of the next manhole both upstream and downstream and verify the corrected deficiencies.

Provide DVD copy of inspection as per OPSS 409.05.01.03.

Payment

Contract will not be considered substantially performed until all camera work inspections are carried out and any deficiencies corrected by the Contractor.

The cost of camera inspections shall be included in the "Sanitary Sewer" and "Storm Sewer" items.

The Contractor shall break into the existing structure, possibly into the benching of these manholes. The Contractor shall break the minimum amount needed to accommodate the new pipes. High strength grout shall be used to parge up and re-bench where necessary to the satisfaction of the Contract Administrator.

Measurement for Payment

Measurement for payment shall be by the number of special structures broken into.

Basis of Payment

Payment at the contract price for each structure broken into, including benching, shall be full compensation for all labour, equipment, and material required to complete the work to the satisfaction of the Contract Administrator.

The Contractor shall break into the existing structure at least 50mm into the surface of the benching. The Contractor shall break the minimum amount needed to accommodate the new pipe. High strength grout shall be used to parge up and re-bench where necessary to the satisfaction of the Contract Administrator.

Measurement for Payment

Measurement for payment shall be by the number of special structures broken into.

Basis of Payment

Payment at the contract price for each structure broken into, including at least 50mm into benching, shall be full compensation for all labour, equipment, and material required to complete the work to the satisfaction of the Contract Administrator.

Where water services are in the same trench as sanitary services, the water service valves may have to be relocated to the property line. The service connected pipes shall be insulated with foam rap up to the property line.

Measurement for Payment

Service connections shall be measured per connection. The unit of measurement shall be each.

Basis of Payment

Payment at the contract unit price for each connection shall be full compensation for the supply of all labour, equipment, and material necessary to complete the work.

Refer to OPSS 410.

Service Reconnections

For each existing Storm service encountered during the construction of the proposed Storm main, the service of a same size and class specified, shall be reconnected in the trench to the new Storm system. The Contractor shall connect the existing service to the new service by means of an approved adapter or a pipe repair clamp to ensure a proper leak-proof connection. The connection to the Storm sewer main shall be with a Kor-N-Tee Assembly or approved equivalent (by the Engineer).

Storm services shall be to a maximum depth based on the existing storm service in the trench. Furthermore, the service must be installed perpendicular to the main storm sewer.

The cost of removing the existing storm in the trench is to be included in the Reconnection Item.

The Contractor shall not allow the interruption of any service to any building. The Contractor shall take care not to allow sewage to reverse flow or obstruct flow in any manner so as to cause flooding to any residence.

Include payment for Bedding and Cover Material in the "Sanitary Sewer Connection and Reconnection" Items.

Measurement for Payment

Shall be measured per unit reconnected.

Basis of Payment

Payment at the contract unit price(s) for the items of work listed in the schedule of prices shall be full compensation for the supply of all material, labour, and equipment necessary to complete the work as shown on the contract drawings and as specified herein.

Refer to O.REG 278/05 or latest version.

Safety Precautions

No cutting or use of power tools shall be permitted.

All handling of Asbestos Cement Pipe must conform to O.REG 278/05 or latest version.

Preconditions

- all workers must be notified of the presence of asbestos pipe on site
- Contractor to make every attempt to leave main line in place and grout it
- ***NOTIFY DELORO LANDFILL OF ASBESTOS DELIVERY, CONTRACTOR SHALL PAY ALL TIPPING FEES***

Measurement for Payment

Measurement for payment shall be paid per linear metre of pipe disposed off site (includes services and main).

Basis of Payment

Payment at the contract price shall be full compensation for all labour, equipment, disposal and handling of materials required to complete the work.

Refer to OPSS 102, 180, 206, 314, 351, SP RD-01, RD-37.

General

The work under this item shall include the following, but not necessarily limited to:

- all excavation, dewatering, bracing, supply and placement of indicated bedding material
- supply and placement of storm sewer pipe of the size and type indicated
- supply and installation of all necessary fittings required
- supply placement and compaction of required cover material
- backfilling of trench with compacted Granular "B" – Type I material as indicated on drawings

Trench widths shall be maintained as narrow a possible without compromising safety. Wider excavations cannot be made without prior approval of the Engineer. Pavement removal must be saw-cut in neat straight lines. Pavement must be saw-cut in long straight lines (min. 30 metres) to the approval of the Engineer. A "saw-toothed" edge of pavement will not be acceptable.

Gravel areas affected by construction shall be restored to match existing.

Measurement of Payment

The measurement for payment shall be in lineal metres measured along the profile of storm sewer installed.

Basis of Payment

Payment at the unit price tendered shall be considered to be payment in full for the supply of all labour, equipment, and material required to install the storm sewer as indicated.

The temporary pumping which occurs unsupervised or overnight shall be considered "By-Pass Pumping".

The Contractor shall allow for a pumping capacity equivalent to the maximum capacity of the pipe being by-passed; c/w a stand-by pump with the equivalent capacity or more and shall be automated to activate in the event of failure of the main pump.

The Contractor shall submit a detailed by-pass pumping plan for approval by the Manager of Engineering, 2 weeks prior to start of any pumping. If by-pass pumping is required, the Contractor shall engage the services of a qualified professional engineer and provide a detailed by-pass pumping procedure.

Measurement for Payment

Payment for this item shall be included in the unit price of the sanitary sewer pipe.

Basis of Payment

Payment at the lump sum price for this item shall be compensation in full for all labour, equipment, and materials necessary to complete the work to the satisfaction of the Contract Administrator.

The Contractor shall fill and parge holes in structures as directed by the Contract Administrator. A layer of Mortar as per OPSS 407.05.06 shall be placed between the structure wall and all bricks used to fill the hole. After the hole is completely filled, a layer of Mortar shall be used to parge the interior and the exterior flush to the walls of the structure to the satisfaction of the Contract Administrator.

Measurement for Payment

Payment for this item shall be by the number of holes parged.

Basis of Payment

All holes smaller than 150mm shall be deemed the responsibility of the Contractor. All holes bigger than 450mm shall be paid on a Time and Material basis. Payment at the contract price for each hole parged shall be compensation in full for all labour, equipment, and materials necessary to complete the work to the satisfaction of the Contract Administrator.

Structure work in its entirety shall be considered one project/item. Each individual structure shall not be considered its own project.

Basis of Payment

Payment shall be based on Time and Material basis (as specified in OPSS.MUNI 100) and be paid out of a cash allowance. This item shall be compensation, in full, for all labour, equipment, and materials necessary to complete the work.

Preface

- Refer to OPSS 441.
- All materials and procedures must conform to the latest edition of the referenced standards.

MATERIALS

Pipe

PVC pipe shall be as follows:

- a) designed to accommodate the operating pressure plus surge pressure
- b) certified by the CSA to CSA B137.3
- c) manufactured by Ipex, Royal Pipe Co. or other approved equivalent by the City of Timmins
- d) the pipe shall be DR 18
- e) each end of pipe length shall be factory sealed

Gaskets and Joints

Gaskets shall be made of SBR. Gaskets shall be removable from the pipe gasket face in order to aid cleaning the bell and spigot prior to assembly.

Measurement of Payment

The measurement for payment of PVC pressure pipe shall be in linear metres measured along the profile of pipe installed.

Basis of Payment

Payment at the unit price tendered shall be considered to be payment in full for the supply of all labour, equipment, and material required to install the pressure pipe watermain as indicated.

Fittings and Specials

These shall be of cast iron or ductile iron (cement lined) with mechanical joints and be suitable for a pressure raising of 800 KPa. The fittings shall conform to CSA or B131.10, ASA A21.10 (AWWA C110) Specifications.

The mechanical joint shall be manufactured in accordance with CSA B131.0, ASA A22.11 (AWWA, CIII).

Note: All valves, hydrants, boots and fittings such as tees, crosses, bends, etc. shall be mechanical joint to allow the installation of the tie bolts and rods where required.

Gate Valves and Valve Boxes

Gate valves shall conform to AWWA Specification C500 or to resilient seat gate valve C507. The valves shall be solid wedge with non-rising stems and shall turn counter-clockwise to open.

Valves shall be either No. 55 as manufactured by Canada Valve and Hydrant Company Limited, with non-rising spindle or Mueller gate valve Designation A-2380-21. Valve boxes shall be MVB polymer bottom section complete with cast iron lid and 300mm ductile iron adjustable tapered top, suitable for a trench depth of 2.4m as manufactured by Mueller or approved equivalent. Jenkins valves in sizes 100mm to 300mm are also acceptable. ABK valves are also approved and may be used. Testing of conductivity shall be conducted for entire length of watermain.

Hydrants

Hydrants shall be Darling Century as manufactured by the Canada Valve and Hydrant Company Limited and must conform to AWWA Specification C502.

The hydrants shall have a compression shut-off, two piece barrel with flange at ground line, 115mm main gate valve, two 63mm diameter hose nozzles plus one 115mm diameter steamer as per CSA 889.2, 150mm inlet connection with mechanical joints, 32mm drains are to be plugged unless otherwise specified.

Frost uplift protection is to be provided by wrapping the hydrant barrel with either 8 mil thick or greater polyethylene sheeting or 55 lb. roofing paper.

Valve Appurtenances

All surfaces that are in contact with water shall be disinfected. All fittings on the service line shall be properly disinfected with a 1-5% chlorine solution. This includes curb stop and corporation (main) stop valves and the copper service line.

Curb Valve Boxes (19mm and 25mm Diameter)

For services up to and including 25 mm dia., the valve boxes shall be either Cambridge Brass Series 161, size 12 with Series 163 ribbed cover, or Mueller Designation A-726 with A-800 ribbed cover.

All curb valve boxes shall be complete with stationary stainless steel rod of a length to suit the application.

Curb Valve Boxes (38mm and 50mm Diameter)

For service lines 38mm and 50mm diameter, the valve boxes shall be either Cambridge Brass Series 161-1, size 12 with Series 163 ribbed cover, or Mueller Designation A-753 with A-806 flat cover.

Single Curb Stops

Single curb stops shall be either Cambridge Brass Series 128 or Mueller Designation A-616.

Double Curb Stops

Double curb stops shall be either Cambridge Brass Series 173 or Mueller Designation A-650.

Corporation Mains Stops

Corporation main stops shall be either Cambridge Brass Series 102 or Mueller Designation A-220.

Service Lines

Service connections shall be 19mm diameter minimum copper pipe unless otherwise designated and shall be type "K" (soft) copper.

Service Insulation

Tundra Plus and Tundra Seal Plus foam rap 3/4" pipe insulation shall be used.

Bleeders

Bleeders must be equipped with a copper fitting at the outlet end for bacteriological testing.

Preface

- Refer to OPSS 441.
- All materials and procedures must conform to the latest edition of the referenced standards.

General

The work under this item shall include the following, but not necessarily limited to:

- all excavation, dewatering, bracing, supply and placement of indicated bedding material
- supply and placement of watermain pipe of the size and type indicated
- supply and installation of all necessary fittings required
- supply and install, with each valve, a geotextile collar (1m x 1m), to be placed above body of valve, below guide plate. After installation of geotextile, re-install guide plate and valve box. Secure geotextile around body of valve prior to backfilling.
- adjust all existing main and service waterline valve boxes to grade. Where a new valve box is required to adjust an existing valve to finished grade, obtain this material from the City of Timmins Public Works Department and install the material.
- supply and install the tracer wire throughout the length of the watermain and connect it as shown in SD 401-R5.
- continuity test shall be performed to ensure proper installation
- supply and installation of required concrete thrust blocks to size and shape indicated, in conjunction with mechanical joint restraints
- supply placement and compaction of required cover material
- backfilling of trench with compacted selected native materials as indicated on drawings

INSTALLATION

Bedding

Bedding material to support the pipe shall be Granular "A". It shall extend to the spring line of the pipe.

Restrained Joints and Thrust Blocking

Mechanical joint restraints shall be Sigma (PV Lok), Romac Grip Ring & Star 3500 Series and shall conform to ASTM F1674-96 and manufacturer's specification. Restraining collars shall be attached to the fitting bell behind the gasket face. Tie rods shall run from the collar behind the bell to a suitable collar on the connecting pipe.

Concrete thrust blocks shall conform to OPSS MUNI 1350 with compressive strength of 20 MPa. Thrust blocks shall be constructed as per OPSD 1103.010 and OPSD 1103.020.

PVC Pressure Pipe

The construction and installation of PVC pressure pipe and fittings shall be completed in accordance with CSA B137.3. Recommended practice for installation of PVC pressure pipe and fittings.

Bleeders

Any bleeder lines needed to take water samples of the main, to prevent stagnant water or used for any other purpose, shall be removed to the main cock.

Sanitary Work Practices

The Contractor shall see to it that any materials that will be used for conveying drinking water are handled as per AWWA Standard C651 Disinfecting Watermains for complete instructions on how to handle and store pipe used for drinking water.

Dirt Entering the Pipe

As per AWWA C651, any dirt entering the pipe during construction shall be promptly removed and the pipe wiped with a 1-5% chlorine solution.

End of Day Housekeeping

As per AWWA C651, the new watermain shall be capped with a mechanical water-tight seal as per manufacturer's recommendation.

DISINFECTION

The work under this item shall require that the Contractor not connect to the existing system until the new system has been pressure tested successfully and disinfected as per the most recent revision of AWWA C651 and that they have received acceptable water bacteriological results. The Contractor shall also either provide his own water to the newly constructed main or from the existing main by tapping each line and using a

double backflow preventer when filling the newly constructed main from the existing main.

Service Lines

Immediately prior to installation, the inside wall of the copper service line shall be properly disinfected with a 1-5% chlorine solution (allow a contact time of at least 15 minutes).

Watermain

Refer to SP WAT-11.

Measurement of Payment

The measurement for payment shall be in lineal metres measured along the profile of watermain installed.

Basis of Payment

Payment at the unit price tendered shall be considered to be payment in full for the supply of all labour, equipment, and material required to install the watermain as indicated.

Payment at the unit price tendered shall be considered to be compensation in full for all required restoration.

Tests

The Contractor shall coordinate with the City of Timmins Public Works staff to carry out a minimum of 400 ampere thawing test using the City of Timmins DBH thawing machine.

Sections shall be tested as follows:

- 100% of water services shall be tested
- each service tested shall conduct a minimum of 400 amperes of current
- each service tested shall be identified on a log showing date tested and results of the test
- each test shall be certified from the City of Timmins staff and an original copy of this certification and log provided to the Engineering Department.

PREFACE

All materials and procedures must conform to the latest edition of the referenced standards.

MATERIALS

Pipe

PVC pipe shall be as follows:

- a) designed to accommodate the operating pressure plus surge pressure
- b) certified by the CSA to CSA B137.3
- c) manufactured by Ipex, Royal Pipe Co. or other approved equivalent by the City of Timmins
- d) the pipe shall be DR 18
- e) each end of pipe length shall be factory sealed.

Gaskets and Joints

Gaskets shall be made of SBR. Gaskets shall be removable from the pipe gasket face in order to aid cleaning the bell and spigot prior to assembly.

Service Connections

Saddles or tees shall be used for connections unless specified otherwise by the Contract Administrator.

Service Pipe

When connecting laterally to PVC watermain, see items "Sanitary Sewer Connections and Reconnections" and "Water Service Connections and Reconnections".

Service Saddles

Service saddles shall be stainless steel 304 and be a minimum 18 gauge construction and shall have a AWWA taper (CC) outlet thread.

Services

The services shall be of K type (soft) copper. The horizontal goose neck shall be used for the horizontal connection to the main.

MEASUREMENT OF PAYMENT

The measurement for payment of PVC pressure pipe shall be in linear metres measured along the profile of pipe installed.

BASIS OF PAYMENT

Payment at the unit price tendered shall be considered to be payment in full for the supply of all labour, equipment, and material required to install the pressure pipe watermain as indicated. Payment at the unit price tendered shall be considered to be compensation in full for all required restoration.

DISINFECTION

Service Lines

Immediately prior to installation, the inside wall of the copper service line shall be properly disinfected with a 1-5% chlorine solution.

Watermain

Refer to SP WAT-12.

*Deleted
(incorporated into SP WAT-01)*

General

The watermain diversion, if required, shall be done as shown on the Drawings.

Measurement for Payment

This item shall be measured for each watermain diversion.

Basis of Payment

Payment for each watermain diversion shall be considered to be payment in full for the supply of all labour, equipment, and material required to complete the work to the satisfaction of the Contract Administrator.

General

Refer to OPSS 441 and City Standard Detail Drawing #420.

Hydrants shall be Darling Century as manufactured by the Canada Valve and Hydrant Company Limited and must conform to AWWA Specification C502.

Measurement of Payment

Hydrants shall be measured per unit installed and shall include the hydrant, valve, valve box, tee, and length of pipe required to make the lateral connection to the main.

Basis of Payment

Payment at the contract unit price(s) for the items of work listed in the Schedule of Prices shall be full compensation for the supply of all materials, labour, and equipment necessary to complete the work as shown on the contract drawings and as specified herein, including pressure testing, disinfection, and flushing of the lateral and the appropriate length of watermain.

Removal of Hydrant

Fire hydrant removal shall include removal of existing hydrant, lead, and valve.

On watermains not abandoned, cap existing tee and place thrust block.

Fire hydrants that are not salvageable shall be disposed of by the Contractor and to a site approved by the Contract Administrator.

All fire hydrants and valves that are removed shall be taken to the City of Timmins Public Work's yard or to the City of Timmins' South Porcupine Public Work's yard, whichever is closest.

Measurement for Payment

Measurement shall be for each fire hydrant removed or each fire hydrant removed and salvaged.

Basis of Payment

Payment at the contract price shall be full compensation for all labour, equipment, and material required to do the work.

Preface

Refer to OPSS 441.

General

- remove existing fire hydrant including the valve and valve box up to the tee at the watermain
- cap existing tee at the main and pour thrust blocks
- place salvaged hydrant, valve, and valve box at the location indicated on the drawing
- provide all necessary pipes, fittings, tees, thrust blocks and hydrant extensions required to connect the salvaged hydrant, valve and valve box at the location indicated on the drawings
- backfill all excavations with compact native material unless otherwise specified

Basis of Payment

Payment at the contract unit price for the Item "Fire Hydrant Relocation" shall be compensation in full for all labour, equipment, and materials necessary to complete the work as shown on the contract drawings and specified herein, including pressure testing, disinfection, and flushing of the lateral and the appropriate length of watermain.

References

Refer to OPSS 441.

Service Connections

Service connections shall include all work and materials necessary to install a new continuous water service including valves, valve boxes, and service connection pipes to the main and existing services at the property line. The service connection pipes shall be insulated with foam wrap. The Contractor shall locate the existing services for connection to the main.

Service Reconnections

Service reconnections shall include all work and materials necessary to install a new water service including valves, valve boxes, and service connections pipes from the main to the existing pipe at the property line.

The Contractor shall connect the existing service to the new service by means of an approved connector to ensure a proper leak-proof connection.

Pipe bedding and cover material shall be bedding sand. Include payment for Bedding and Cover Material in the "Water Service Connection or Reconnection" Item.

The cost of backfilling with native material shall be included in the pipe unit price.

Measurement For Payment

Service connections and reconnections shall be measured per connection.

The unit of measurement shall be each.

Basis of Payment

Payment at the contract unit price for the items of work listed in the "Schedule of Prices" shall be full compensation for the supply of all material, labour, equipment, and testing to complete the work. It shall also include the location of the existing services.

The Contractor shall plug the abandoned watermain/sewer pipes by grouting at the ends of the pipe.

Measurement For Payment

Measurement for payment will be made for each abandoned watermain.

Basis of Payment

Payment for each abandoned watermain shall be payment in full for the supply of all labour, equipment, and material required to complete the work.

References

- OPSS 441
- AWWA C651¹

Disinfection Procedure

Two weeks prior to the start of construction, the Contractor shall submit a detailed disinfection procedure, sealed by a qualified Professional Engineer licensed in the Province of Ontario with demonstrated experience of a minimum of 5 yrs., for approval that meets the requirements outlined below. (These requirements can be found in greater detail in AWWA Standard C651, which is the regulated standard for disinfecting watermains in Ontario.)

Water supplied to the new main shall be through a double check valve. Flushing and disinfecting operations shall be conducted under the supervision of the Contract Administrator.

The watermain shall be flushed to achieve a minimum velocity of 0.76 m/sec. in the main (if this method is used calculations shall be supplied with disinfection procedure); otherwise the watermain shall be swabbed. The Contract Administrator shall be notified at least 2 Business Days in advance of the proposed date on which flushing and disinfecting operations are to commence.

Watermains shall be flushed in a sequence approved by the Contract Administrator. The Engineer and/or Contract Administrator may permit or require the flushing to be carried out in stages as sections of the system are completed. Flushed sections shall be protected from contamination.

Liquid chlorine solution and water shall be introduced so that the chlorine is distributed homogenously throughout the section being disinfected. The disinfection procedure shall be by the continuous feed method so that the chlorine concentration is 50 mg/liter minimum throughout the section, **if chlorine residual exceeds 100 mg/liter, the line shall be flushed, dechlorinated and chlorination procedure redone.** The system shall be left charged with the chlorine solution for 24 hours. The chlorine residual shall be tested in the section after 24 hours. If tests indicate a chlorine residual of 25 mg/liter minimum, the section shall be flushed completely and recharged with water normal to the operation of the system. If the tests do not meet the requirements, the chlorination procedure shall be repeated until satisfactory results are obtained.

The Contractor under the supervision of the Contract Administrator shall carry out all microbiological sampling. The Contract Administrator will measure the chlorine residual.

¹ AWWA Standard C651 is an Official Provincial document adopted by reference in Ontario Regulation 170/03 or latest version and as such shall be followed. Any failure to follow this document can result in criminal charges levied by the Ministry of the Environment.

One set of samples shall be collected each day for two (2) consecutive days, the first of which shall be collected Monday to Thursday only, between 8:00 a.m. to 4:00 p.m.

The Contractor shall be responsible for all additional costs associated with sampling on all other days. A sample set consists of one sample collected from every 350 m of the new watermain plus one sample from the beginning and one from the end of the main and one sample from the end of each branch main. If there is indication of contamination in the second or any subsequent sets of samples, the disinfection procedure shall be repeated until satisfactory bacteriological results and chlorine residuals of minimum 0.2 mg/L are achieved for two consecutive days.

Bacteriological samples shall not be sent to a testing laboratory unless chlorine residuals are above 0.2 mg/L.

The system shall not be put into operation until the Contract Administrator has given clearance. At no time shall the contractor operate valves on the distribution system. This function shall be carried out by the City of Timmins Public Works Department only. In the submitted disinfection procedure, the Contractor shall identify on a site map, the water sampling points for the disinfection. All sampling points shall be individually named. In the field, each sampling pipe shall have its own unique, non-removable identifier that shall correspond with the name given to it on the water sampling map required.

Invoicing

The City of Timmins will assume the cost of testing the first set of samples only.

Temporary Watermain Installation

Temporary water supply for all residents and commercial buildings shall be provided by means of PVC or High-density Polyethylene (HDPE) pipes for both the main and the services. The Contractor shall only use new piping and materials or piping and materials that have only contained or conveyed potable water. (Garden hoses shall not be used under any circumstances.) Unless otherwise specified on the drawings, the Contractor shall supply services of equal size or larger.

The connection at the house shall be by means of a brass or metal "Y" to allow the resident continued use of his/her exterior hose bib. The temporary service line shall have its own valve and the service line and valve shall be tied and suspended from the hose bib in order to prevent them resting on the ground or on any other potential source of contamination. A plastic bag secured in place over the valve shall provide additional protection. The Contractor shall take additional precautions in order to prevent anyone from using the unapproved service lines. (This may be done by removing the valve key on the service line or locking it out in some way.)

The connection at the fire hydrant shall include a double check valve assembly (backflow protection), a control valve, and a chlorine injection point. The main shall have

a sampling point at the beginning, at each end, and after a maximum interval of at most 350 m.

Once the main is loaded with the minimum initial chlorine concentration of 50 mg/L, each of the service lines shall be flushed so as to introduce the chlorinated water into each of these as well. It will not be necessary to verify the chlorine residual level of these after the 24 hour holding period.

After having received the second set of successful bacteriological results and the Contract Administrator has given clearance, the Contractor shall notify all residents that they will now receive water supplied by the temporary line and make the house connections. Before connecting to the hose bib, the contractor shall also disinfect (allow a 1-5% chlorine solution a contact time of at least 15 minutes) the inside walls of the exterior hose bib.

References

Refer to OPSS 510, 180.

If the Contractor is required to remove the existing watermain, the material shall be removed and disposed of to a site agreed to by the Contract Administrator.

Measurement for Payment

The measurement of payment shall be made in linear metres.

Basis of Payment

Payment at the contract price, per linear metre, shall be full compensation for all labour, equipment, and material required to complete the work to the satisfaction of the Contract Administrator.

Deleted (refer to OPSS 510)

SUPPLY AND INSTALL SACRIFICIAL ANODES ON HYDRANTS AND FITTINGS

Materials

Anodes – Duratron DZP-12-24 and DZP-24-48, or approved equal

Service Clamp – 3/4" Hydro ground clamp

Construction

The Contractor shall thermite weld the anode to hydrant or fitting, and attach the anode by means of a service clamp to copper service lines. Anodes shall be installed during installation of the mains, hydrant, valves, fittings and services.

After installation, and prior to backfill, each anode shall be soaked in water until saturated. The connecting wires shall not lift anodes. Connecting wires shall be tied round the main and sufficient slack shall be left to prevent stress during backfilling.

After cooling, the completed weld shall be checked to ensure that a secure connection has been achieved. Each weld and service clamp shall be sealed with T.C. Mastic Tapecoat.

Z-12-24 anodes shall be connected to all valves and fittings.

Z-24-48 anodes shall be connected to all hydrants and copper services.

Measurement of Payment

The total cost of installing anodes will be included in the price tendered for watermain and its associated appurtenances.

Preface

- This Specification shall be used for the priming, caulking and wrapping with Denso petrolatum products on any of the following surfaces:
Valve and Valve assembly (nuts, bolts and flanges etc.)
- Contractor shall comply with all written recommendations of the manufacturer regarding applications of the specified system

MATERIALS

Denso Primer

The Primer is an integral component for the preparation of metal surfaces prior to wrapping

Denso Mastics

Denso Mastics shall be cold applied self-supporting Mastics for molding around irregular shaped Valve and fittings to provide a suitable profile for applying anti-corrosion tapes.

Denso Petrolatum Tapes

Petroleum Tapes shall be non-hardening and non-cracking. The tape shall be highly resistant to mineral acids and alkalis.

Requirements for General Surface Preparation and the Application of the Denso Tape, the Application of Denso Mastics refer to the

PETROLATUM PRODUCTS SPECIFICATION GUIDE AT
WWW.densona.com

Denso Pretolatum Products Contact Information

Denso North America Inc.
Toronto On
Tel: 416-291-3435
Fax: 416-291-0898
www.densona.com

BASIS OF PAYMENT

Payment at the unit price tendered for the Valve shall include all the Materials and Labour of the Taping of the Valve and Valve assembly (Bolts, Nuts, Flanges etc.)

APPENDIX B

City of Timmins Standard Detail Drawings

STANDARD DETAIL DRAWINGS

INDEX

CITY OF TIMMINS DETAILS

100 SERIES

- RAINFALL INTENSITY DURATION CURVE
- 115 STORM SEWER DESIGN SHEET
- 120 SANITARY SEWER DESIGN SHEET
- 125 SANITARY SEWER INFILTRATION TEST FORM
- 126 SANITARY AND STORM SEWER INSPECTION
- 130 WATERMAIN PRESSURE TEST FORM
- 131 SERVICE LOCATION RECORD

200 SERIES – ROADWAY DETAILS

- 201 TYPICAL STREET CROSS-SECTION WITH CURB AND GUTTER
- 202 TYPICAL STREET CROSS-SECTION WITH ASPHALT GUTTER BANK
- 203 TYPICAL STREET CROSS-SECTION RURAL STANDARD IN FILL
- 204 TYPICAL STREET CROSS-SECTION RURAL STANDARD IN CUT
- 209 CONCRETE CURB AND GUTTER WITH STRUCTURE ADJUSTMENT - TWO PHASE CONSTRUCTION
- 210 TYPICAL DRIVEWAY DROP CURB
- 256 SEWER & WATER DIMENSION FOR PAYMENT OF ROCK EXCAVATION
- 261 ROAD SUBDRAIN DETAIL
- 265 LOT GRADING DETAILS
- 271 SODDING OF SIDE SLOPES
- 272 METHOD OF FITTING EXISTING DRIVEWAYS IN CUT AND FILL
- 280 STREET LIGHT STANDARD
- 290 ROADWAY RESTORATION FOR UTILITY COMPANY

300 SERIES – STORM AND SANITARY SEWERS

- 341 SEPARATE TRENCH SEWERS AND WATERMAIN
- 343 SEPARATE TRENCH DETAIL FOR SHALLOW STORM SEWERS < 1.5M COVER
- 346 BRIDGING AND CRADLING DETAILS
- 347 CONCRETE END PROTECTION DETAIL
- 348 SEPARATE TRENCH SEWERS & WATERMAIN WITH SUPPORTED EXCAVATION
- 380 STYROFOAM INSULATION

400 SERIES – WATERMAINS

- 401 GATE VALVE AND BOX
- 411 WATER SERVICE “MAIN STOP” WITH ELECTRICAL THAW CONNECTION
- 420 HYDRANT INSTALLATION
- 440 WATERMAIN DIVERSION
- 443 TRACER WIRE DETAIL
- 500 ROUTING AND SEALING CRACKS WITH NO OVERBAND

OPSD

200 – GRADING SECTIONS

205.010	TRANSITION TREATMENT - EARTH CUT TO EARTH FILL
205.020	TRANSITION TREATMENT - ROCK CUT TO ROCK FILL
205.030	TRANSITION TREATMENT - ROCK CUT TO EARTH FILL
205.040	TRANSITION TREATMENT - EARTH FILL TO ROCK FILL & EARTH FILL TO GRANULAR FILL
205.050	TRANSITION TREATMENT - ROCK CUT TO EARTH CUT
206.050	SUBDRAIN PIPE, CONNECTION AND OUTLET, RURAL
216.021	SUBDRAIN PIPE, CONNECTION AND OUTLET, URBAN
217.050	ACCESS TO HYDRANT ACROSS DITCH

300 – SIDE ENTRANCES

310.010	CONCRETE SIDEWALK
310.020	CONCRETE SIDEWALK ADJACENT TO CURB AND GUTTER
310.030	CONCRETE SIDEWALK RAMPS AT INTERSECTIONS

400 – FRAMES AND GRATES

400.020	CAST IRON, SQ. FRAME WITH SQ. FLAT GRATE FOR C.B.'S, HERRING BONE OPENINGS
400.070	CAST IRON, RAISED SQ. FRAME WITH CIRCULAR FLAT GRATE FOR C.B.'S, HERRING BONE
401.010	CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN COVER FOR M.H.'S
401.030	CAST IRON, SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR M.H.'S
403.010	GALVANIZED STEEL HONEYCOMB GRATING FOR DITCH INLETS
404.020	ALUMINUM SAFETY PLATFORM FOR CIRCULAR MAINTENANCE HOLES
405.010	MAINTENANCE HOLE STEPS (HOLLOW)
405.020	MAINTENANCE HOLE STEPS (SOLID)

600 – CURBS AND GUTTERS

600.040	CONCRETE BARRIER CURB WITH STANDARD GUTTER
601.010	ASPHALT CURB AND ASPHALT CURB WITH GUTTER
605.040	ASPHALT SPILLWAYS
608.010	METHOD OF TERMINATION FOR CONCRETE CURB WITH GUTTER

700 – CATCH BASIN AND MAINTENANCE HOLES

701.010	PRECAST CONCRETE MAINTENANCE HOLE 1200MM DIAMETER
701.011	PRECAST CONCRETE MAINTENANCE HOLE 1500MM DIAMETER
701.012	PRECAST CONCRETE MAINTENANCE HOLE 1800MM DIAMETER
701.013	PRECAST CONCRETE MAINTENANCE HOLE 2400MM DIAMETER
701.021	MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES
701.100	FROST STRAP INSTALLATION
704.010	PRECAST CONCRETE ADJUSTMENT UNITS FOR MH, CB, VALVE CHAMBERS
705.010	PRECAST CONCRETE CATCH BASIN (600MM X 600MM)
705.020	PRECAST CONCRETE TWIN INLET CATCH BASIN (600MM X 1450MM)
705.030	PRECAST CONCRETE DITCH INLET (600MM X 600MM)
708.020	SUPPORT FOR PIPE AT CATCH BASIN OR MAINTENANCE HOLE

800 – CULVERTS AND DRAINS

- 803.030 FROST TREATMENT – PIPE CULVERTS FROST PENETRATION LINE BELOW BEDDING
- 804.030 CONCRETE HEADWALL, FOR PIPES LESS THAN 900MM DIAMETER
- 804.040 CONCRETE HEADWALL, FOR SEWER OR CULVERT PIPE OUTLET
- 804.050 GRATING FOR CONCRETE ENDWALL
- 809.010 PERFORATED PIPE SUBDRAIN IN GRANULAR TRENCH MAIN STORM SEWER CONNECTION TO DRAINAGE STRUCTURE

900 – FENCING, GUIDE RAILS

- 912.101 GUIDE RAIL SYSTEM, STEEL BEAM RAIL COMPONENT
- 912.102 GUIDE RAIL SYSTEM, STEEL BEAM CHANNEL COMPONENT
- 912.140 GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY INSTALLATION – SINGLE RAIL
- 912.141 GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY INSTALLATION – DOUBLE RAIL
- 980.101 PEDESTRIAN BARRICADE INSTALLATION

1000 – SANITARY SEWERS, MANHOLES, & CATCH BASINS

- 1003.030 INTERNAL DROP STRUCTURE FOR EXISTING MAINTENANCE HOLES
- 1003.031 INTERNAL DROP STRUCTURE FOR NEW MAINTENANCE HOLES
- 1006.020 SEWER SERVICE CONNECTIONS FOR FLEXIBLE MAIN PIPE SEWER

1100 – WATERMAINS

- 1103.010 CONCRETE THRUST BLOCKS FOR TEES, PLUGS, AND HORIZONTAL BENDS
- 1103.020 CONCRETE THRUST BLOCKS FOR VERTICAL BENDS
- 1104.010 WATER SERVICE CONNECTION (19MM AND 25MM DIAMETER SIZES)
- 1109.011 CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS

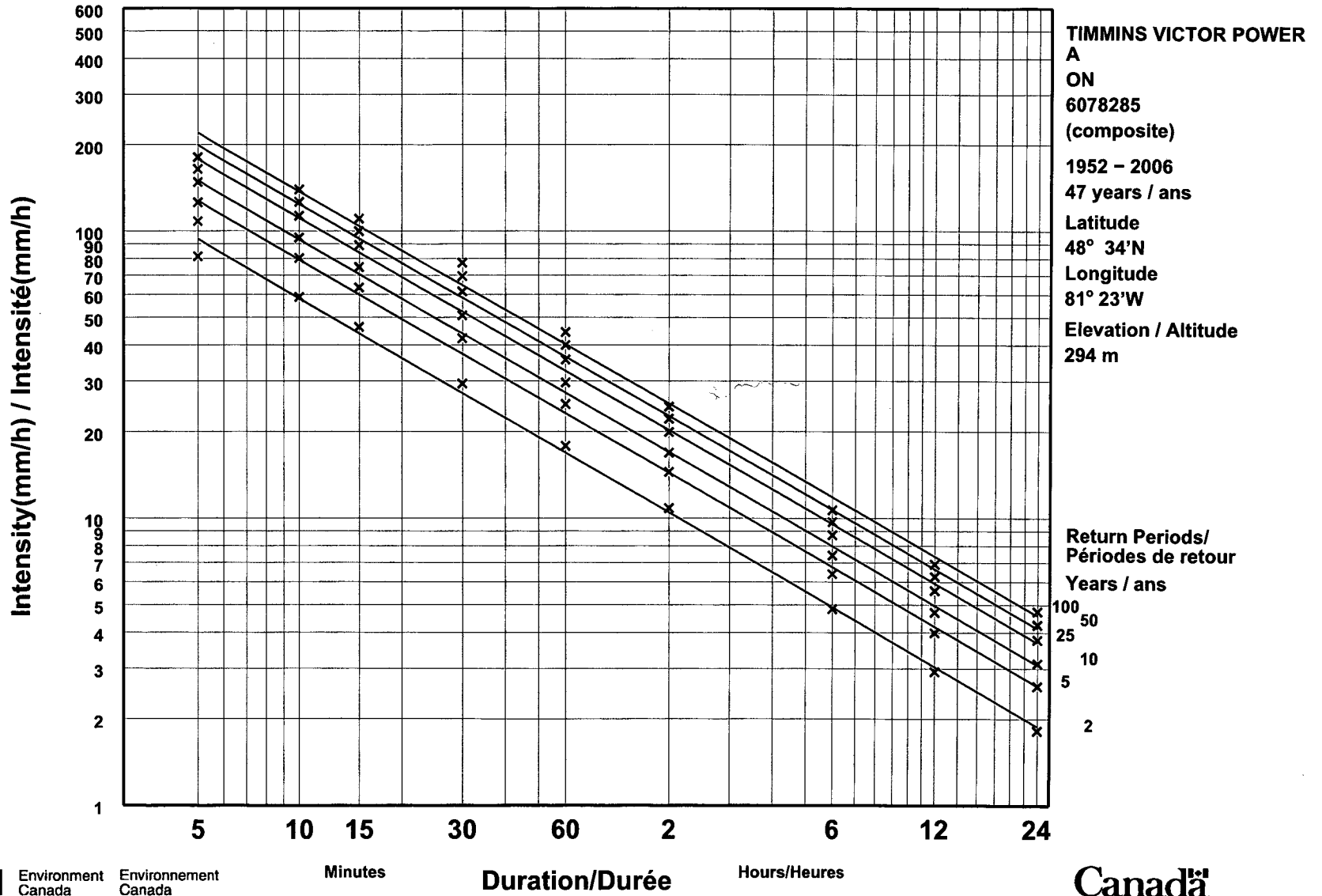
3000 – STRUCTURES

- 3120.100 WALLS - RETAINING CONCRETE TOE WALL
- 3121.150 WALLS - RETAINING BACKFILL MINIMUM GRANULAR REQUIREMENT
- 3190.100 WALLS - RETAINING AND ABUTMENT WALL DRAIN

Short Duration Rainfall Intensity-Duration-Frequency Data

2012/02/09

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



SANITARY AND STORM SEWER INSPECTION

STREET: _____ DATE: _____

FROM MH: _____ TO MH: _____ PROJECT NO. _____

SIZE: _____ GRADE: _____

TYPE OF PIPE: _____

VISUAL INSPECTION: _____

INFILTRATION TEST: _____

EXFILTRATION TEST: _____

DEFICIENCY: _____

REMARKS: _____

REVISIONS		
NO.	DATE	REMARKS

CITY OF TIMMINS		
ENGINEERING DEPARTMENT		
TITLE: SANITARY AND STORM SEWER INSPECTION		
DRAWN BY: EJM	CHECK BY:	DWG No.126
DATE: FEB 2010	APPROVED BY:	

**CITY OF TIMMINS
ENGINEERING DEPARTMENT
WATERMAIN HYDROSTATIC TEST REPORT
(OPSS 441.07.24.03)**

LOCATION: _____ **DATE:** _____

LOCATION	FROM	TO	LENGTH	SIZE	ACTUAL LEAKAGE	ALLOWABLE LEAKAGE

***Note: Hydrostatic Test shall be conducted for two (2) hours @ 1035 kPa (150 psi)**

Calculation of Allowable Leakage

A = 0.082 x mm diameter x kilometer
A = Allowable leakage in litres
mm diameter = Diameter of pipe in millimeters
kilometer = Length of pipe in kilometers

Per: _____
City of Timmins Inspector

Consultant's Representative

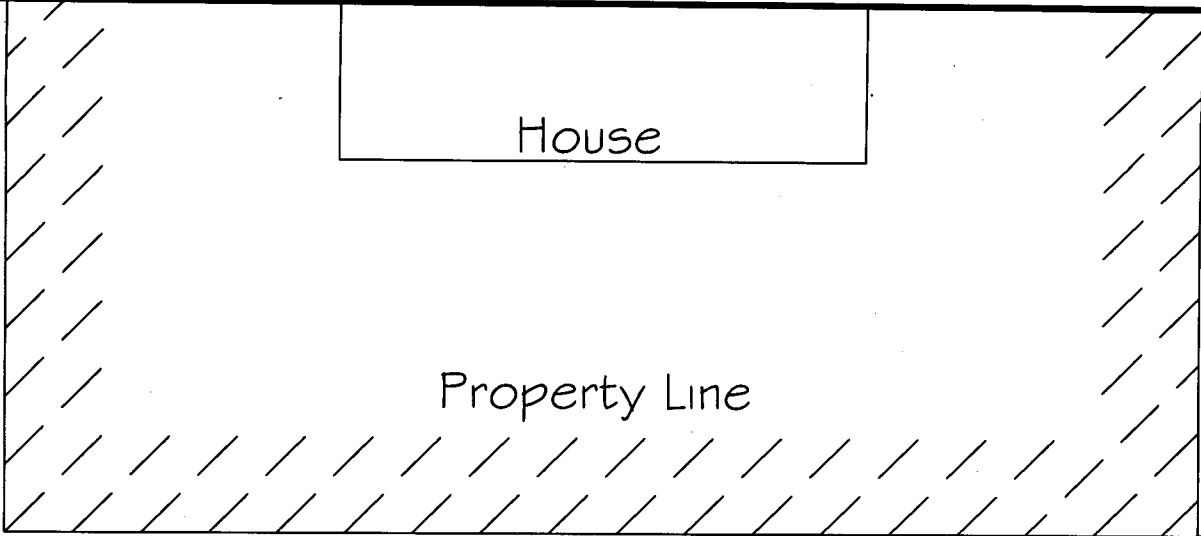
cc: Manager of Engineering
Inspector
Contractor

REVISIONS		
NO.	DATE	REMARKS

CITY OF TIMMINS		
ENGINEERING DEPARTMENT		
TITLE: WATERMAIN HYDROSTATIC TEST		
DRAWN BY: CM	CHECK BY:	DWG. No. 130
DATE: FEB 2013	APPROVED BY:	



House



Property Line



Distance from property line
to main line

Watermain/ Sanitary Sewer/ Storm Sewer



STREET NAME: _____ LOT No./PARCEL No.: _____

SERVICE TYPE/ SIZE/ MATERIAL: _____

INVERT 1) @ PROPERTY LINE: _____ 2) @ MAIN LINE: _____

INSPECTOR: _____ DATE APPROVED: _____

DATE INSTALLED: _____

REMARKS: _____



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

SERVICE LOCATION RECORD

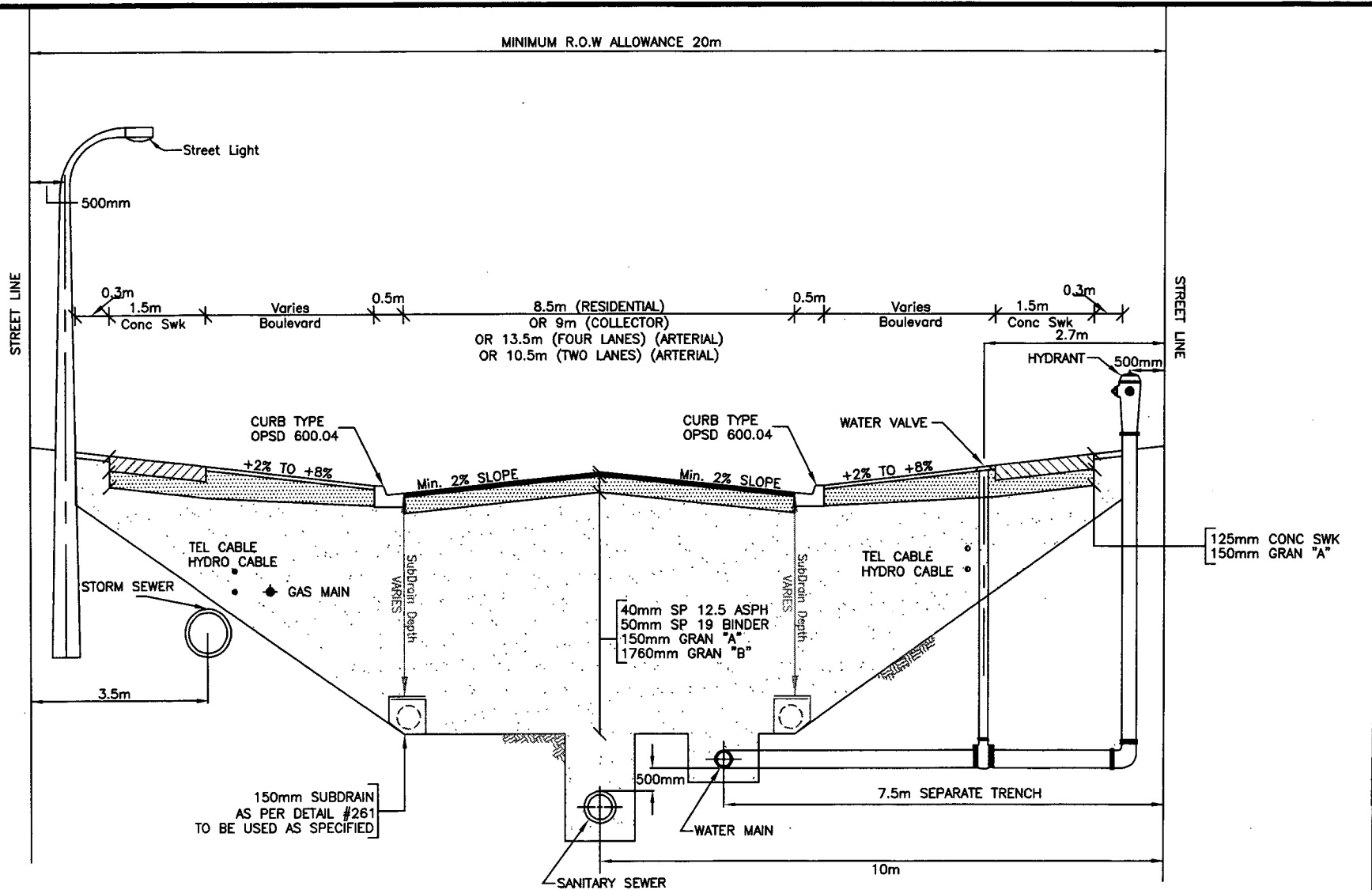
NO.	DATE	DESCRIPTION

SCALE: N.T.S.
DRAWN BY:
CHECK BY: C.M.

DATE: JULY 2013

DRAWING NO:

131



NOTES:

- 1) CONCRETE SIDEWALK TO BE INSTALLED IF REQUIRED AS PER SUBDIVISION AGREEMENT.
- 2) ALL UTILITY INSTALLATIONS ARE TO BE APPROVED BY THE ENGINEER.
- 3) WHERE THE WATERMAIN IS INSTALLED IN A SEPARATE TRENCH. THE 500MM VERTICAL SEPARATION FROM THE SANITARY SEWER IS NOT REQUIRED
- 4) MINIMUM COVER OVER WATERMAIN AND SANITARY SEWER IS 2.4m.
- 5) MINIMUM COVER OVER STORM SEWER IS 1.5m.
- 6) ALL ASPHALT AND GRANULAR MATERIALS ARE TO CONFORM TO CITY SPECIFICATIONS.



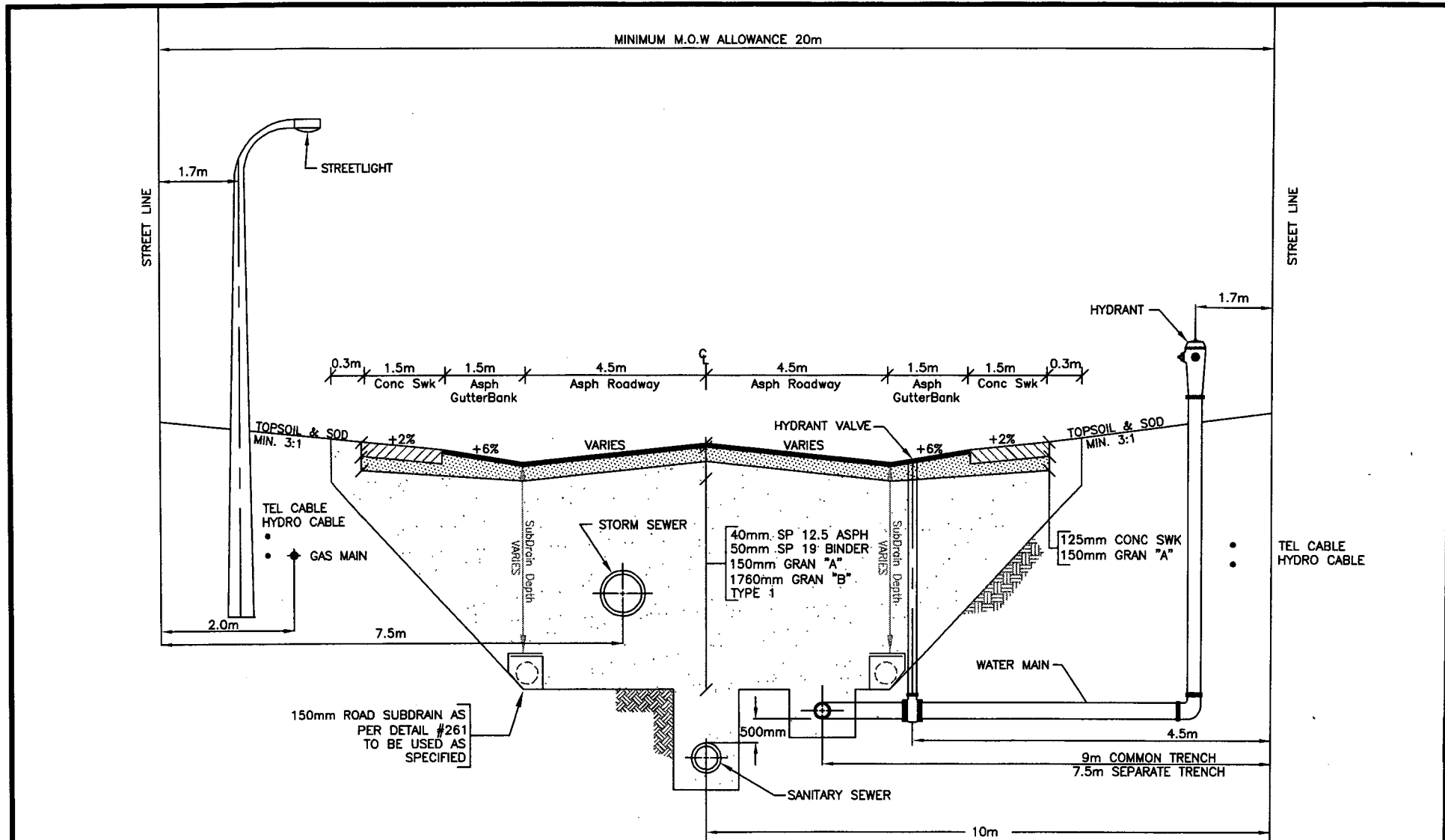
ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

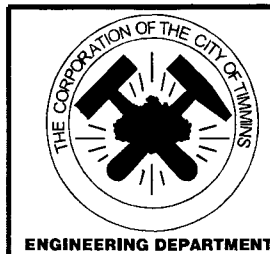
TYPICAL STREET X-SECTION WITH CONCRETE CURB & GUTTER

DATE: JULY-2013	NO. 1	DATE FEB 14	DESCRIPTION EXC LIMITS
SCALE: N.T.S.	DRAWING NO:		
DRAWN BY: S.G.	201		
CHECK BY: C.M.			



NOTES:

- 1) CONCRETE SIDEWALK TO BE INSTALLED IF REQUIRED AS PER SUBDIVISION AGREEMENT.
- 2) ALL UTILITY INSTALLATIONS ARE TO BE APPROVED BY THE ENGINEER.
- 3) WHERE THE WATERMAIN IS INSTALLED IN A SEPARATE TRENCH, THE 500MM VERTICAL SEPARATION FROM THE SANITARY SEWER IS NOT REQUIRED
- 4) MINIMUM COVER OVER WATERMAIN AND SANITARY SEWER IS 2.4m.
- 5) MINIMUM COVER OVER STORM SEWER IS 1.5m.
- 6) ALL ASPHALT AND GRANULAR MATERIALS ARE TO CONFORM TO CITY SPECIFICATIONS.



ENGINEERING DEPARTMENT

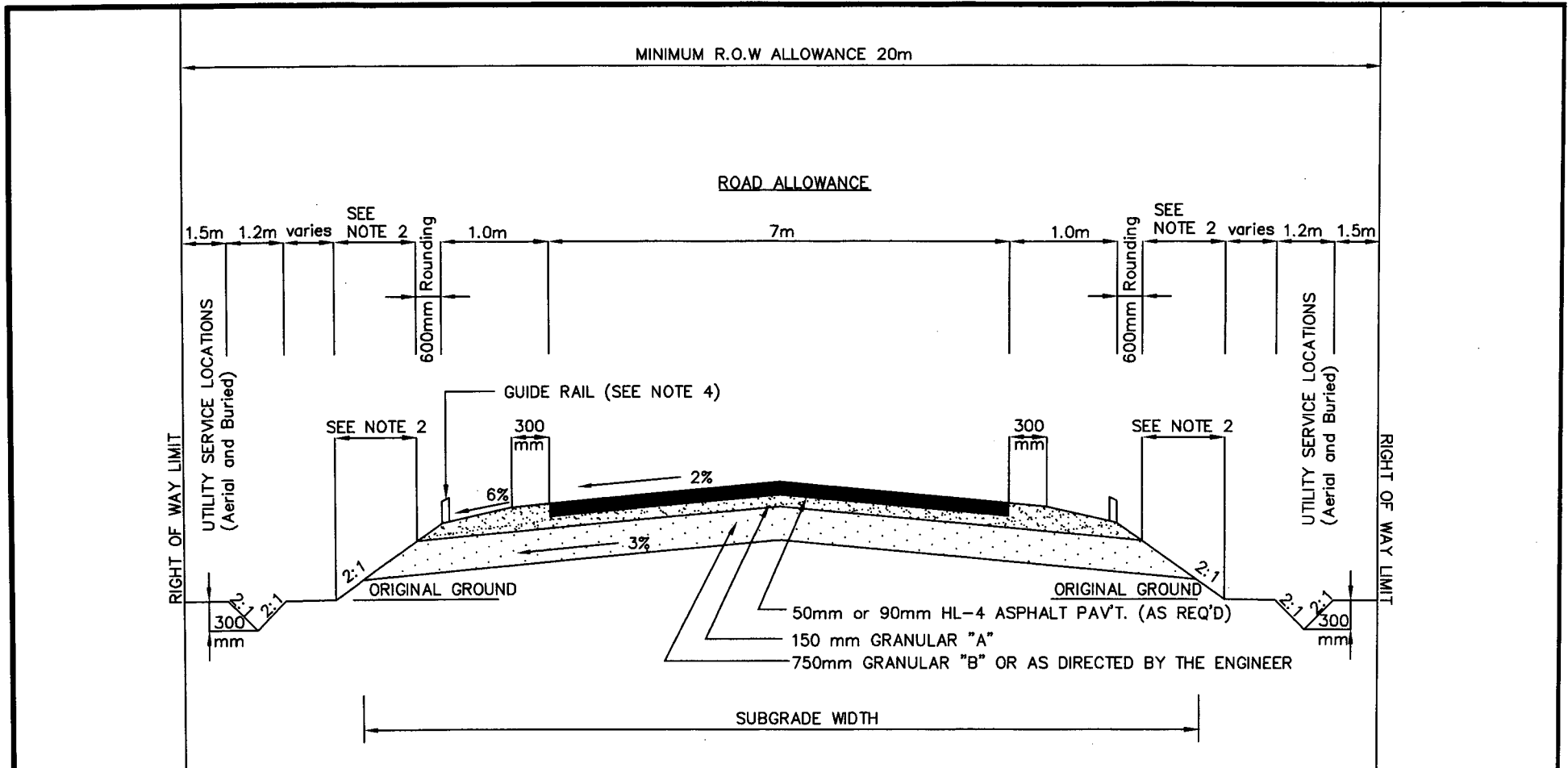
APPROVED BY:

P. SEGUIN, P. Eng

TYPICAL STREET X-SECTION WITH ASPHALT GUTTER BANK

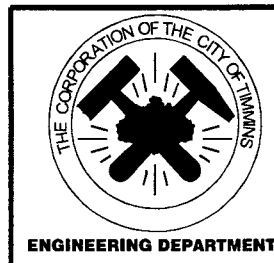
DATE	NO.	DATE	DESCRIPTION
JULY-2013	1	FEB 14	EXC LIMITS

SCALE: N.T.S.	DRAWING NO: 202
DRAWN BY: S.G.	
CHECK BY: C.M.	



Notes:

- 1) TOPSOIL TO BE REMOVED WITHIN THE SUBGRADE WIDTH WHERE HEIGHT OF FILL IS 1.2m. OR LESS.
- 2) SLOPES: ALL FILL TO BE PLACED AT 2:1. HEIGHT OF FILL IS THE DIFFERENCE IN ELEVATION BETWEEN ORIGINAL GROUND AT THE TOE OF SLOPE AND OUTER EDGE OF ROUNDING
- 3) ROADSIDE DITCH ONLY WHERE REQUIRED BY THE ENGINEER: ITS LOCATIONS AND CROSS-SECTION MAY BE ALTERED AS DIRECTED.
- 4) GUIDE RAILS ARE REQUIRED ON FILLS 3m. IN HEIGHT OR MORE. WHERE STEEL BEAM GUIDE RAIL IS INDICATED, WIDTH OF ROUNDING SHALL BE 1m.

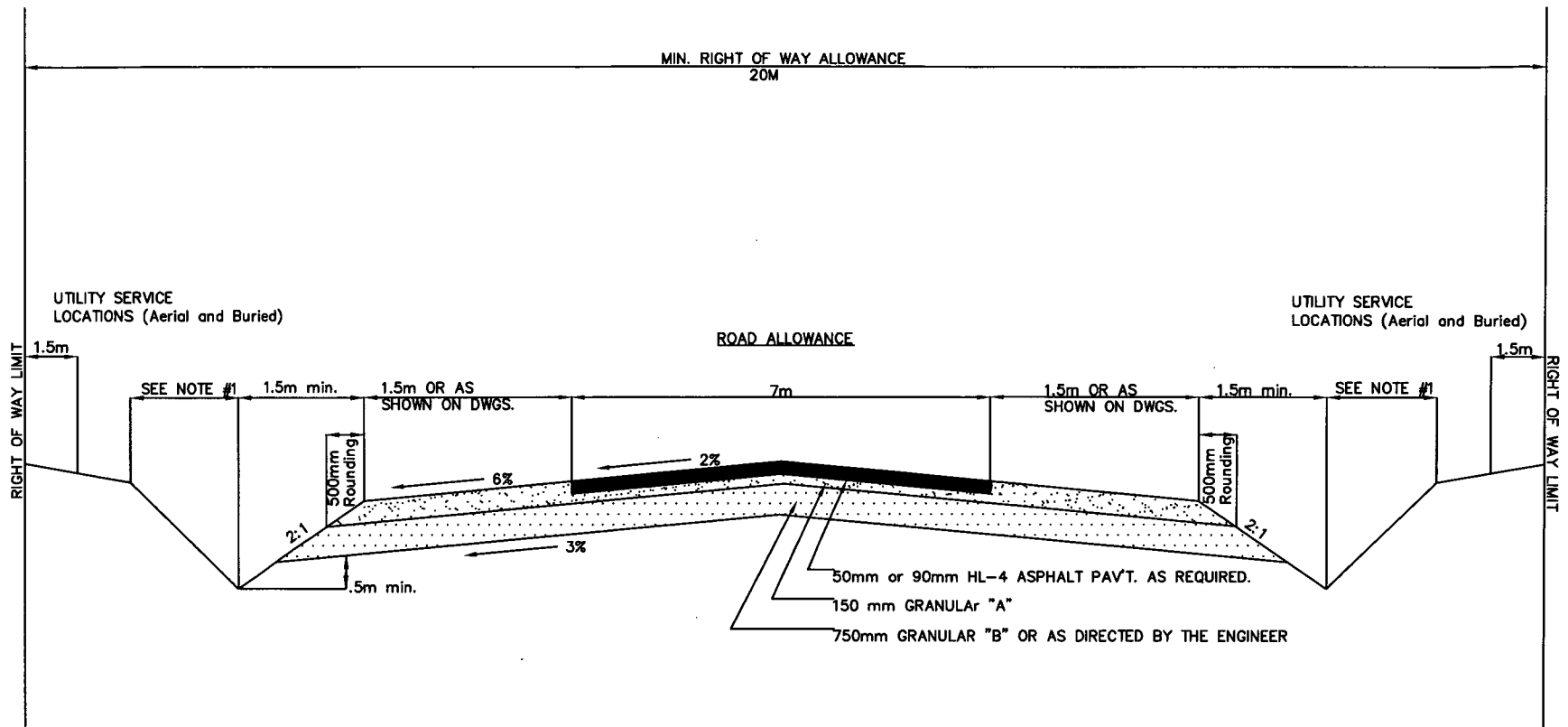


APPROVED BY:

P. SEGUIN, P. Eng

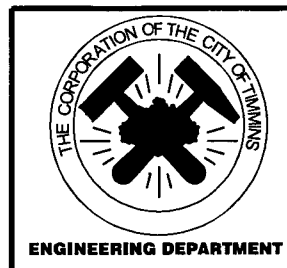
TYPICAL STREET X-SECTION RURAL STANDARD IN FILL

NO.	DATE	DESCRIPTION	DATE:
			AUG.-2013
SCALE: N.T.S.			DRAWING NO: 203
DRAWN BY: S.G.			
CHECK BY: C.M.			



Notes:

- 1) BACK SLOPES: DEPTHS OF CUT 1.2m OR LESS 3:1; OVER 1.2m 2:1
- 2) IF SUBGRADE IS .5m OR LESS ABOVE DITCH LINE, SUBDRAIN PIPE IS REQUIRED TO DRAIN SUBBASE
- 3) TOPSOIL TO BE REMOVED FOR WIDTH OF CUT.



APPROVED BY:

P. SEGUIN, P. Eng

**TYPICAL STREET CROSS SECTION
RURAL STANDARD IN CUT**

NO.	DATE	DESCRIPTION

DATE: AUG.-2013

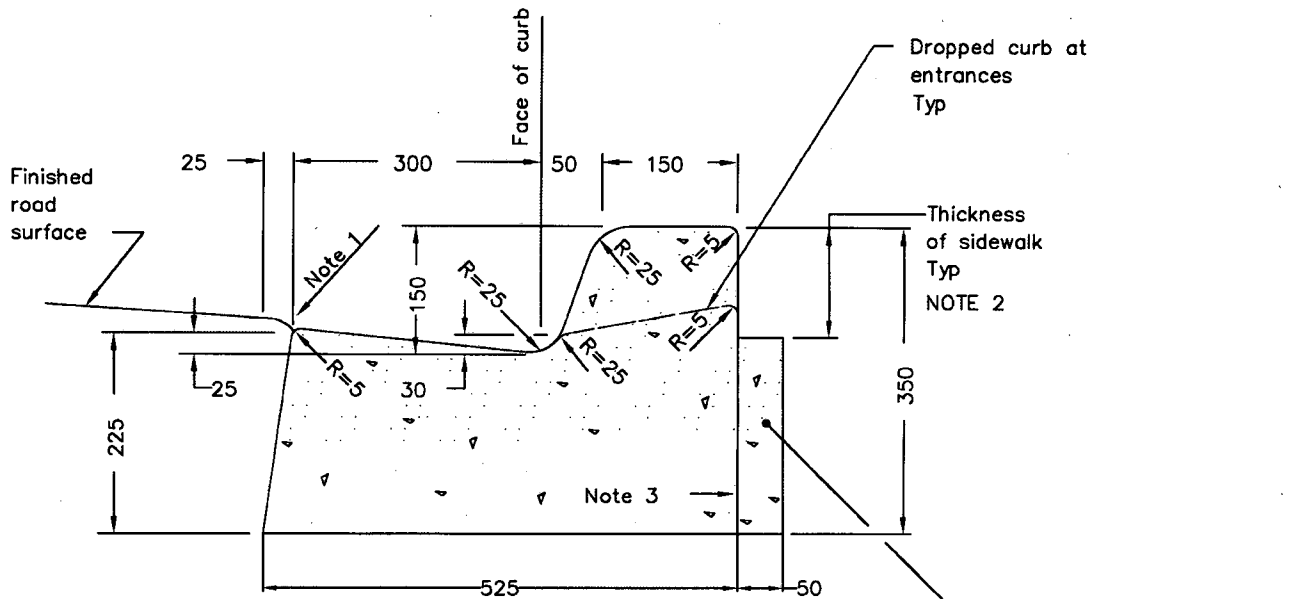
SCALE:

DRAWING NO:

DRAWN BY: S.G.

204

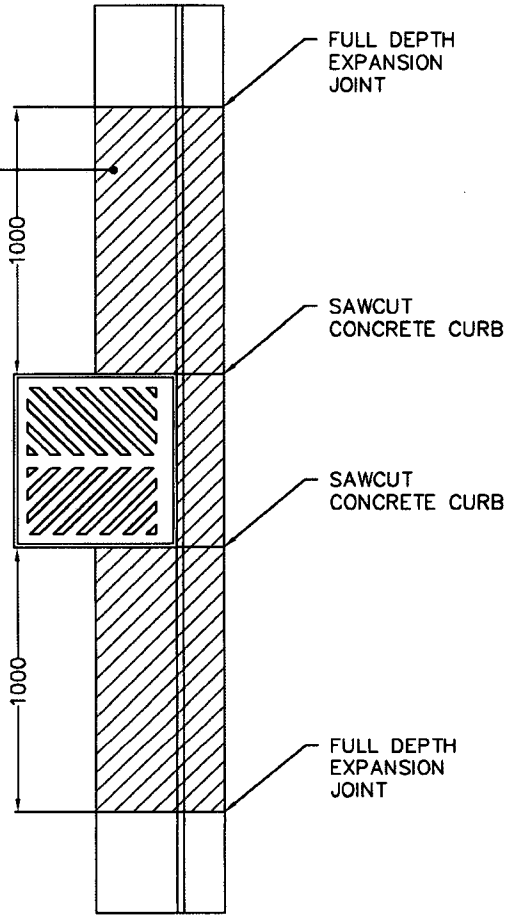
CHECK BY: C.M.



TANGENT

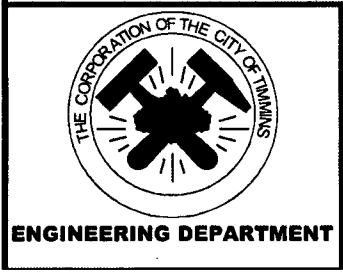
Additional width where sidewalk is adjacent to curb Typ


Phase I - Temporary hot mix filler around catch basin
 Phase II - Remove asphalt filler and complete curb in one pour



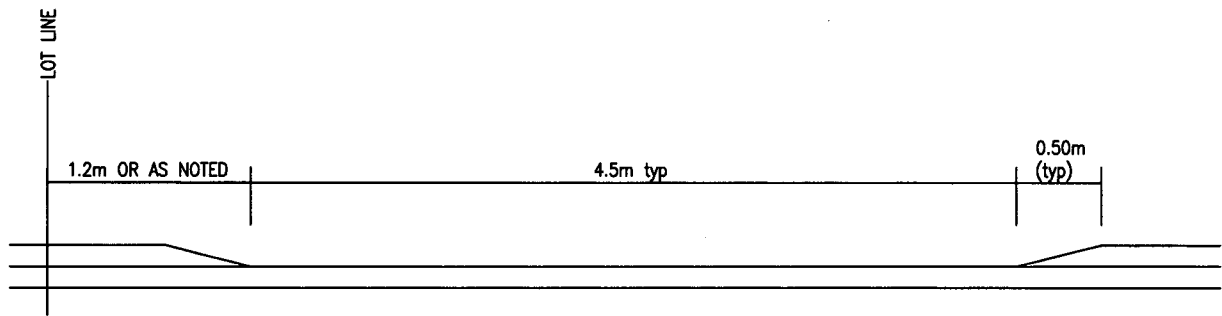
NOTES:

- 1 Flexible pavement shall be 5mm above the adjacent edge of gutter.
- 2 When sidewalk is continuously adjacent, reduce the dropped curb at entrances to 75mm.
- 3 For slipforming procedure, a 5% batter is acceptable.
- A Phase I surface shall be cleaned of foreign material prior to placement.
- B Treatment at entrances shall conform with OPSD-351.010.
- C Outlet treatment shall conform with OPSD-610 Series.
- D The length of transition from one curb type to another shall be 3.0m, except in conjunction with guide rail, it shall conform to OPSD-900 Series.
- E All dimensions are in millimetres unless otherwise shown.



APPROVED BY:

 P. SEGUIN, P. Eng

CONCRETE CURB AND GUTTER WITH STRUCTURE ADJUSTMENT TWO PHASE CONSTRUCTION			
DATE:	NO.	DATE	DESCRIPTION
MAR 2014			
SCALE: N.T.S.	DRAWING NO:		
DRAWN BY: S.C.	209		
CHECK BY:			



NOTE:
 WIDTH OF THE DRIVEWAY MUST NOT EXCEED 50% OF THE LOT FRONTAGE
 OR 7.1m, WHICHEVER IS LESS AS PER THE ZONING BY-LAW



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

TYPICAL DRIVEWAY DROP CURB

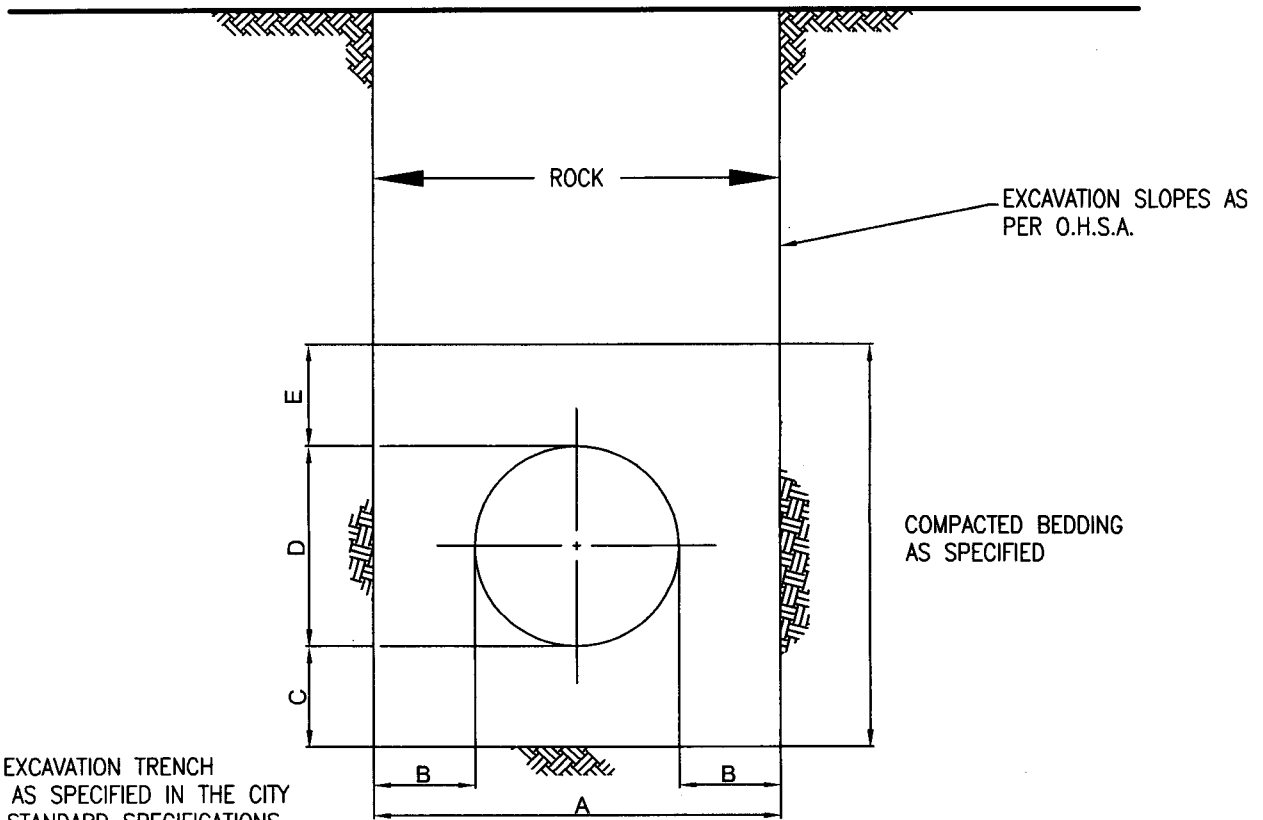
NO.	DATE	DESCRIPTION
SCALE: N.T.S.		
DRAWN BY: L.M.		
CHECK BY:		

DATE: APRIL 2014

DRAWING NO:

210

	SEWERS	SERVICES
A	D+600mm	600mm
B	300mm	300mm
C	300mm	150mm
D	OD of pipe	OD of pipe
E	300mm	300mm



NOTE:

FOR EARTH EXCAVATION TRENCH WIDTHS ARE AS SPECIFIED IN THE CITY OF TIMMINS STANDARD SPECIFICATIONS



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

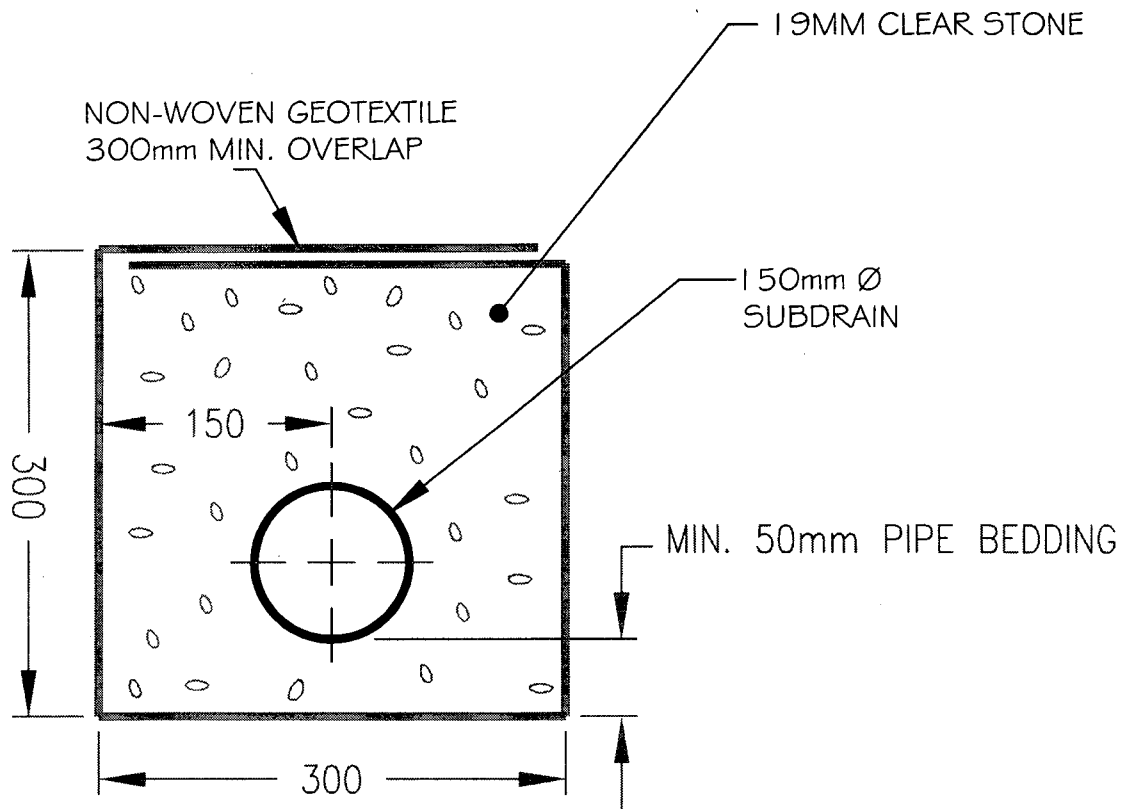
**SEWER & WATER
DIMENSION FOR PAYMENT OF ROCK EXCAVATION**

NO.	DATE	DESCRIPTION
SCALE: N.T.S.		
DRAWN BY: S.G.		
CHECK BY: C.M.		

DATE: MAY 2013

DRAWING NO:

256



NOTE: CONNECT LOW END OF PIPE TO STRUCTURE.
CAP HIGH END



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

ROAD SUBDRAIN DETAIL

NO.	DATE	DESCRIPTION

DATE: JULY 2013

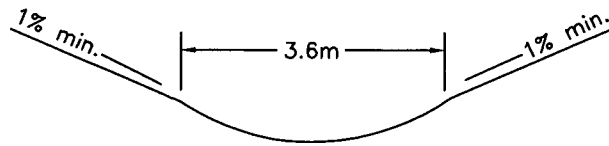
SCALE: N.T.S.

DRAWING NO:

DRAWN BY: D.S.

261

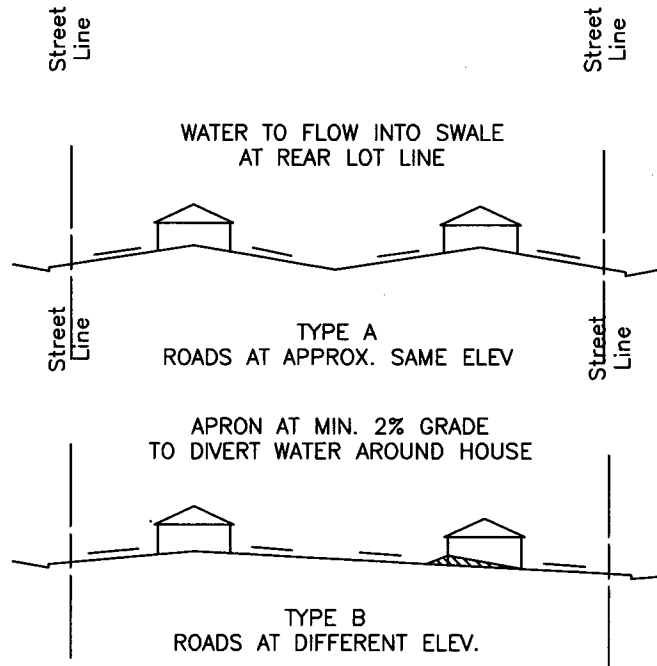
CHECK BY: C.M.



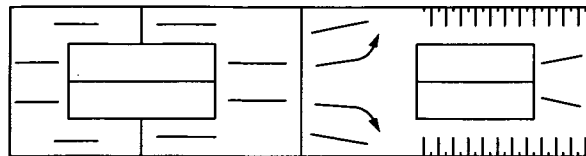
SECTION THROUGH SWALE
(GRADE TRANSITIONS SHALL BE SMOOTH TO FACILITATE LAWN MOWING)

Notes:

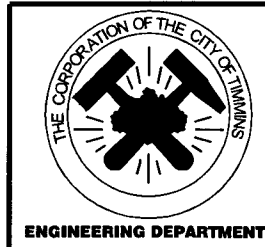
- 1) SURFACE DRAINAGE SHALL BE DIRECTED AWAY FROM ANY HOUSES
- 2) REAR LOT DRAINAGE IS REQUIRED WHERE BY ONE HALF THE LOT DRAINS TOWARD THE STREET AND THE OTHER TOWARDS THE REAR. THE HIGH-POINT SHOULD BE IN THE MIDDLE OF THE LOTS.
- 3) THE HIGHEST FINISHED GROUND ELEVATION SHOULD BE AT LEAST 500mm GREATER THAN THE ROAD CENTERLINE ELEVATION DIRECTLY IN FRONT OF THE LOT.
- 4) SURFACE DRAINAGE WHICH IS CARRIED AROUND HOUSES IS TO BE CONFINED IN SWALES LOCATED ALONG THE LOT LINES.
- 5) DRIVEWAYS - OPTIMUM GRADIENT IS 4%
MAXIMUM GRADIENT IS 10%
- 6) FROM HOUSE TO SIDE LOT LINE, THE MINIMUM SLOPE IS 4% AWAY FROM THE HOUSE. THE MINIMUM SLOPE ANYWHERE ON THE LOT WILL BE 1%. BANKS OR TERRACES WILL BE BUILT TO A MAXIMUM SLOPE OF 3:1.
- 7) REAR LOT LINE SWALES LONGER THAN 90m WILL REQUIRE A DITCH INTLET WITH A RIVETED GRATING CONNECTING TO THE STORM SEWER SYSTEM.
8. THE MINIMUM GRADE IN A SWALE WILL BE 1%, THE MAXIMUM WILL BE 10%. REAR LOT SWALES SHALL BE AT LEAST 3.6m WIDE.



FLOW DIVERTED AROUND HOUSE INTO SWALE



PLAN OF TYPE B



APPROVED BY:

P. SEGUIN, P. Eng

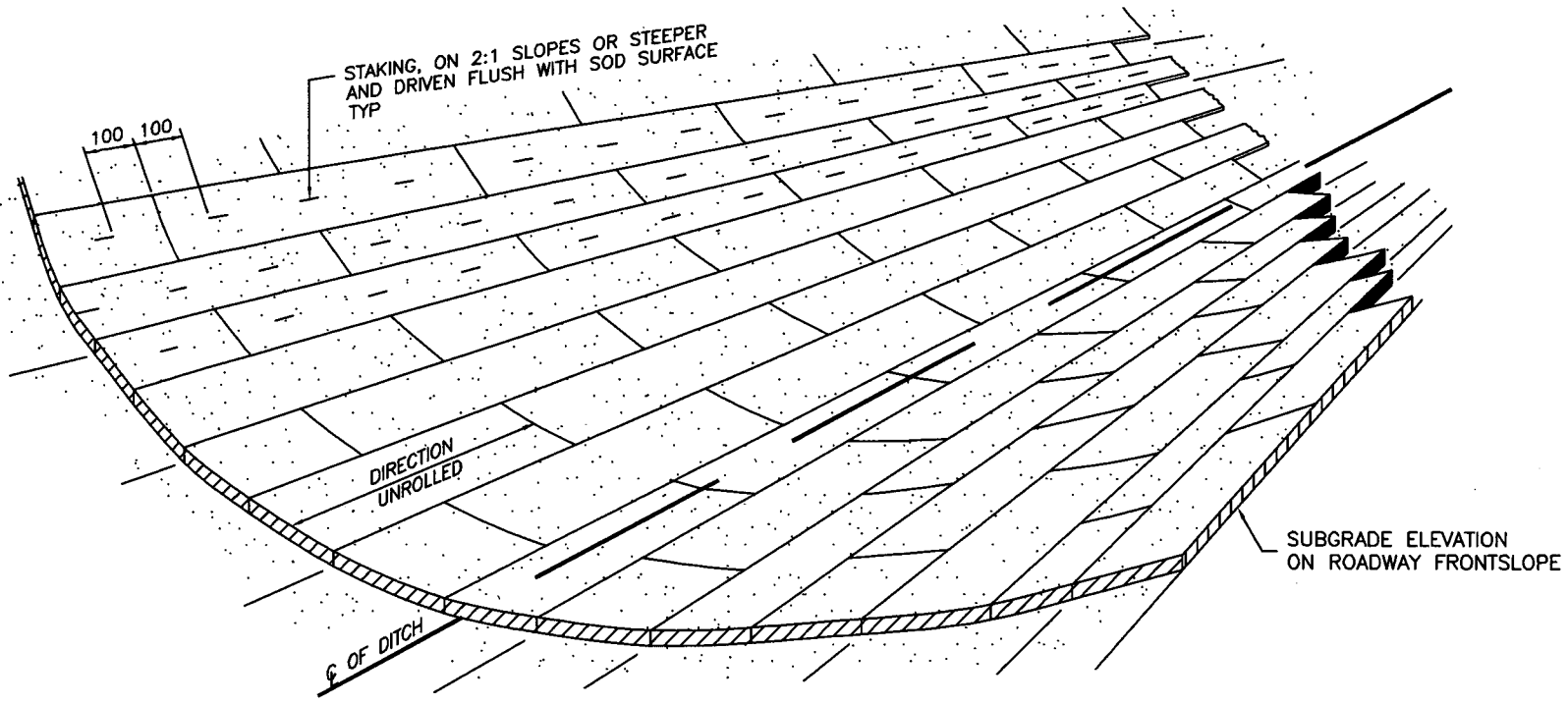
LOT GRADING DETAILS

NO.	DATE	DESCRIPTION
SCALE: N.T.S.		
DRAWN BY: C.L.		
CHECK BY: C.M.		

DATE: JUNE 2013



DRAWING NO:

265



NOTES:

- 1) WHERE TOPSOIL AND SODDING IS SPECIFIED THE TOP EDGE IS TO BE RECESSED INTO THE SLOPE AS TO IMPEDE THE FLOW OF SURFACE RUN-OFF.
- 2) JOINTS IN ADJACENT ROWS SHALL BE STAGGERED.
- 3) ON SLOPES OF 2:1 TO 3:1, THE BOTTOM THREE ROWS AND EVERY 3RD ROW SHALL BE PEGGED. ON SLOPES STEEPER THAN 2:1 EACH AND EVERY ROW SHALL BE PEGGED.
- 4) READ IN CONJUNCTION WITH OPSS 803.
- 5) ALL DIMENSIONS ARE IN MILLIMETRES.

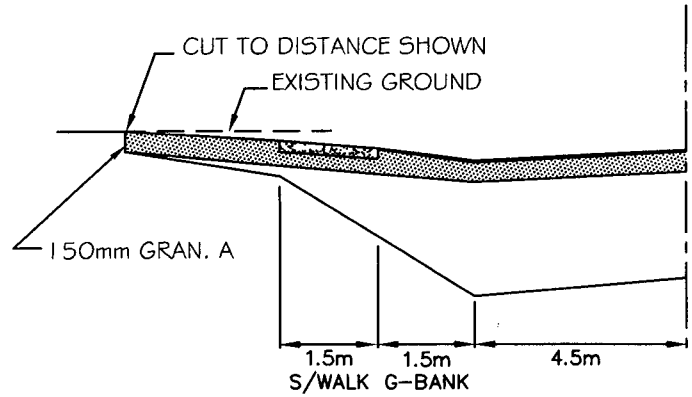
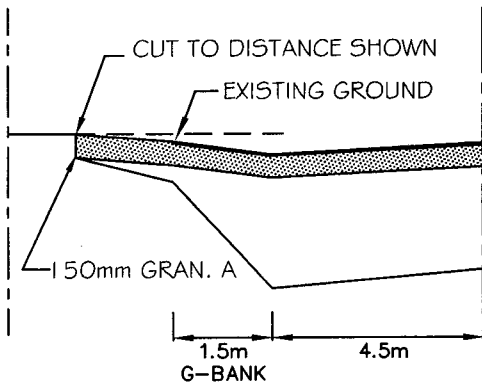
 ENGINEERING DEPARTMENT	APPROVED BY:  P. SEGUIN, P. Eng	SODDING OF SIDE SLOPES		
	NO.	DATE	DESCRIPTION	DATE: FEB. 2010
	SCALE: N.T.S.			DRAWING NO: 271
	DRAWN BY: E.J.M.			
CHECK BY: C.M.				

R.O.W

ROADWAY
⊕

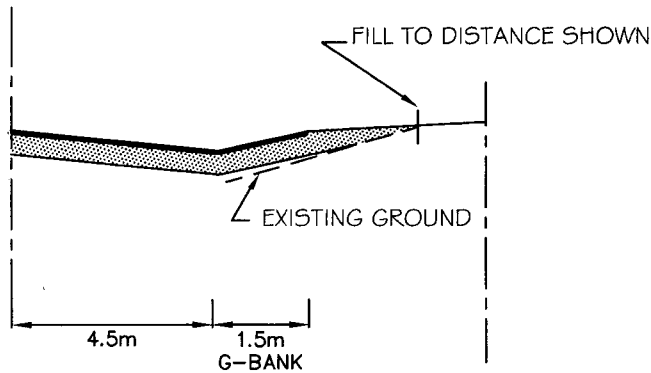
R.O.W

ROADWAY
⊕



EXAMPLE OF DRIVEWAY IN CUT

ROADWAY
⊕



NO MORE THAN 150MM OF GRANULAR "A"
IS TO BE PLACED WHERE FILL EXCEEDS
150MM. THE REMAINING FILL SHALL
BE GRANULAR "C"

MINIMUM DEPTH OF GRANULAR "A"
TO BE PLACED OVER EXISTING ASPHALT
IS 100MM

Notes :

- 1) EXISTING WIDTH OF DRIVEWAYS IS TO BE MAINTAINED UNLESS OTHERWISE DIRECTED BY THE ENGINEER
- 2) THESE DETAILS ALSO APPLY TO CUT AND FILL POINTS FROM ROADWAY CROSS SECTION

EXAMPLE OF DRIVEWAY IN FILL


CITY OF TIMMINS

ENGINEERING DEPARTMENT

REVISIONS

NO.	DATE	DESCRIPTION

Title : **METHOD OF FITTING EXISTING DRIVEWAYS IN CUT AND FILL**

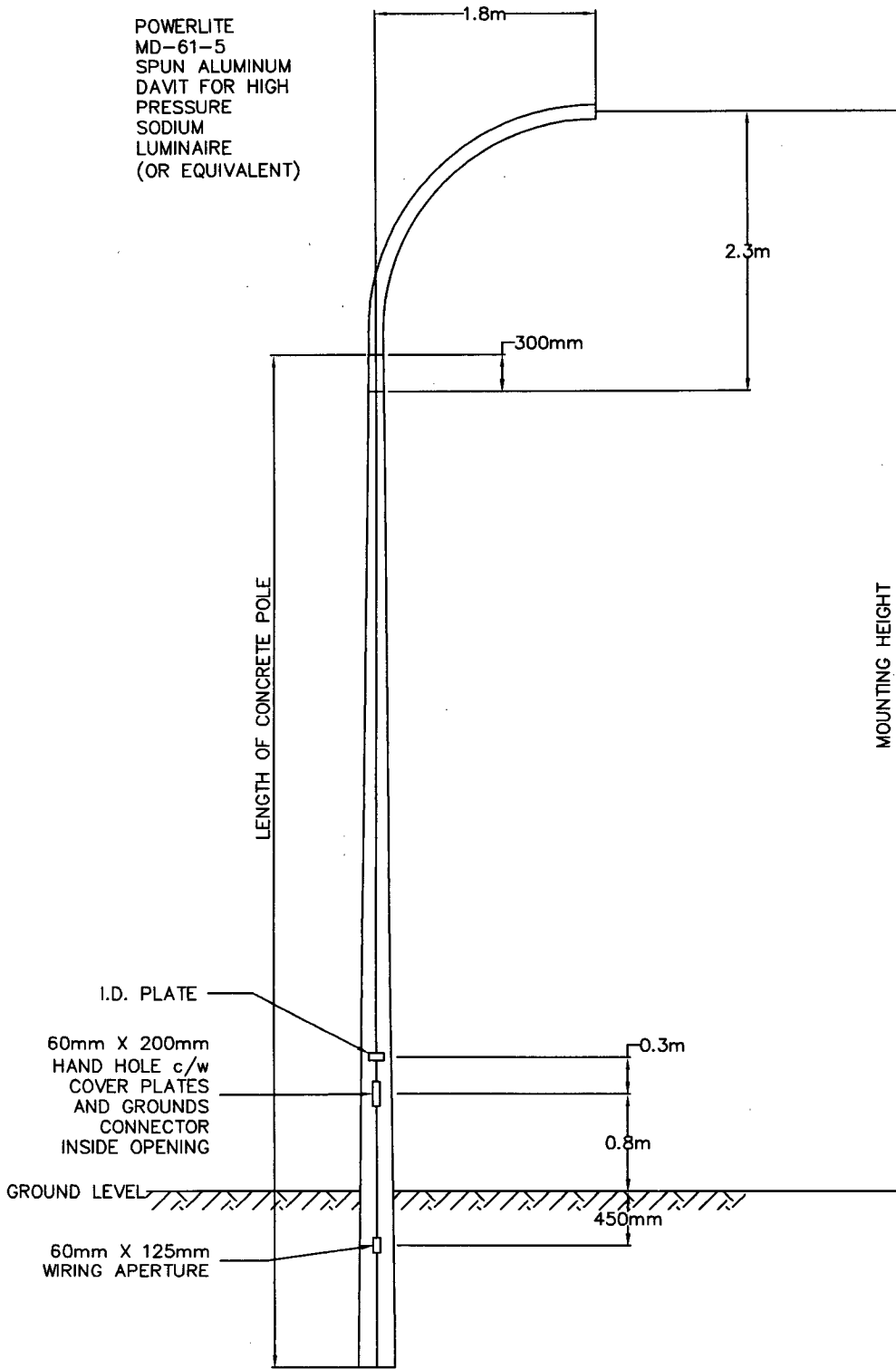
APPROVED BY: 
P. SEGUIN, P. Eng

DRAWN BY: M.W.
CHECK BY: C.M.

SCALE: N.T.S.
DATE: JUNE 2013

DRAWING NO:
272

POWERLITE
MD-61-5
SPUN ALUMINUM
DAVIT FOR HIGH
PRESSURE
SODIUM
LUMINAIRE
(OR EQUIVALENT)




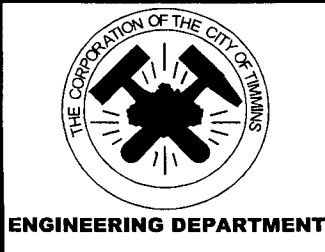
NOTES :

1) FOR 100 WATT HPS
LUMINAIRES
POLE LENGTH = 6.9m
MOUNTING HEIGHT = 7.4m
BURIAL DEPTH = 1.5m

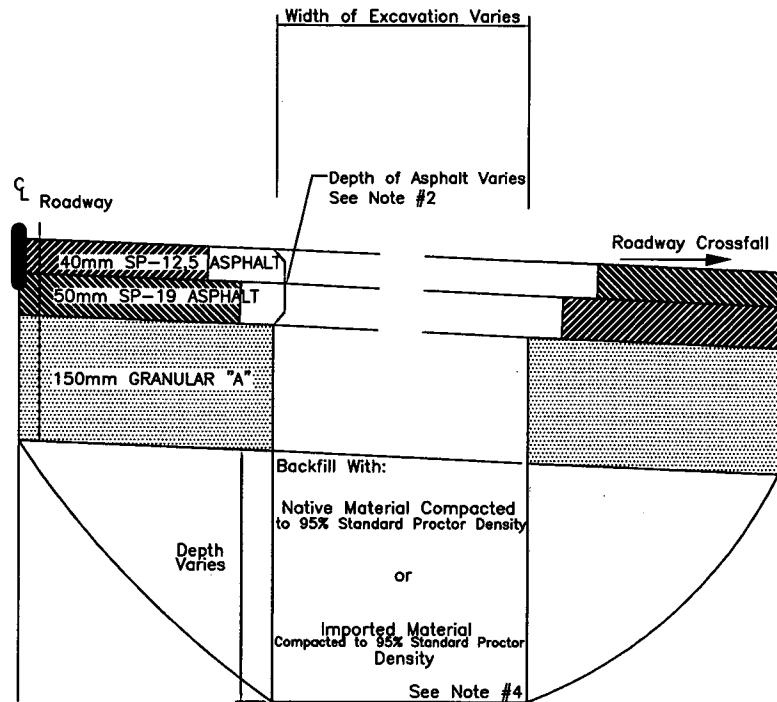
2) FOR 150 WATT HPS
LUMINAIRES
POLE LENGTH = 8.4m
MOUNTING HEIGHT = 8.9m
BURIAL DEPTH = 1.5m

I.D. PLATE
60mm X 200mm
HAND HOLE c/w
COVER PLATES
AND GROUNDS
CONNECTOR
INSIDE OPENING
GROUND LEVEL
60mm X 125mm
WIRING APERTURE

APPROVED BY:

P. SEGUIN, P. Eng

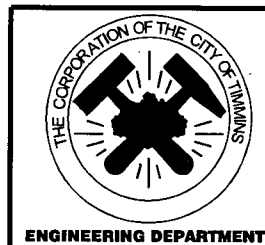


STREET LIGHT STANDARD		
NO.	DATE	DESCRIPTION
SCALE: N.T.S.		DATE: FEB 2014
DRAWN BY: L.M.		DRAWING NO:
CHECK BY: C.M.		280



Notes:

- 1) ALL ASPHALT SURFACES ARE TO BE SAWCUT IN NEAT STRAIGHT LINES PRIOR TO EXCAVATION
- 2) THE DEPTH OF ASPHALT RESTORATION MUST MATCH THE EXISTING DEPTHS AND INDIVIDUAL LIFTS MUST NOT EXCEED 50mm.
- 3) ALL ASPHALTIC AND GRANULAR MATERIAL SOURCES MUST BE CITY APPROVED.
- 4) IF THE NATIVE MATERIAL IS UNACCEPTABLE TO BE USED IN THE BACKFILL APPROVED IMPORTED MATERIAL TO BE USED
- 5) PRIOR TO PLACING THE ASPHALT, ALL JOINTS MUST BE CLEAN OF DIRT AND LOOSE MATERIAL SHALL BE COATED WITH A THIN UNIFORM AND CONTINUOUS COATING OF JOINT ASPHALTIC MATERIAL.
- 6) WHEN MATCHING A COMPACTED JOINT, THE DEPTH OF THE UN-COMPACTED MATERIAL SHALL BE SET TO ALLOW FOR COMPACTION AND THE PAVER SHALL OVERLAP THE AD-JOINTING MATERIAL BY AT LEAST 50mm. BUT MUST INSURE THAT THE FINAL JOINT HAS A SMOOTH, CLEAN AND TIGHT FINISH WITH NO OVERLAPPING EXISTING ASPHALT.
- 7) ALL PROCEDURES OF GRANULAR AN ASPHALT PAVEMENT MUST CONFORM TO THE CITY OF TIMMINS SPECIFICATIONS AND IN TURN M.T.C FORM 310



APPROVED BY:

P. SEGUIN, P. Eng

**ROADWAY RESTORATION
FOR UTILITY COMPANY**

NO.	DATE	DESCRIPTION
SCALE: N.T.S.		
DRAWN BY: S.G.		
CHECK BY: G.A.		

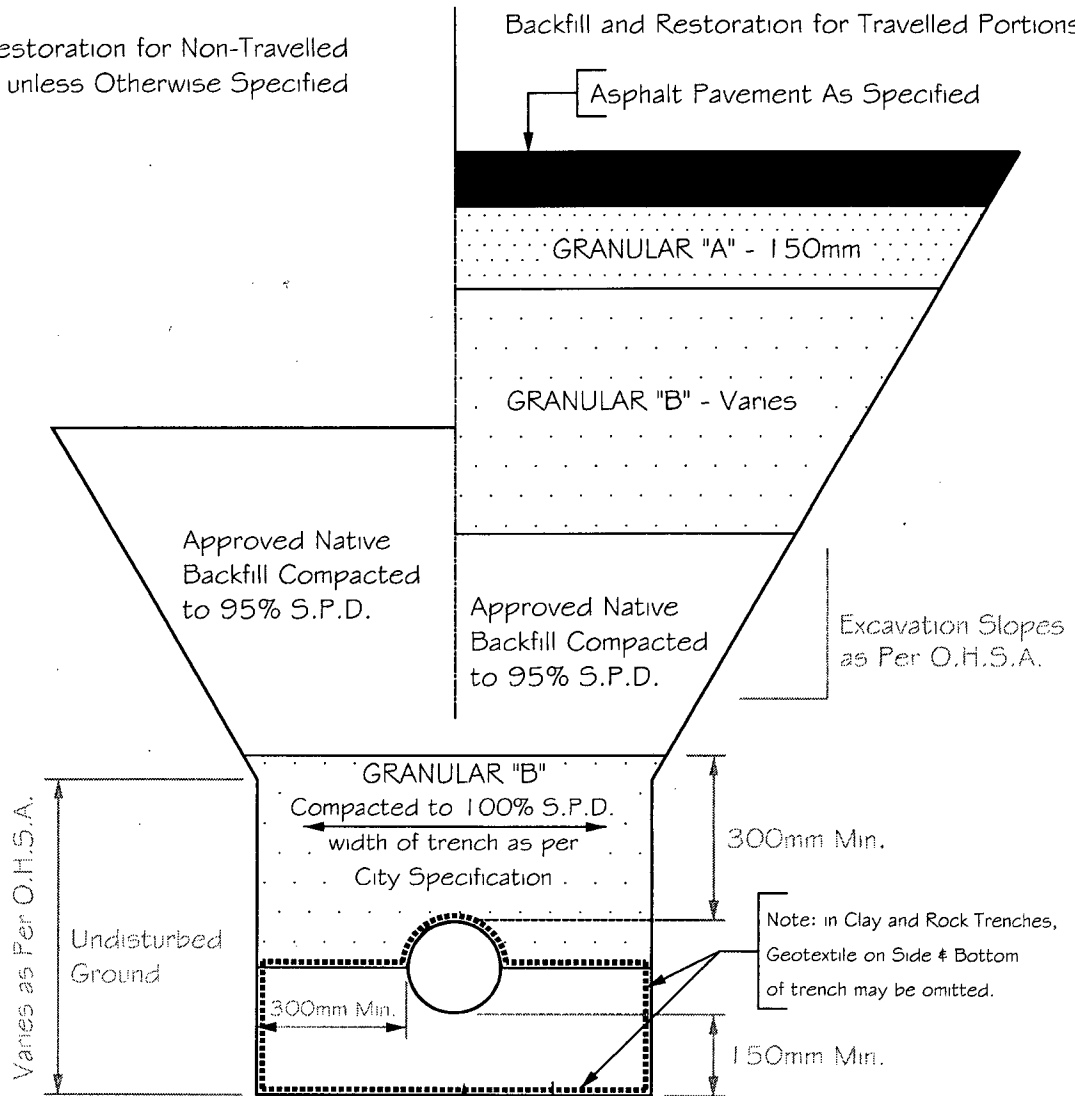
DATE: MARCH 85

DRAWING NO:

290

Backfill and Restoration for Non-Travelled Portions unless Otherwise Specified

Backfill and Restoration for Travelled Portions



- A) Granular "A" --WATERMAIN & SANITARY SEWER
- B) Granular "B" --STORM SEWER - with > 1.5m cover (UN.O.)
- C) 19mm Clearstone with Bedding and Pipe wrapped in Geotextile --SANITARY SEWER (Wet Areas Only; Approved by the Engineer)

Notes:

- 1) THE LAYERS OF GRANULAR MATERIAL ARE TO BE COMPACTED TO 100% S.P.D.
- 2) ALL GRANULAR MATERIAL IS TO MEET CITY SPECIFICATIONS.
- 3) TRENCH EXCAVATION MUST CONFORM TO THE CONSTRUCTION SAFETY ACT (LATEST EDITION).



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

SEPARATE TRENCH SEWERS & WATERMAIN

NO.	DATE	DESCRIPTION
SCALE: N.T.S.		
DRAWN BY: D.S.		
CHECK BY: C.M.		

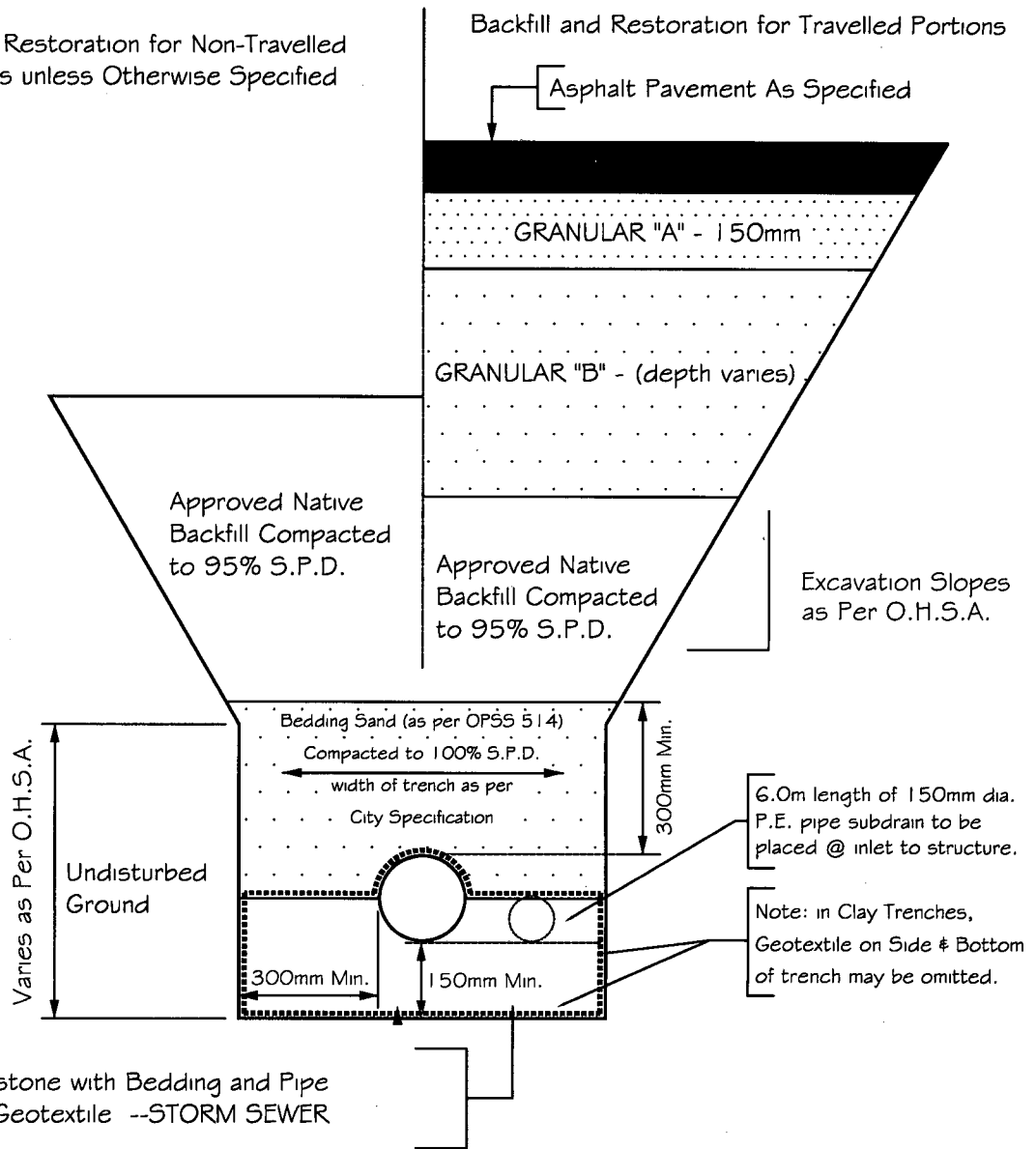
DATE: JULY 2013

DRAWING NO:

341

Backfill and Restoration for Non-Travelled Portions unless Otherwise Specified

Backfill and Restoration for Travelled Portions



Notes:

- 1) THIS DETAIL APPLIES TO : STORM LEADS < 1.2m COVER
MAIN LINES < 1.5m COVER
IF DISCREPANCY - THE MOST CONSERVATIVE SPECIFICATION SHALL GOVERN
- 2) THE LAYERS OF GRANULAR MATERIAL ARE TO BE COMPACTED TO 100% S.P.D.
- 3) ALL GRANULAR MATERIAL IS TO MEET CITY SPECIFICATIONS.
- 4) TRENCH EXCAVATION MUST CONFORM TO THE CONSTRUCTION SAFETY ACT (LATEST EDITION).



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

SEPARATE TRENCH DETAIL FOR SHALLOW STORM SEWERS < 1.5m COVER

REV: 4

SCALE: D.S.

DRAWN BY: D.S.

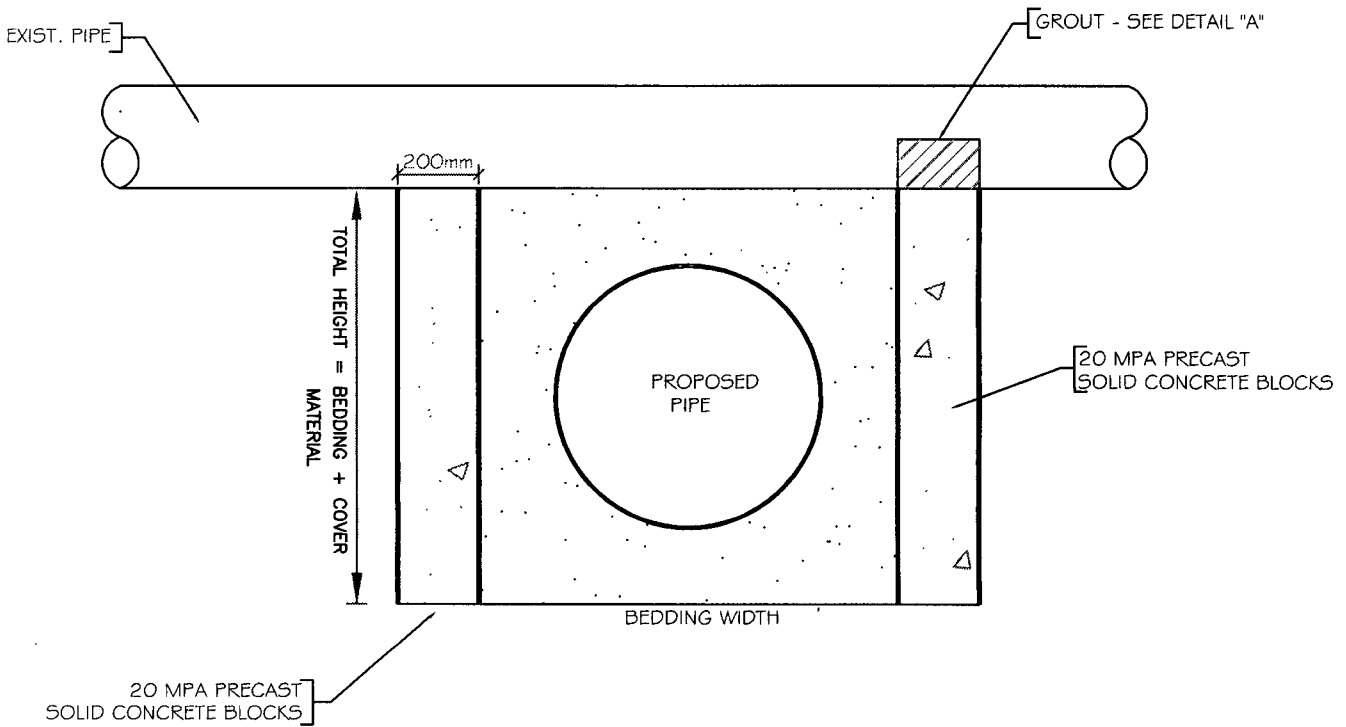
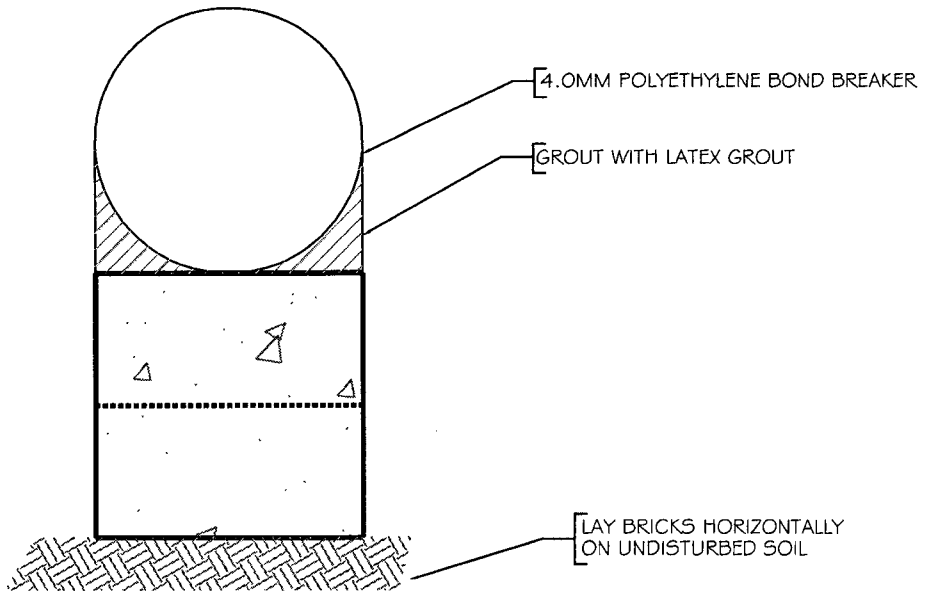
CHECK BY: C.M.

DATE: FEB 2015

DRAWING NO:

343

DETAIL "A"



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

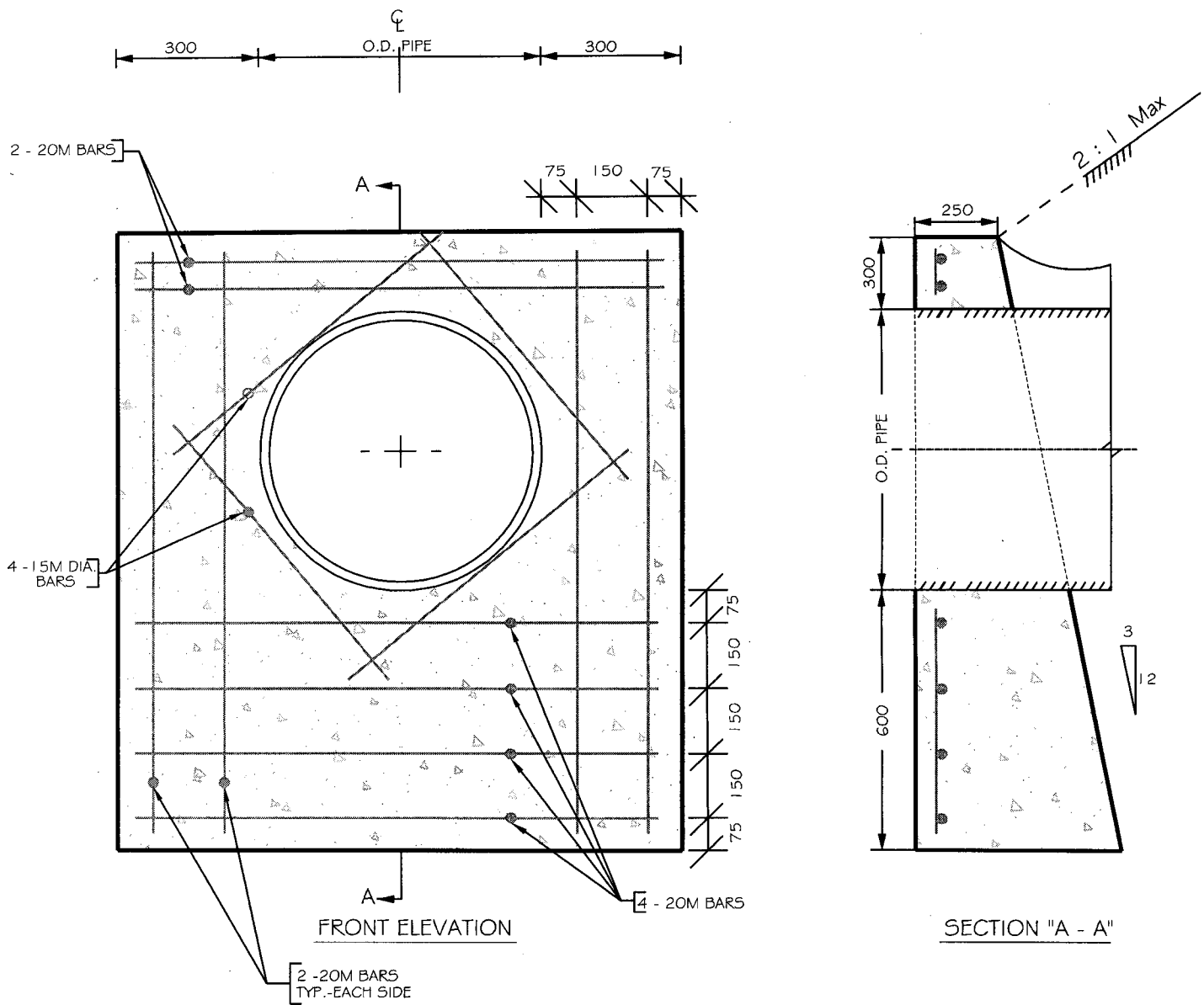
BRIDGING AND CRADLING DETAILS

NO.	DATE	DESCRIPTION
SCALE:		N.T.S.
DRAWN BY:		G.H.
CHECK BY:		C.M.

DATE: JULY 2013

DRAWING NO:

346



Notes:

- 1) IF STEEL GRATE IS REQUIRED, 4 - ANCHOR BOLTS TO BE SET AS PER OPSD #804.05A
 # INTO THE CONCRETE AS PER BOLT LAYOUT SHOWN ON FORM 373 AND 374.
- A) CLASS OF CONCRETE 30 MPA
- B) REINFORCING BARS TO HAVE 75mm MINIMUM COVER
- C) ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED
- D) AIR ENTRAINMENT 7% (+ 1.5% OR - 1.5%)



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

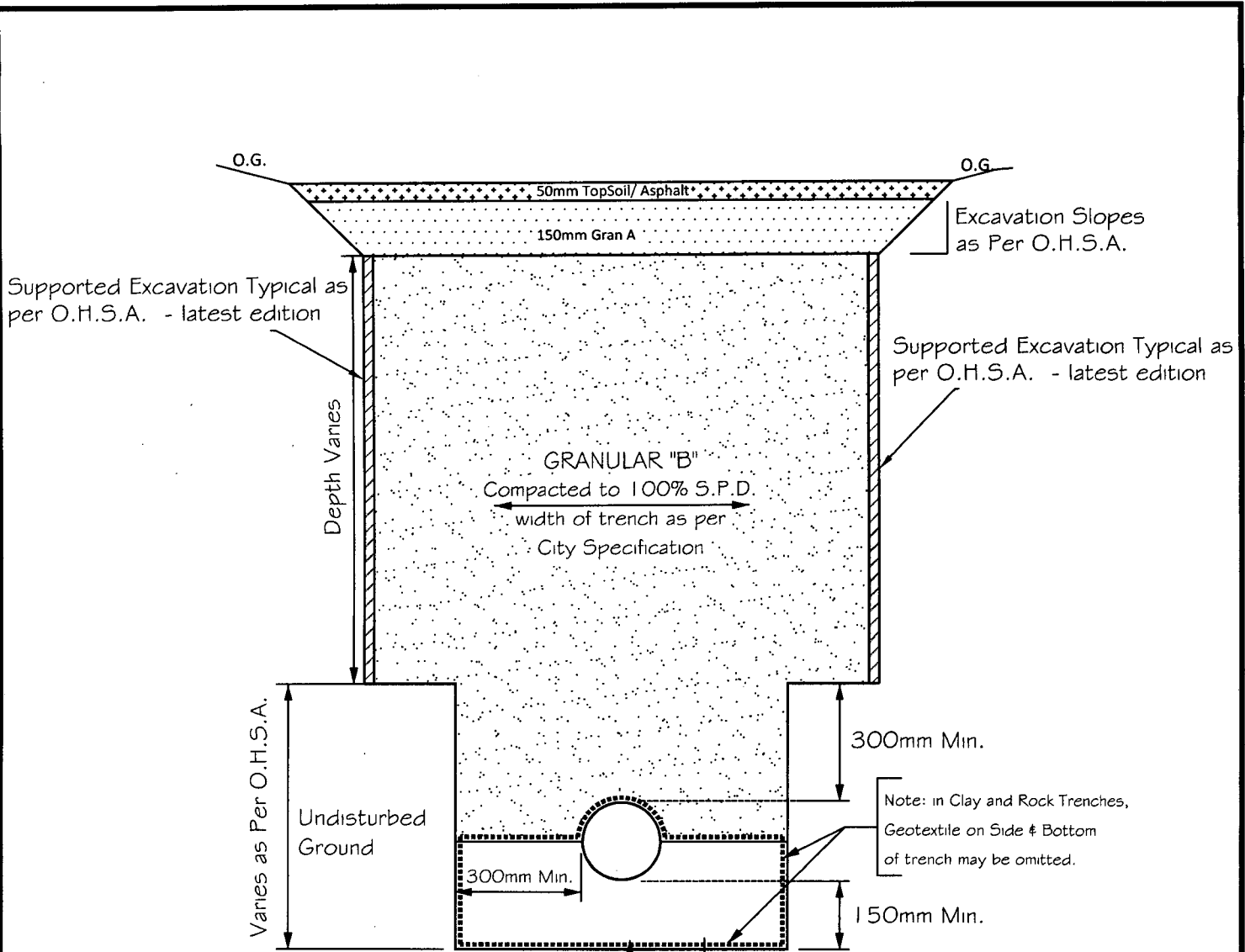
CONCRETE END PROTECTION DETAIL

NO.	DATE	DESCRIPTION
SCALE:		N.T.S.
DRAWN BY:		G.H.
CHECK BY:		C.M.

DATE: JULY 2013

DRAWING NO:

347



Supported Excavation Typical as per O.H.S.A. - latest edition

Excavation Slopes as Per O.H.S.A.

Supported Excavation Typical as per O.H.S.A. - latest edition

GRANULAR "B"
Compacted to 100% S.P.D.
width of trench as per
City Specification

Varies as Per O.H.S.A.

Undisturbed Ground

300mm Min.

Note: in Clay and Rock Trenches, Geotextile on Side & Bottom of trench may be omitted.

300mm Min.

150mm Min.

- A) Granular "A" --WATERMAIN & SANITARY SEWER
- B) Granular "B" --STORM SEWER - with > 1.5m cover (UN.O.)
- C) 19mm Clearstone with Bedding and Pipe wrapped in Geotextile --SANITARY SEWER (Wet Areas Only; Approved by the Engineer)

Notes:

- 1) THE LAYERS OF GRANULAR MATERIAL ARE TO BE COMPACTED TO 100% S.P.D.
- 2) ALL GRANULAR MATERIAL IS TO MEET CITY SPECIFICATIONS.
- 3) TRENCH EXCAVATION MUST CONFORM TO THE CONSTRUCTION SAFETY ACT (LATEST EDITION).



ENGINEERING DEPARTMENT

APPROVED BY:

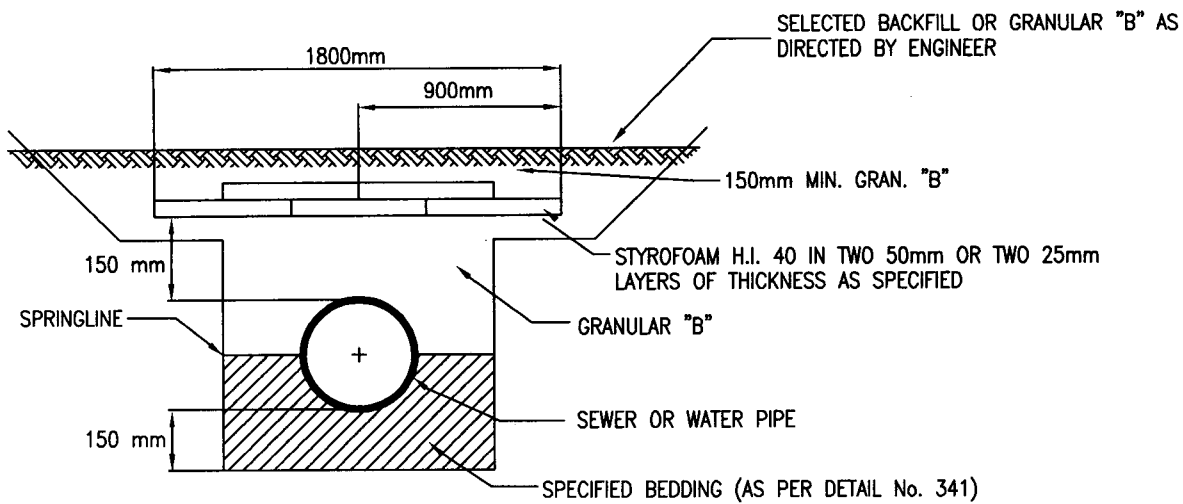
P. SEGUIN, P. Eng

SEPARATE TRENCH SEWERS & WATERMAIN WITH SUPPORTED EXCAVATION

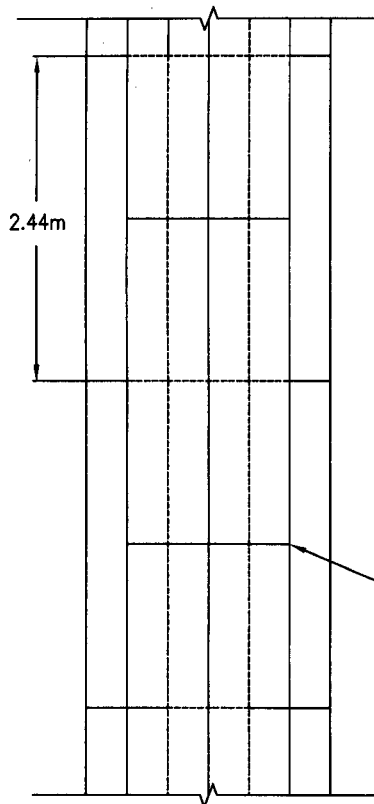
NO.	DATE	DESCRIPTION
SCALE:		N.T.S.
DRAWN BY:		S.C.
CHECK BY:		C.M.

DATE: May-2012

DRAWING NO: **348**



STYROFOAM H.I. 40 - DOW CHEMICAL INDIVIDUAL STYROFOAM SIZES ARE 600mm X 2440mm



ALL JOINTS OVERLAPPED

NOTES:

- 1) 100mm STYROFOAM INSULATION TWO 50mm LAYERS.
- 2) 50mm STYROFOAM INSULATION TWO 25mm LAYERS.



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

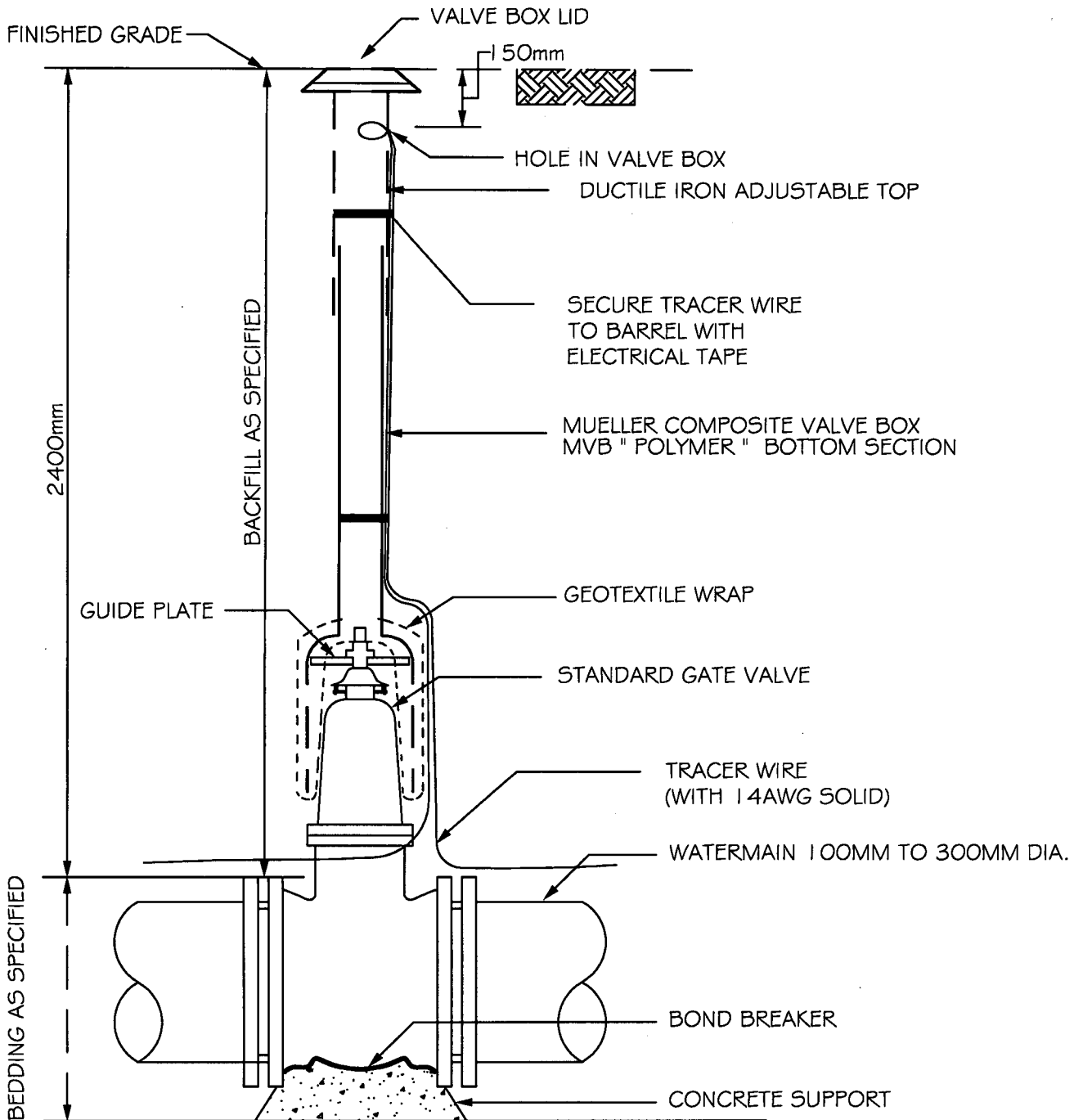
STYROFOAM INSULATION

NO.	DATE	DESCRIPTION
SCALE:		N.T.S.
DRAWN BY:		S.G.
CHECK BY:		C.M.

DATE: JULY 2013

DRAWING NO:

380



Notes:

- 1) VALVE BOX TO BE ADEQUATELY BRACED WHILE BACKFILLING AND MUST REMAIN PLUMB.
- 2) VALVE BOX EXTENSION TO BE USED ONLY IF REQUIRED.
- 3) BOND BREAKER TO BE USED BETWEEN CONCRETE AND VALVE.
- 4) ALL CONCRETE TO BE 20 Mpa AT 28 DAYS.
- 5) VALVE BOX TO BE EITHER #1322 SIZE "F" CANADA VALVE OR MUELLER A-759.
- 6) VALVES SHALL TURN COUNTER CLOCKWISE TO OPEN.
- 7) VALVE BOX TO BE WRAPPED IN GEOTEXTILE AS PER S.P. WAT-08
- 8) DENSO WRAP VALVE AND VALVE ASSEMBLY



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

GATE VALVE & BOX

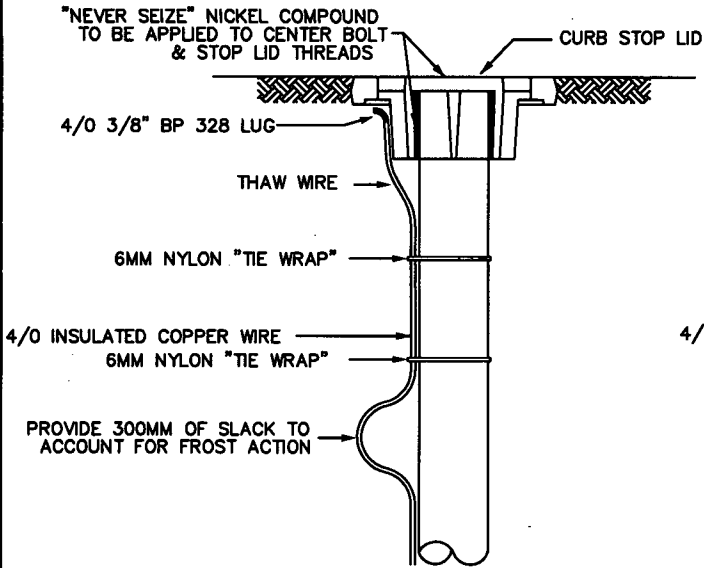
REV:	6
SCALE:	N.T.S.
DRAWN BY:	D.S./S.CHIN
CHECK BY:	C.M.

DATE: FEB. 2015

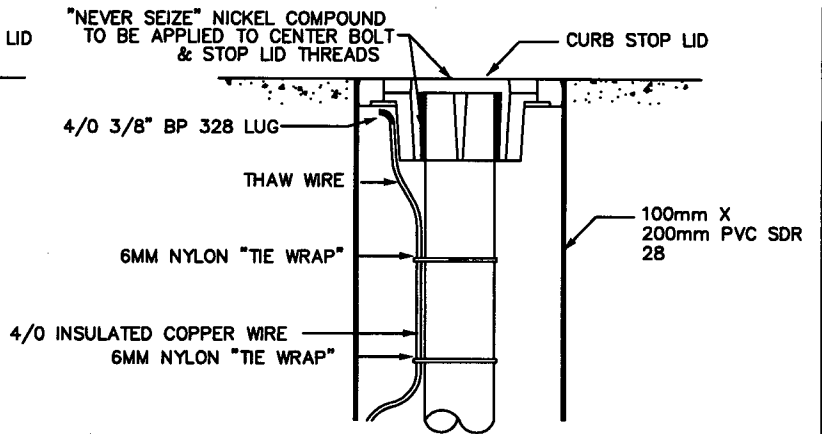
DRAWING NO:

401

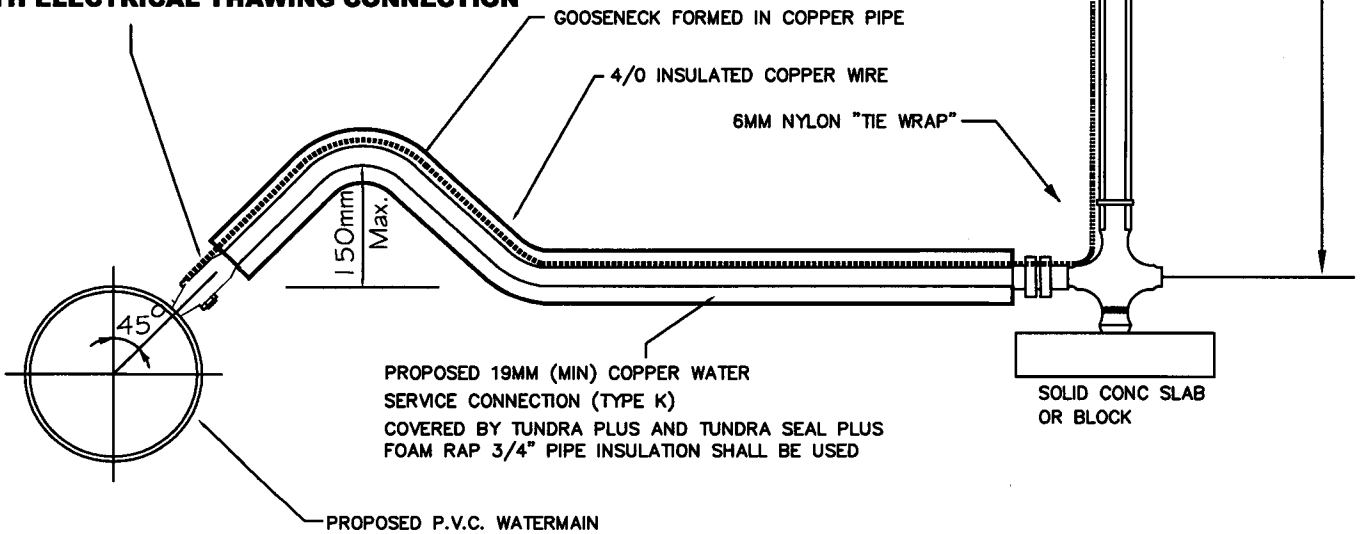
DETAIL "A"



DETAIL "B"
ASPHALT AND CONCRETE



**MUELLER SERVICE FITTING #H-12924
WITH ELECTRICAL THAWING CONNECTION**



- 1) ALL WATER SERVICES TO BE INSTALLED AT RIGHT ANGLES TO THE WATERMAIN UNLESS OTHERWISE INDICATED.
- 2) SERVICE BOX TO BE INSTALLED IN VERTICAL POSITION WITH TOP AT FINISHED GRADE



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

**WATER SERVICE "MAIN STOP"
WITH ELECTRICAL THAW CONNECTION**

REV: 3

SCALE: N.T.S.

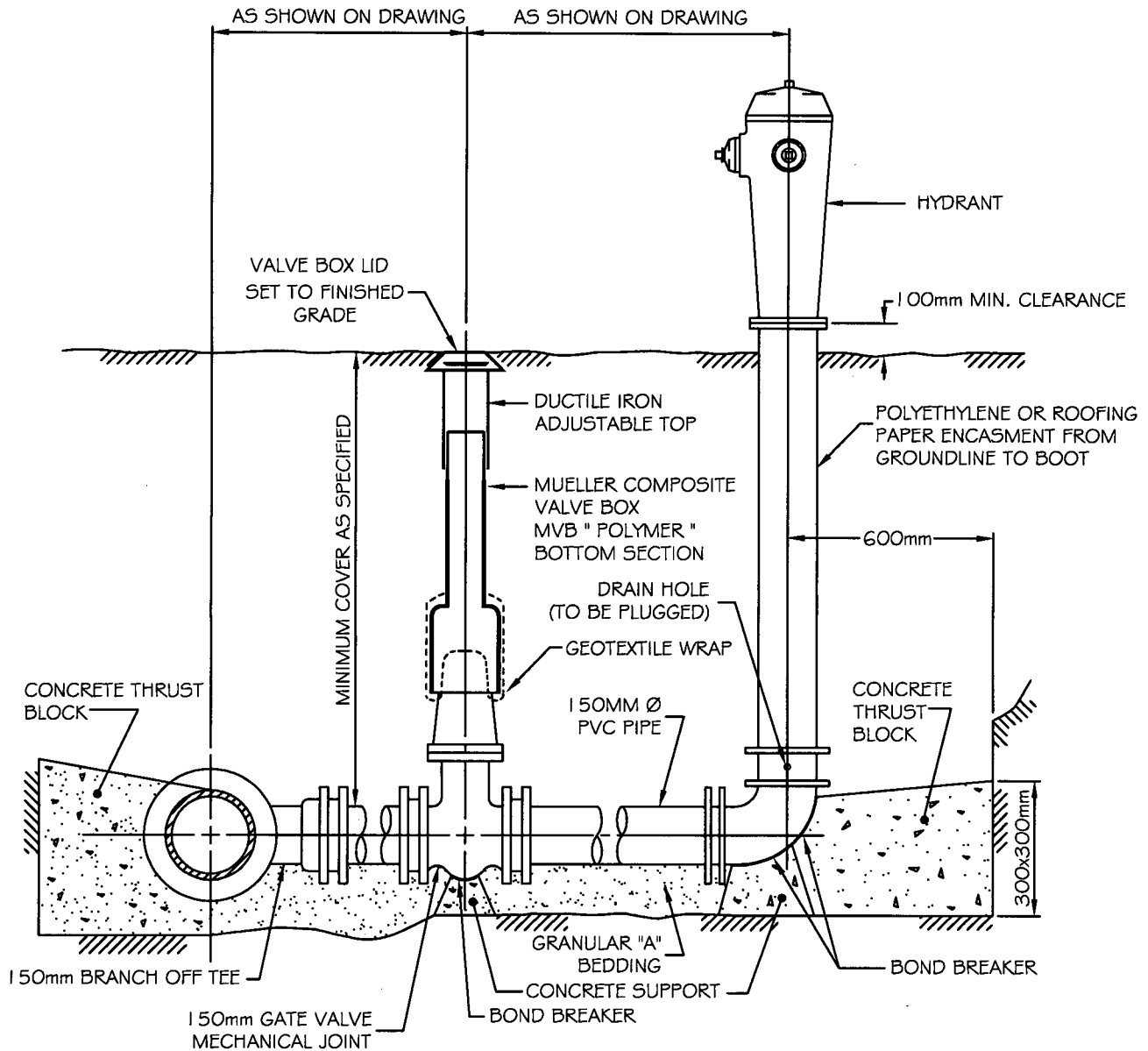
DRAWN BY: D.S.

CHECK BY: G.V.

DATE: FEB 2015

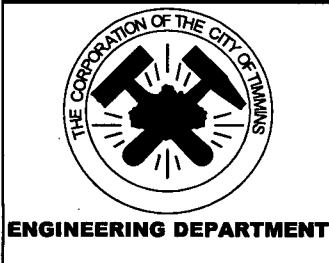
DRAWING NO:

411



NOTES:

- 1) ALL CONCRETE TO BE 20Mpa AT 28 DAYS.
- 2) ALL CONCRETE TO BE AGAINST UNDISTURBED TRENCH WALL.
- 3) COLOUR AND PAINTING OF HYDRANT MUST CONFORM TO CITY STANDARD SPECIFICATIONS.
- 4) ALL APPROVED BOND BREAKER IS TO BE USED AT ALL THRUST BLOCK LOCATIONS.
- 5) HYDRANT EXTENSIONS, IF REQUIRED, MUST BE PLACED AT THE BOOT OF THE HYDRANT.
- 6) INSTALL GEOTEXTILE COLLAR AS PER S.P. WAT-02
- 7) DENSO WRAP VALVE AND VALVE ASSEMBLY



APPROVED BY:

P. SEGUIN, P. Eng

HYDRANT INSTALLATION

REV: 4

SCALE: N.T.S.

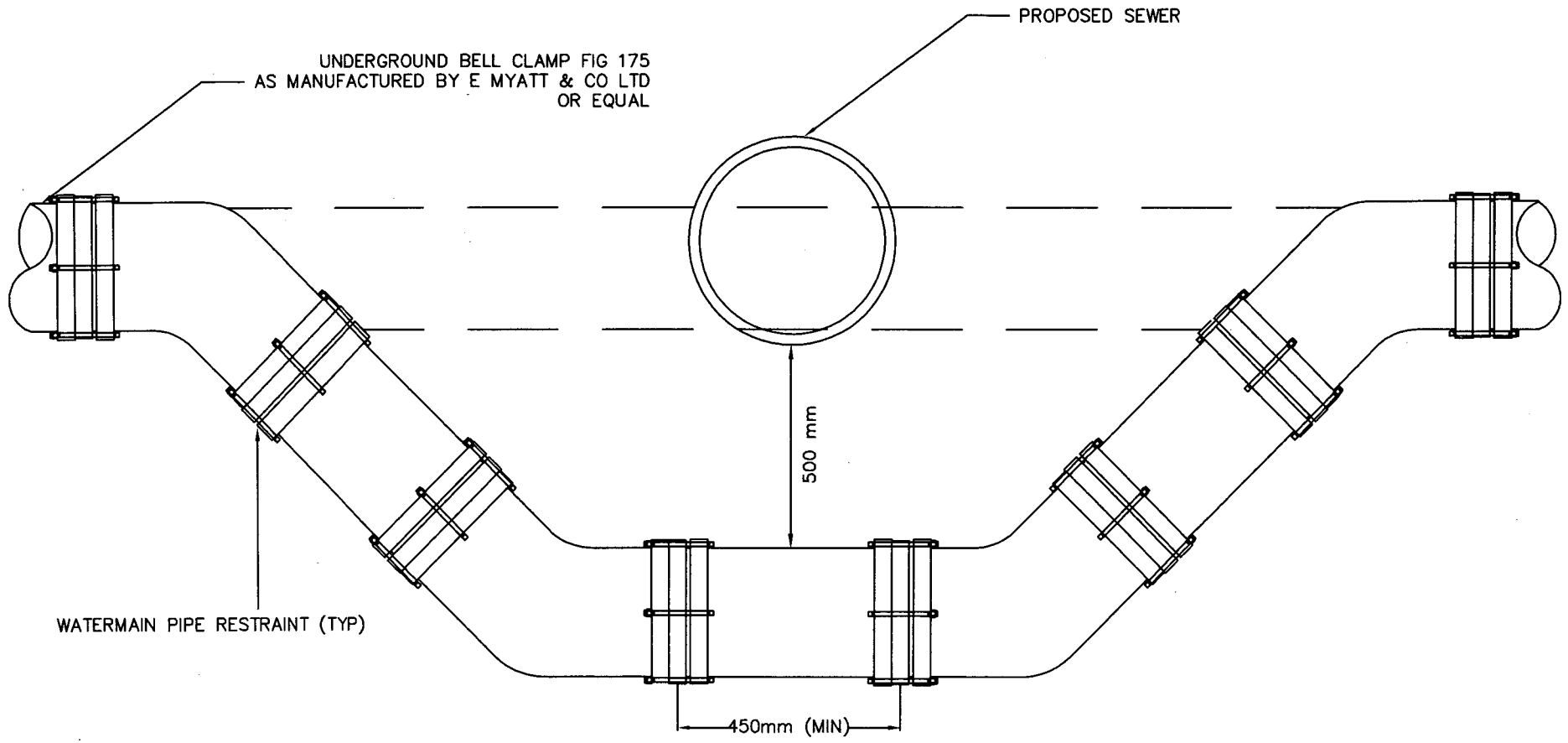
DRAWN BY: D.S.

CHECK BY: G.V.

DATE: FEB 2015

DRAWING NO:

420



UNDERGROUND BELL CLAMP FIG 175
AS MANUFACTURED BY E MYATT & CO LTD
OR EQUAL

PROPOSED SEWER

WATERMAIN PIPE RESTRAINT (TYP)

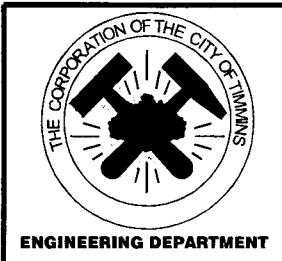
500 mm

450mm (MIN)

LENGTHS OF WATERMAIN
DIVERSION PIPES ARE VARIABLE

TIE ROD DIAMETER

100mm WATERMAIN - 16mm
150mm WATERMAIN AND OVER - 19mm



APPROVED BY:

P. SEGUIN, P. Eng

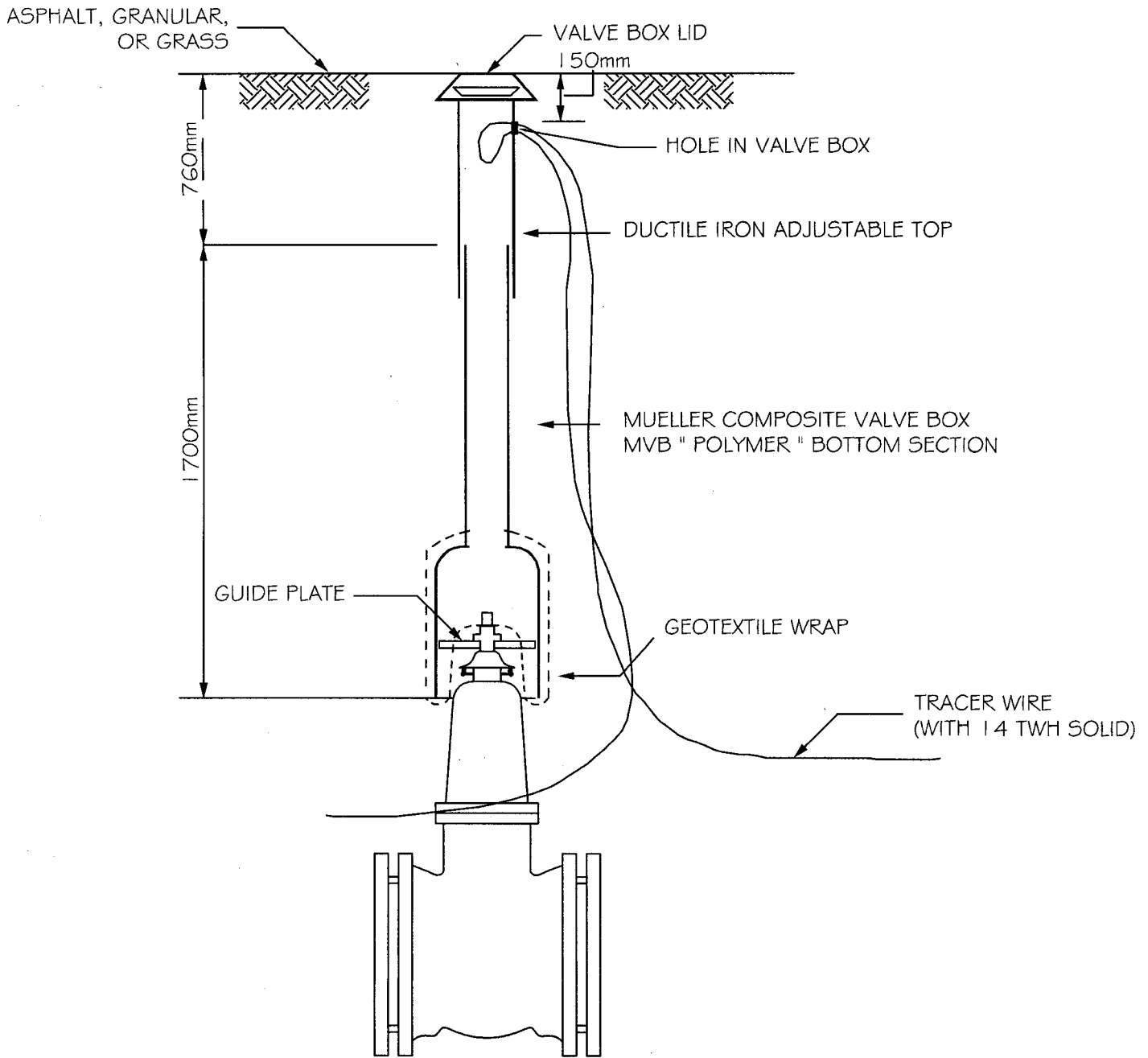
Water Main Diversion

NO.	DATE	DESCRIPTION
SCALE: N.T.S		
DRAWN BY: AMY		
CHECK BY:		

DATE: Dec 2013

DRAWING NO:

440



ALL DIMENSIONS ARE IN MILLIMETERS



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

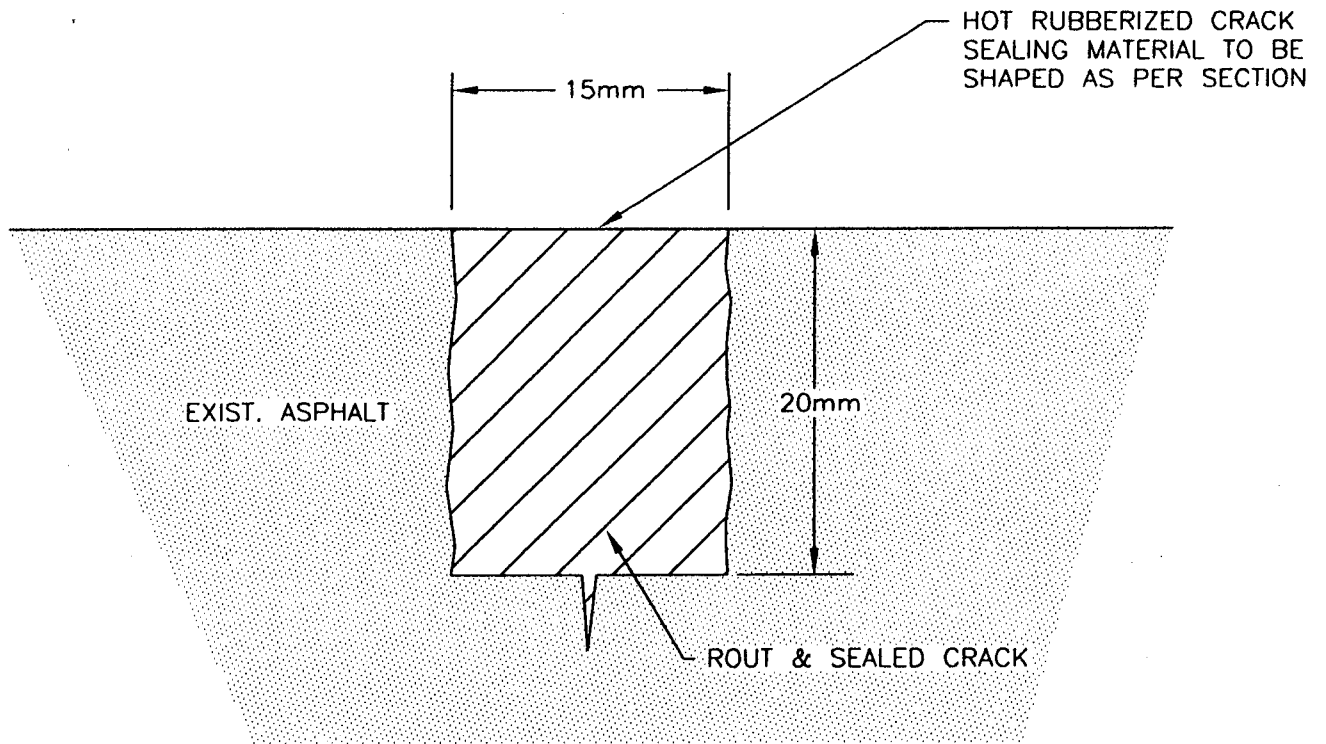
TRACER WIRE DETAIL

NO.	DATE	DESCRIPTION
2	Apr 2007	GEOTEXTILE WRAP MUELLER VALVE BOX DUCTILE IRON ADJ. TOP
SCALE: N.T.S.		
DRAWN BY: D.S.		
CHECK BY: G.V.		

DATE: APRIL 2007

DRAWING NO:

443



TYPICAL CRACK SEALING SECTION (WITHOUT OVERLAY)
 (ROUTED, CLEANED AND SEALED)



ENGINEERING DEPARTMENT

APPROVED BY:

P. SEGUIN, P. Eng

ROUTING AND SEALING CRACKS WITH NO OVERBAND
 (ROUT - 15mm x 20mm)

REV:

SCALE: N.T.S.

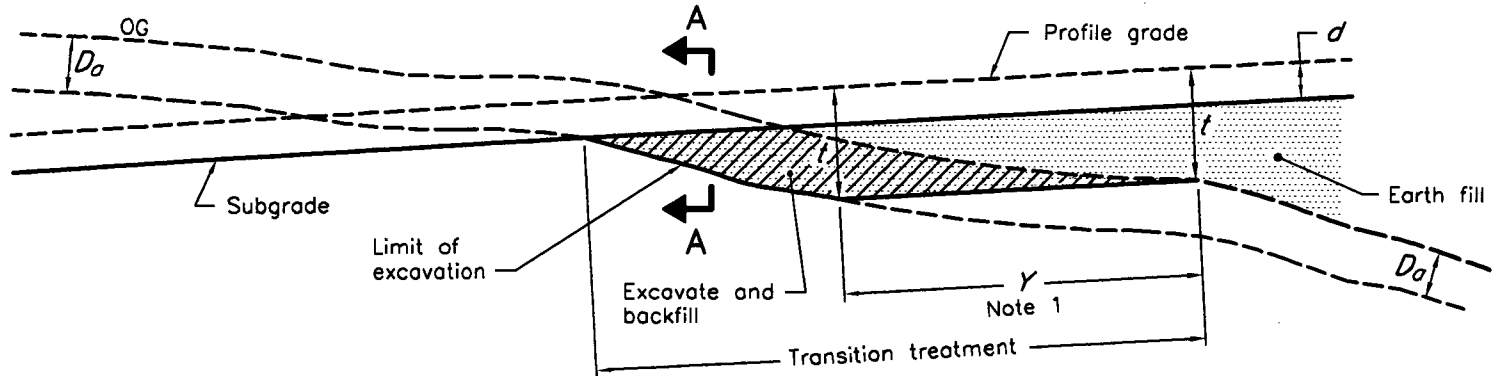
DRAWN BY: S.C.

CHECK BY: B.K.

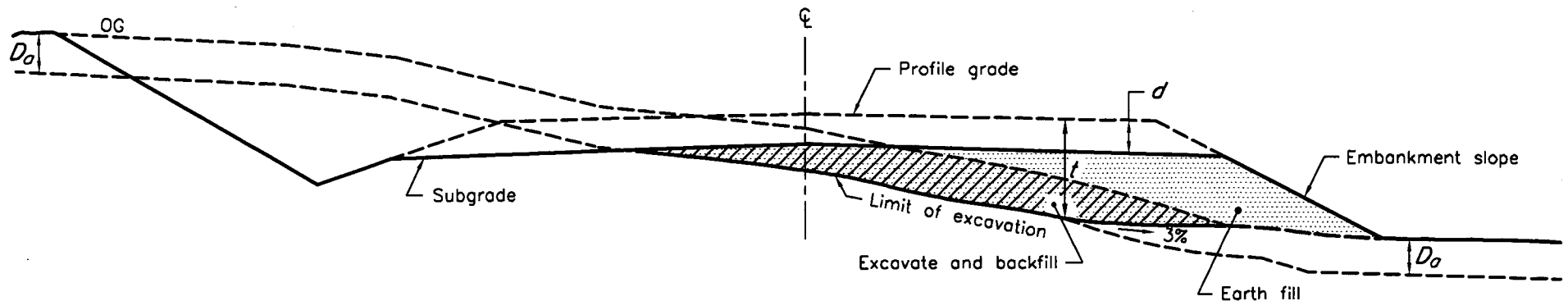
DATE: APRIL 2015

DRAWING NO:

500



LONGITUDINAL SECTION




TRANSVERSE SECTION A-A

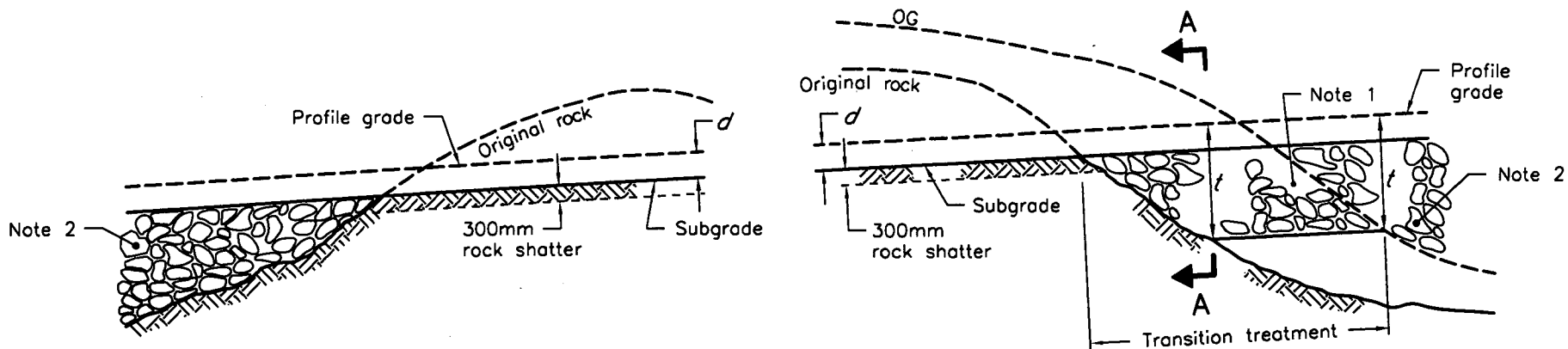
NOTES:

1 Longitudinal runout Y start and finish points vary across the transverse section, due to original overburden thickness. Profile grade and subgrade lines apply across the transverse section.

LEGEND:

- d - Depth of granular base and subbase
- t - Transition treatment depth, as specified
- D_o - Depth of organic, leached, and accumulated layers, as specified
- Y - Transition length through D_o

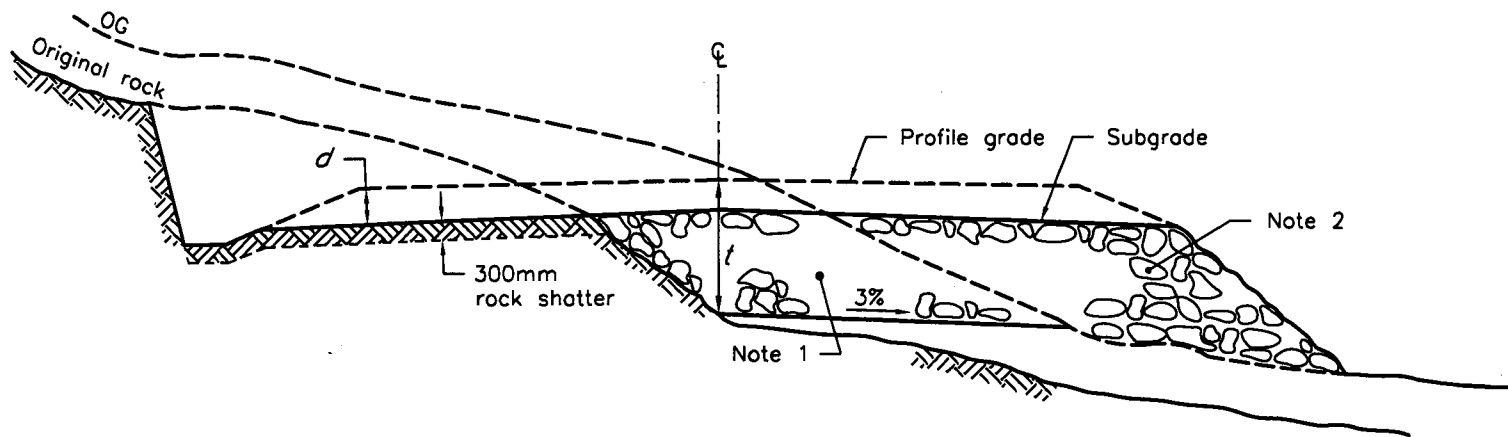
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev 2
TRANSITION TREATMENT	EARTH CUT TO EARTH FILL	
OPSD 205.010		



WITHOUT OVERBURDEN

LONGITUDINAL SECTIONS

WITH OVERBURDEN



TRANSVERSE SECTION A-A

NOTES:

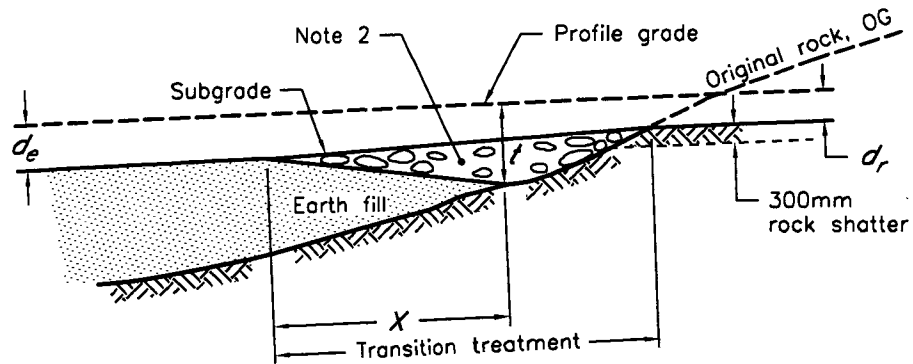
- 1 Excavate overburden for transition where applicable.
- 2 Rock or granular fill.
- A All dimensions are in millimetres unless otherwise shown.

LEGEND:

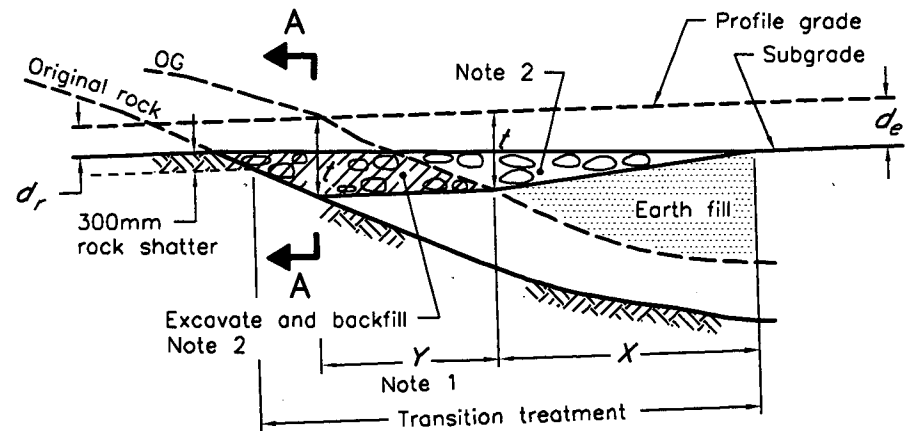
- t - Transition treatment depth, as specified
- d - Depth of granular base and subbase, as specified

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2009	Rev	2
TRANSITION TREATMENT ROCK CUT TO ROCK FILL		-----		

OPSD 205.020				

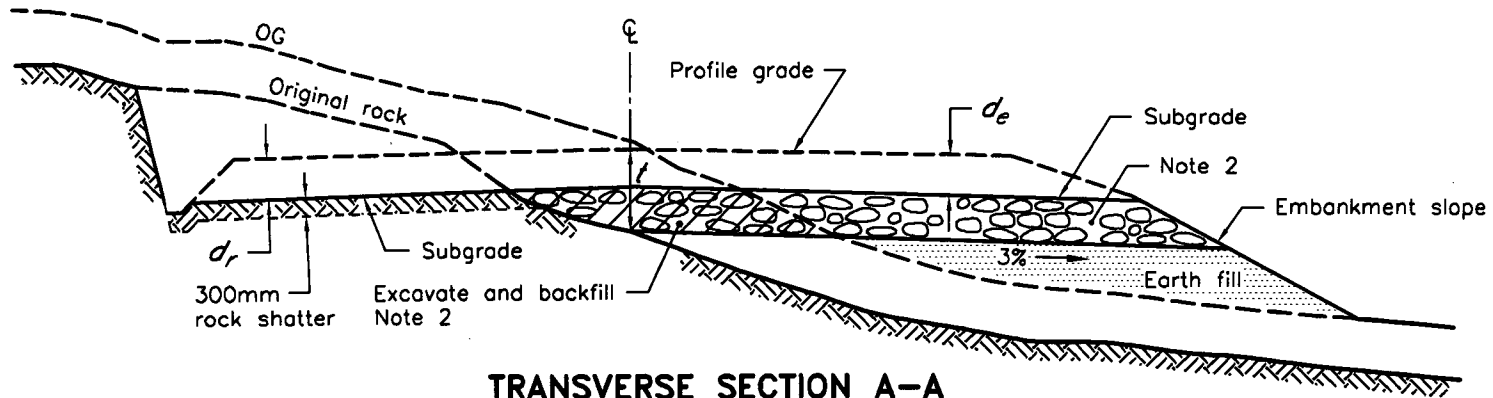


WITHOUT OVERBURDEN



WITH OVERBURDEN

LONGITUDINAL SECTIONS




TRANSVERSE SECTION A-A

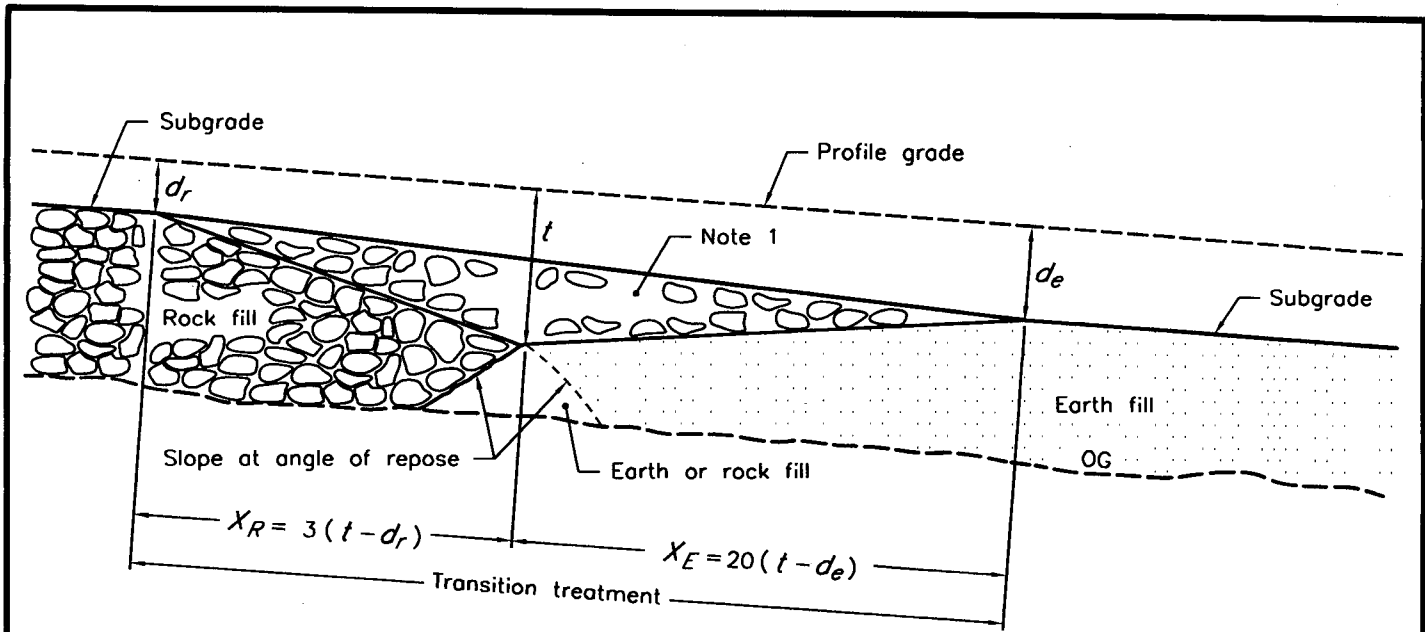
NOTES:

- 1 Longitudinal runout Y start and finish points vary across the transverse section due to differences in original overburden thickness. Profile grade and subgrade lines apply across the transverse section.
- 2 Rock or granular fill.
- A Carry out sufficient shatter at transition to obtain drainage.
- B All dimensions are in millimetres unless otherwise shown.

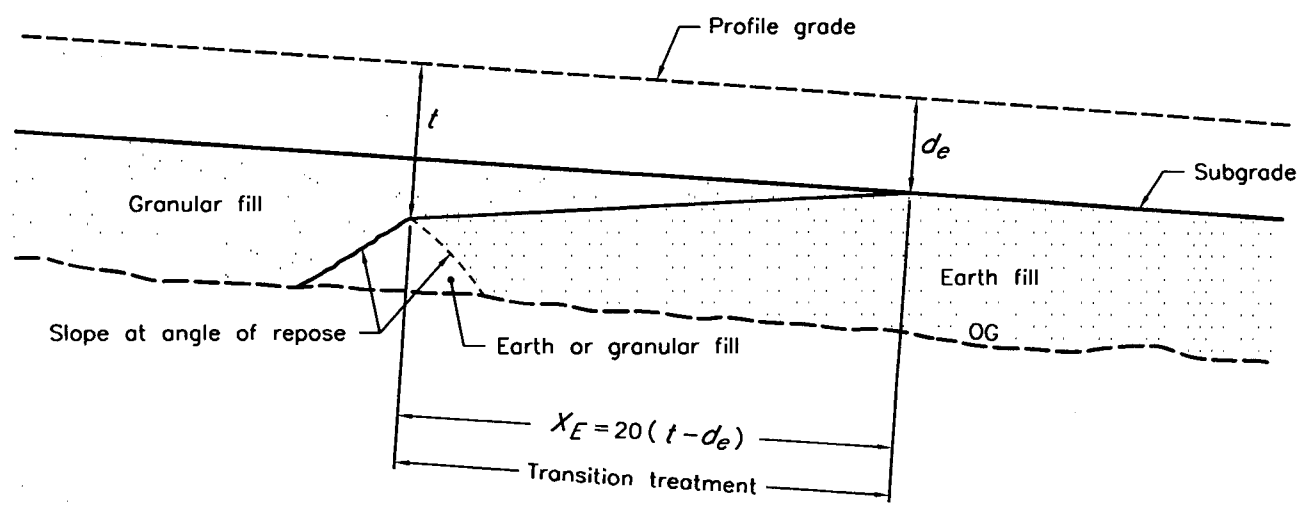
LEGEND:

- t - Transition treatment depth, as specified
- d_e - Depth of granular base and subbase over earth
- d_r - Depth of granular base and subbase over rock
- X - Taper to subgrade over $20(t - d_e)$
- Y - Transition length, 15m maximum

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2009	Rev 2
TRANSITION TREATMENT	-----	
ROCK CUT TO EARTH FILL	-----	
OPSD 205.030		



EARTH FILL TO ROCK FILL



EARTH FILL TO GRANULAR FILL

NOTES:

- 1 Rock or granular fill.
- A Embankment slopes to transition uniformly over distance X_R and X_E .
- B Profile grade and subgrade lines apply across the transverse section.

LEGEND:

- d_e - Depth of granular base and subbase over earth
- d_r - Depth of granular base and subbase over rock fill
- t - Transition treatment depth, as specified
- X_E - Length of transition for earth fill, 15m maximum
- X_R - Length of transition in rock fill

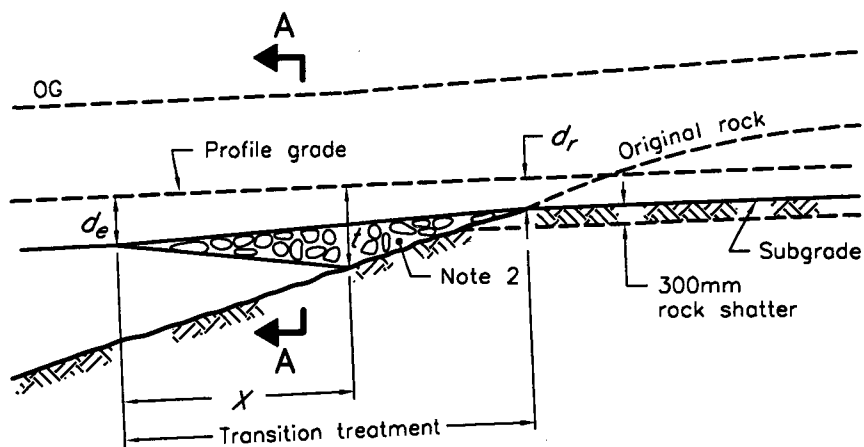
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2009 Rev 2

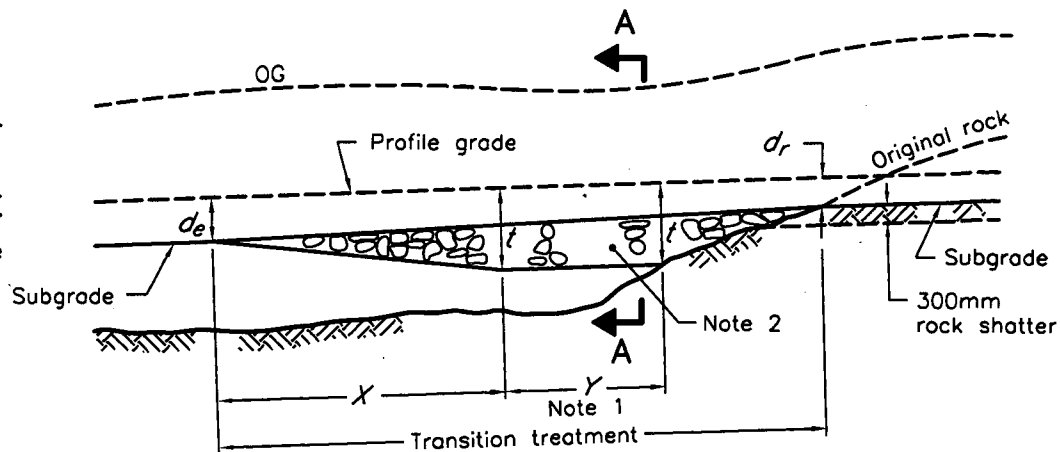


**TRANSITION TREATMENT
EARTH FILL TO ROCK FILL AND
EARTH FILL TO GRANULAR FILL**

OPSD 205.040

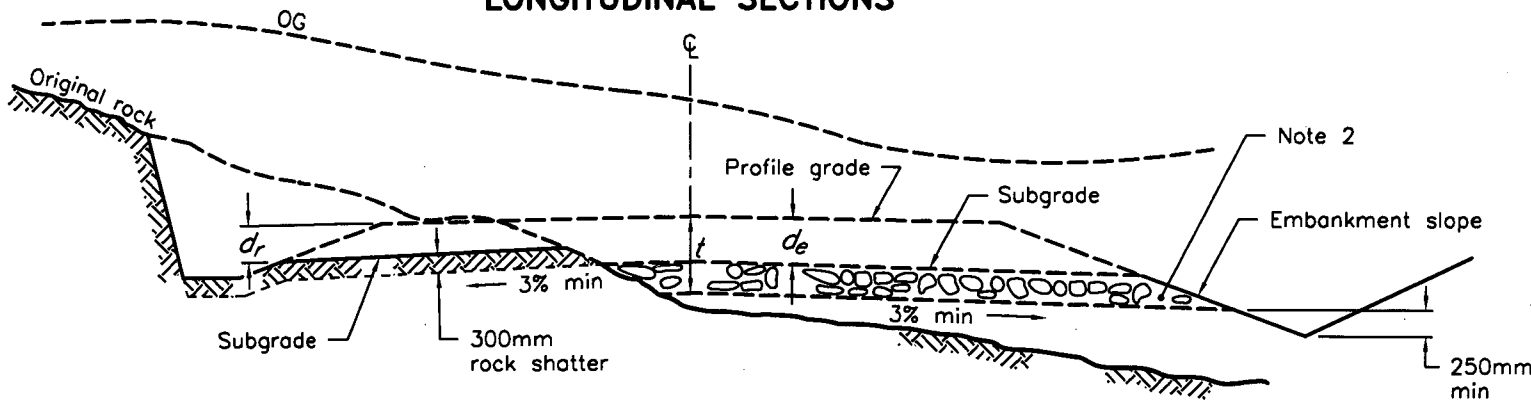


NON-FROST SUSCEPTIBLE SOILS



FROST SUSCEPTIBLE SOILS

LONGITUDINAL SECTIONS



TRANSVERSE SECTION A-A

NOTES:

- 1 Longitudinal runout Y start and finish points vary across the transverse section due to differences in original overburden thickness. Profile grade and subgrade line apply across the transverse section.
- 2 Rock or granular fill.
- A Carry out sufficient shatter at transitions to obtain drainage.
- B All dimensions are in millimetres unless otherwise shown.

LEGEND:

- t - Transition treatment depth, as specified
- d_e - Depth of granular base and subbase over earth
- d_r - Depth of granular base and subbase over rock
- X - Taper to subgrade over $20(t - d_e)$
- Y - Transition length, 15.0m maximum

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2009

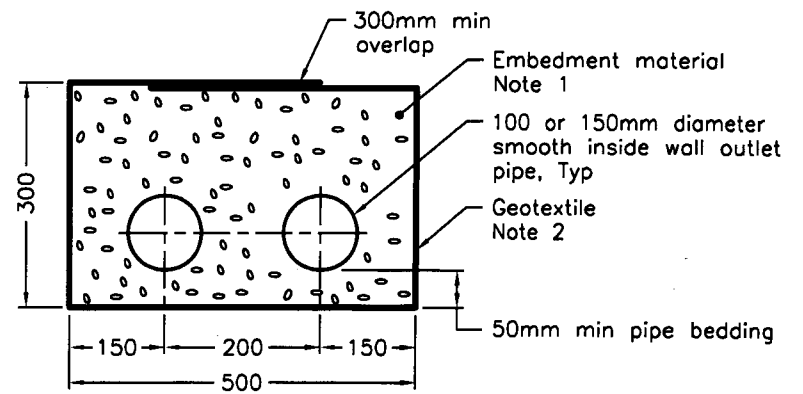
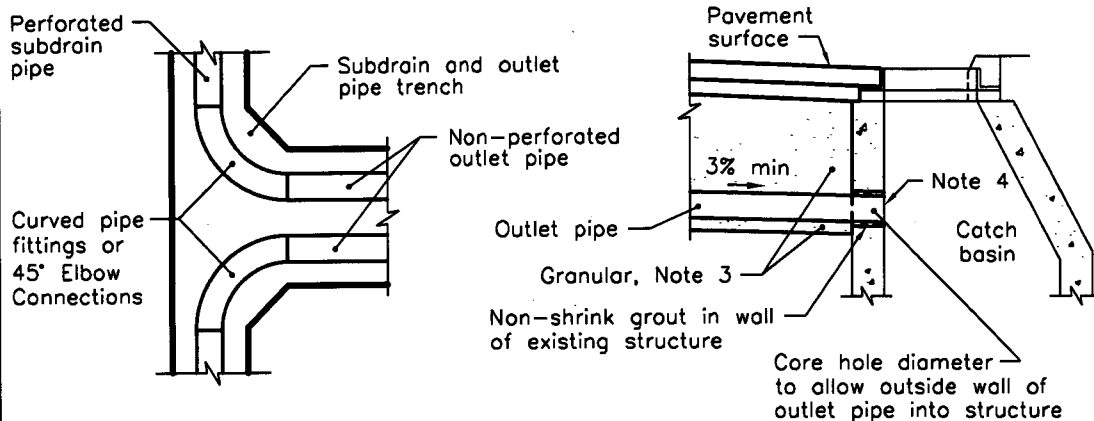
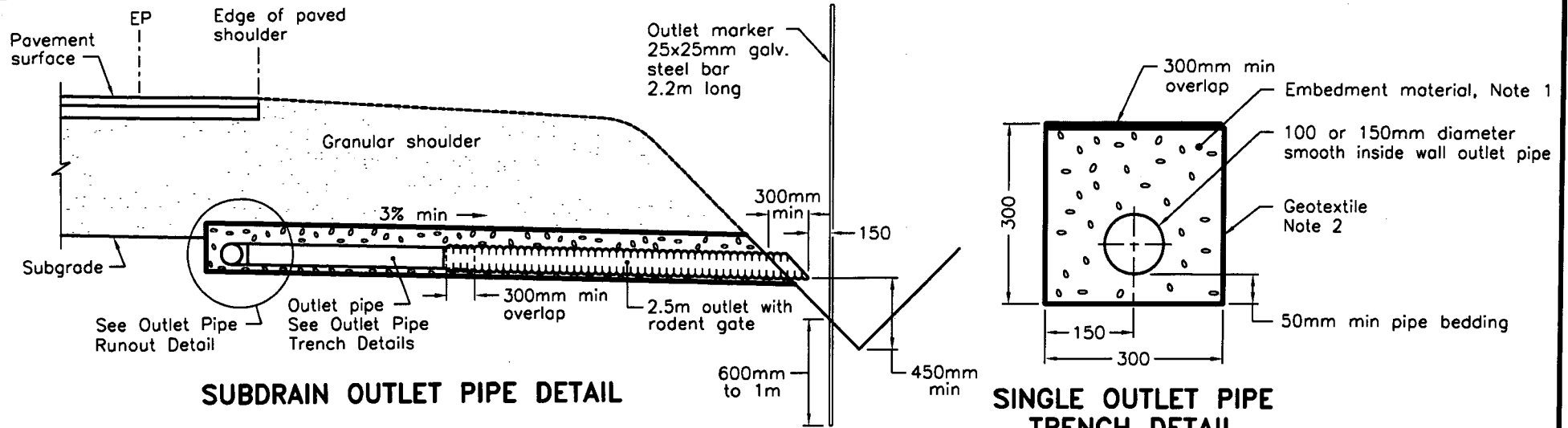
Rev 2

TRANSITION TREATMENT

ROCK CUT TO EARTH CUT



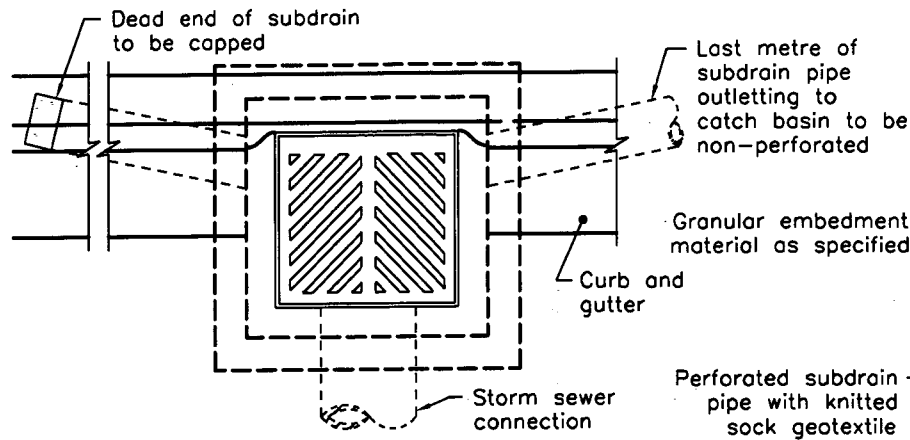
OPSD 205.050



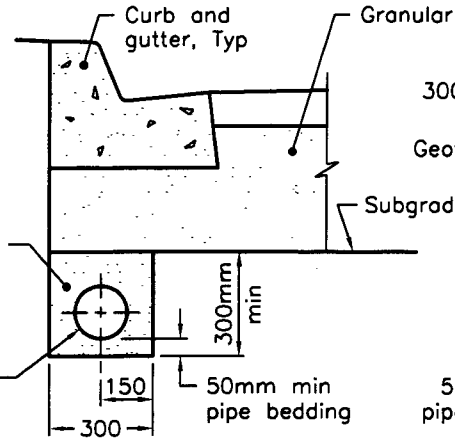
NOTES:

- 1 Embedment material shall be 19mm clear stone or granular as specified.
- 2 Outlet pipe and subdrain trench embedment material shall be wrapped with geotextile.
- 3 For catch basin connections, outlet pipe trenches backfilled with granular do not require geotextile wrap.
- 4 Install outlet pipe flush with inside face of catch basin.
- A Use compatible manufactured fittings for all connectors and couplings.
- B All dimensions are in millimetres unless otherwise shown

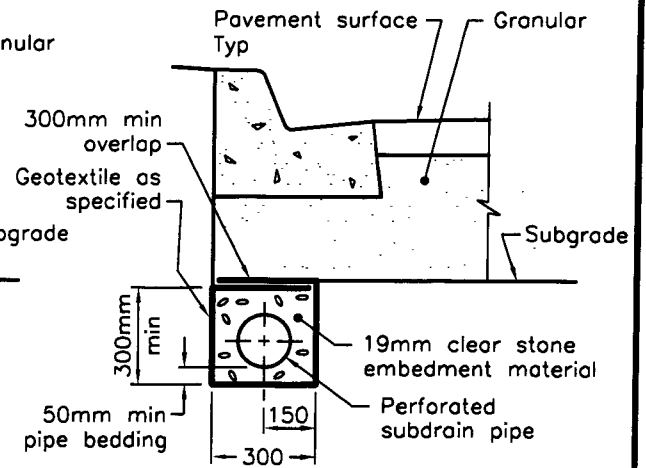
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2008	Rev 1	
SUBDRAIN PIPE CONNECTION AND OUTLET				
RURAL				
OPSD 206.050				



LONGITUDINAL SUBDRAIN CONNECTION TO CATCH BASIN



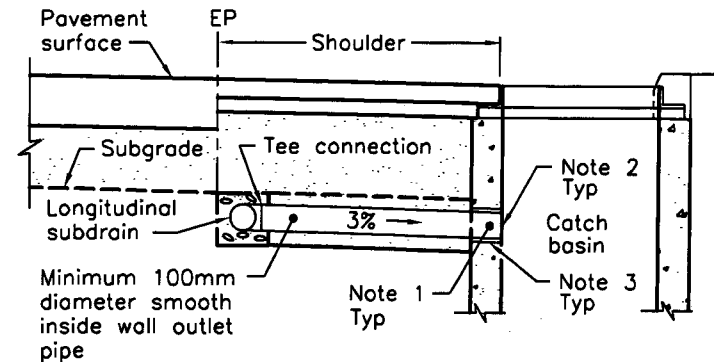
UNWRAPPED TRENCH



WRAPPED TRENCH

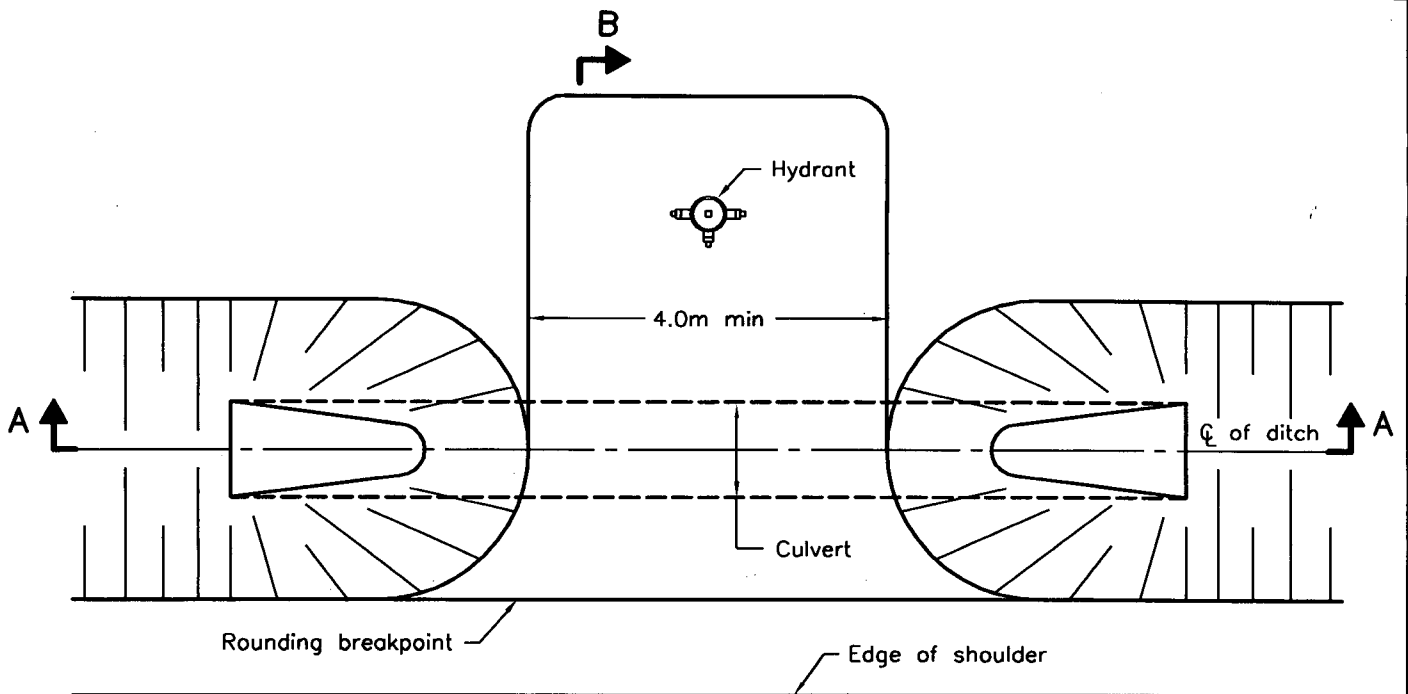
NOTES:

- 1 Core hole diameter to allow outlet pipe into structure.
 - 2 Install outlet pipe flush with inside face of catch basin.
 - 3 Annular space around pipe to be filled with non-shrink grout.
- A Use compatible manufactured fittings for all connectors, couplings, and caps.
- B Trench dimensions shown to accommodate 100 or 150mm diameter subdrain pipe.
- C Longitudinal subdrain pipe shall be installed parallel to the grade of the gutter.
- D All dimensions are in millimetres unless otherwise shown.

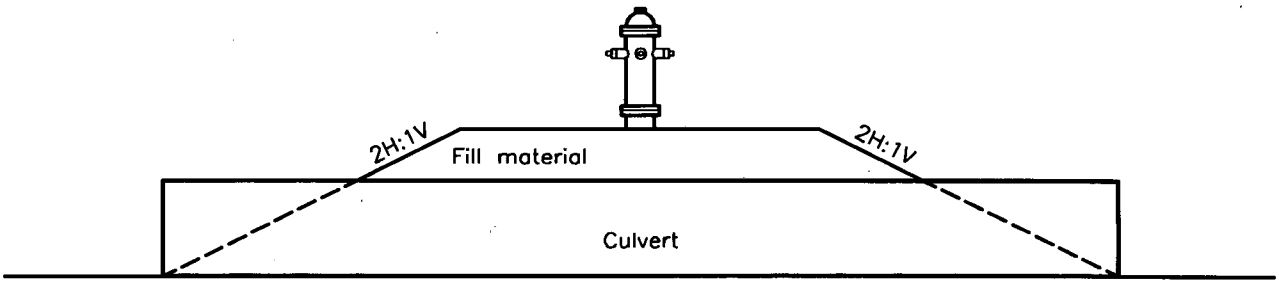


LATERAL SUBDRAIN OUTLET PIPE CONNECTION TO CATCH BASIN

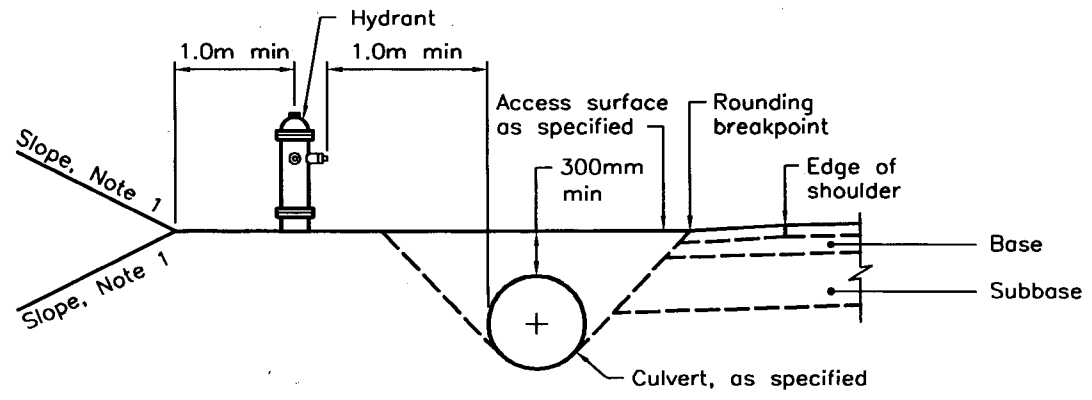
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev	2	
SUBDRAIN PIPE CONNECTION AND OUTLET URBAN				
			OPSD 216.021	



PLAN



SECTION A-A



SECTION B-B

NOTE:

- 1 Slope shall be 2H:1V or flatter.
- A All dimensions are in millimetres unless otherwise shown.

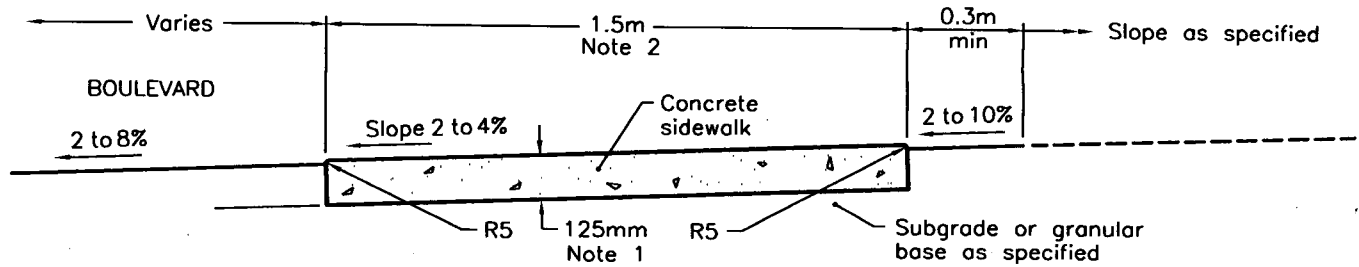
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2011 Rev 2

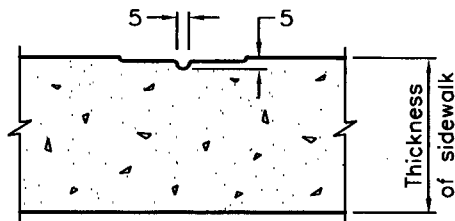
**ACCESS TO HYDRANT
ACROSS DITCH**



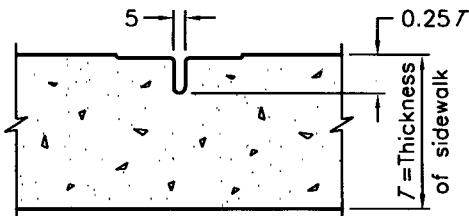
OPSD 217.050



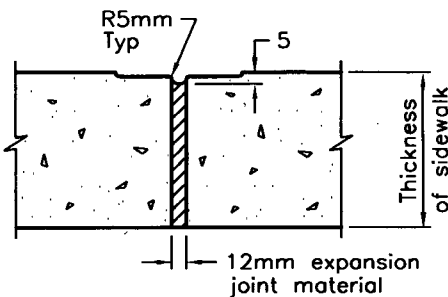
TYPICAL SECTION



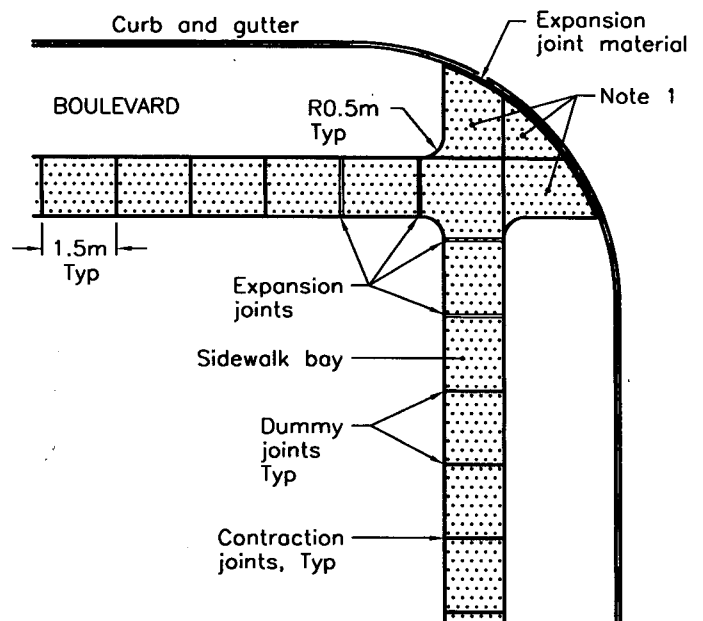
DUMMY JOINT



CONTRACTION JOINT



EXPANSION JOINT



JOINT LAYOUT

NOTES:

- 1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
- 2 Sidewalk width shall be increased to 2.4m at schools, bus stops, and other high pedestrian areas.

- A This OPSD to be read in conjunction with OPSD-310.030.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

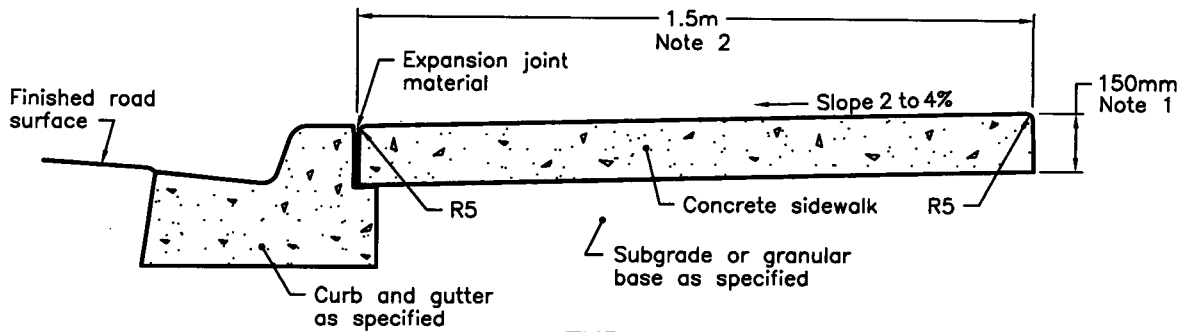
Nov 2005

Rev 1

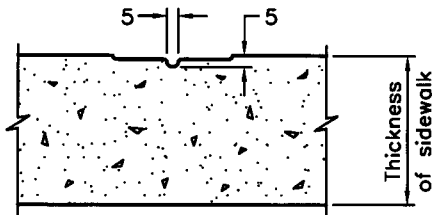
CONCRETE SIDEWALK



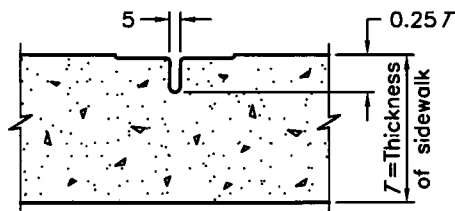
OPSD - 310.010



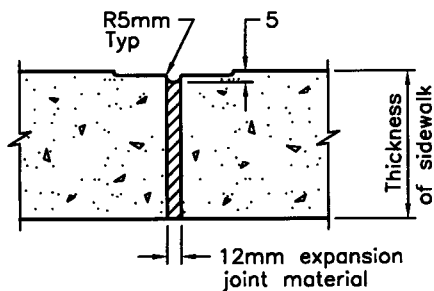
TYPICAL SECTION



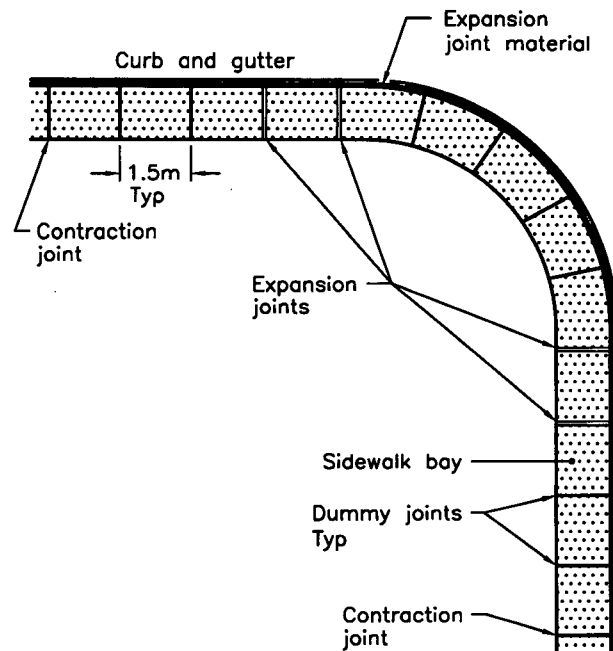
DUMMY JOINT



CONTRACTION JOINT



EXPANSION JOINT



JOINT LAYOUT

NOTES:

- 1 At commercial and industrial driveways, the thickness shall be 200mm.
- 2 Sidewalk width shall be increased to:
 - 1.8m on major roadways
 - 2.4m at schools, bus stops, and other high pedestrian areas.

A This OPSD to be read in conjunction with OPSD-310.030.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

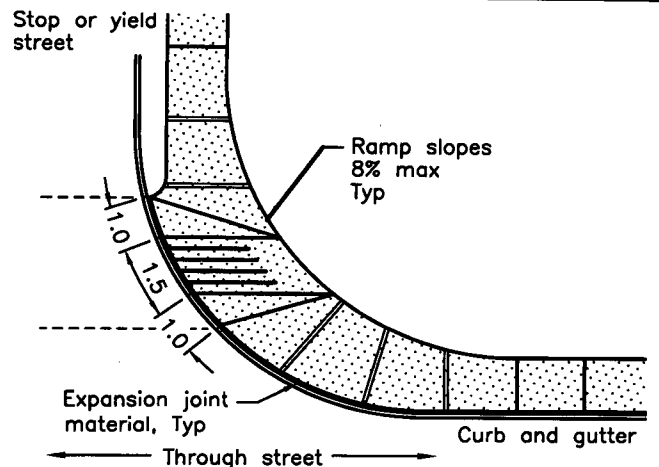
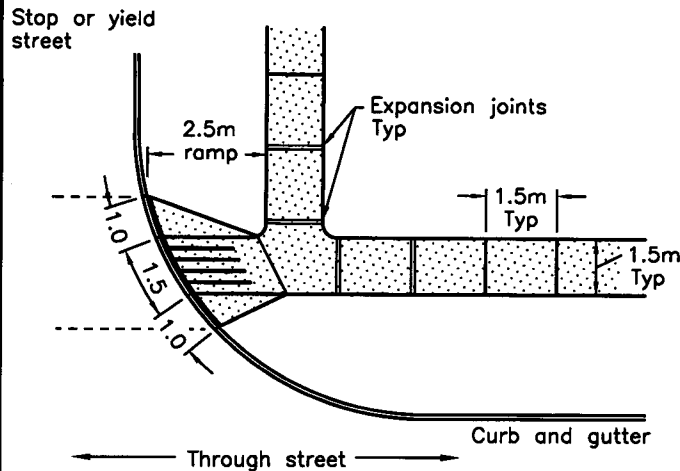
Nov 2005

Rev 1

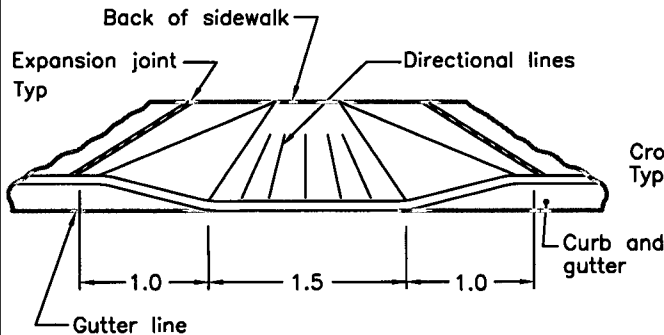
**CONCRETE SIDEWALK
ADJACENT TO CURB AND GUTTER**



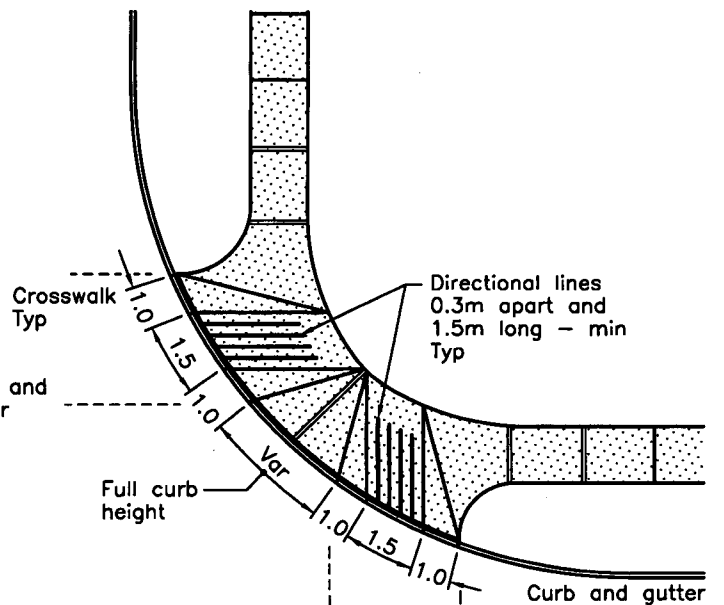
OPSD - 310.020



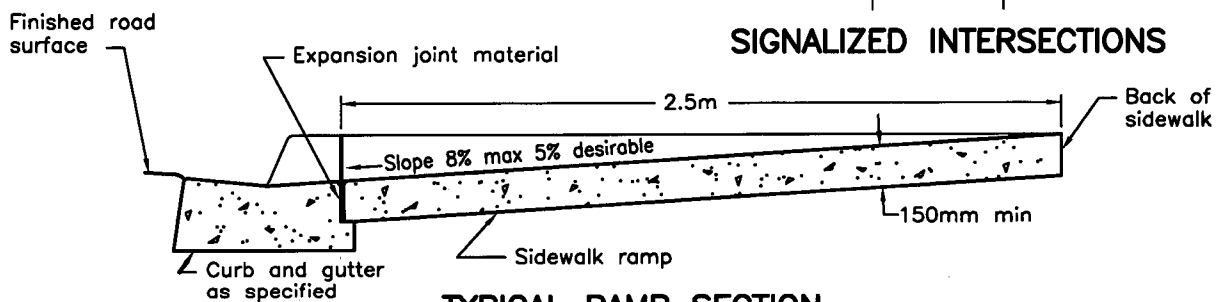
UNSIGNALIZED INTERSECTIONS



RAMP ELEVATION



SIGNALIZED INTERSECTIONS



TYPICAL RAMP SECTION

NOTES:

- A Directional lines shall be 10x10mm made with grooving tool having a 15mm radius.
- B All dimensions are in millimetres or metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

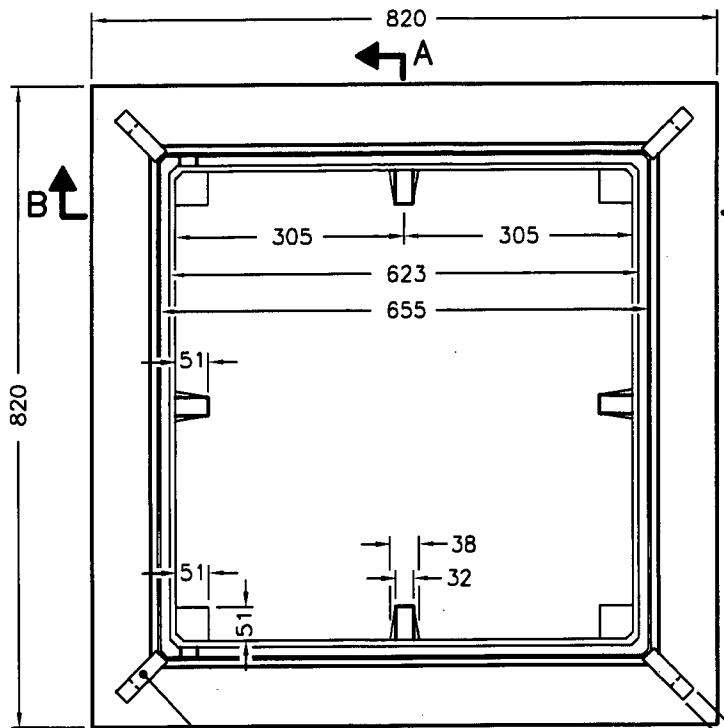
1993 10 01 Rev

CONCRETE SIDEWALK RAMPS AT INTERSECTIONS

Date

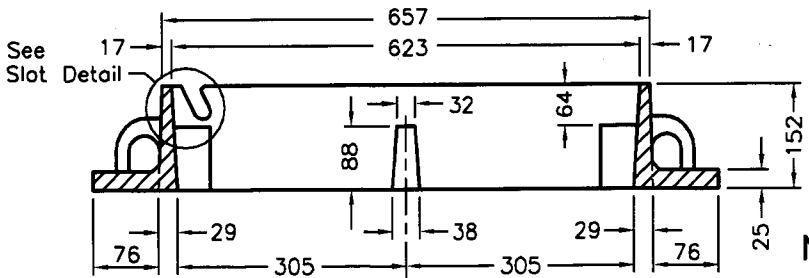


OPSD - 310.030

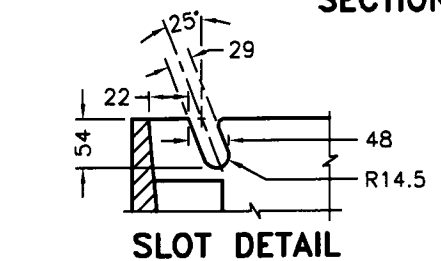


FRAME PLAN

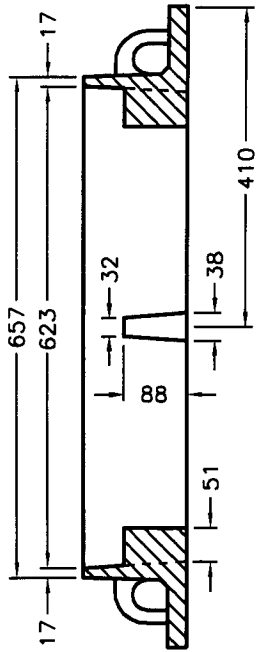
Hoisting hook rib,
Typ, OPSD 400.001



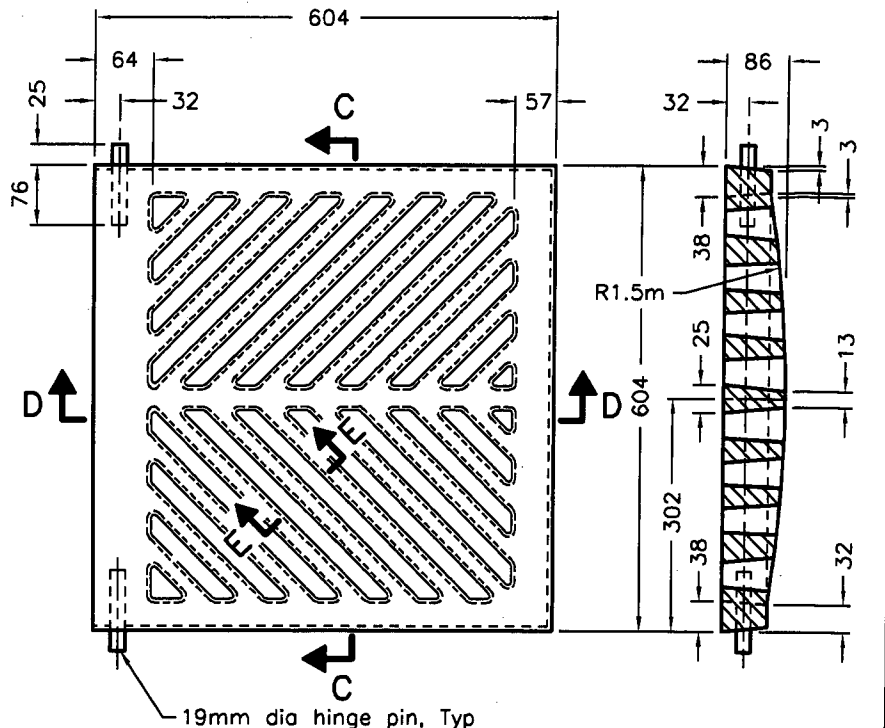
SECTION B-B



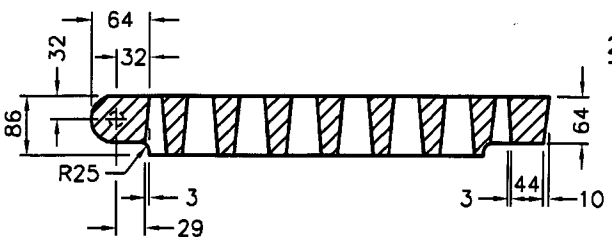
SLOT DETAIL



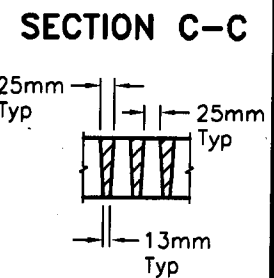
SECTION A-A



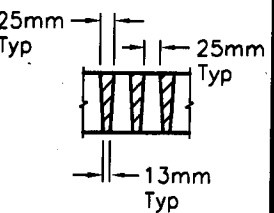
GRATE PLAN



SECTION D-D



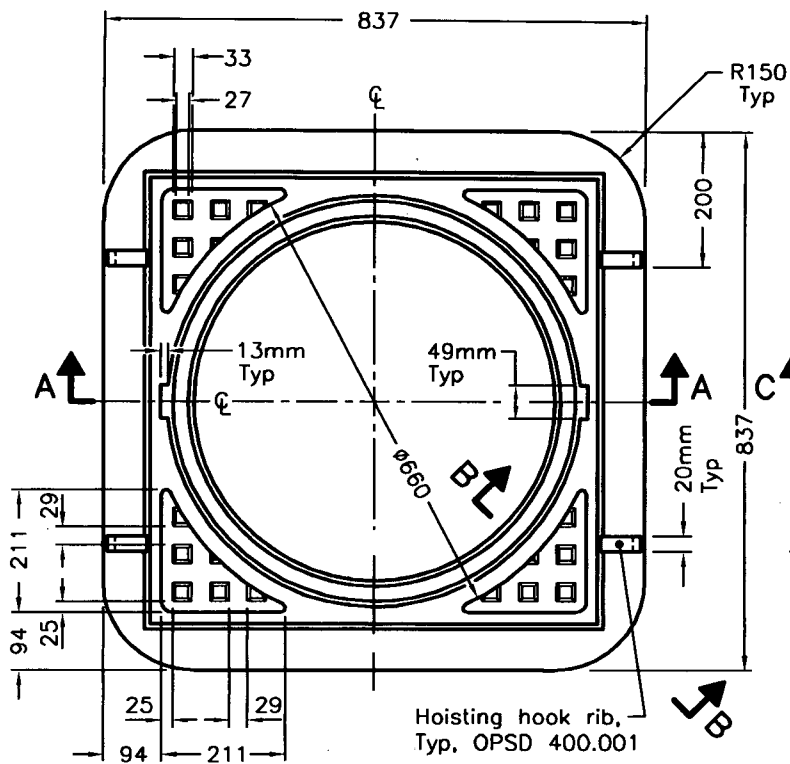
SECTION C-C



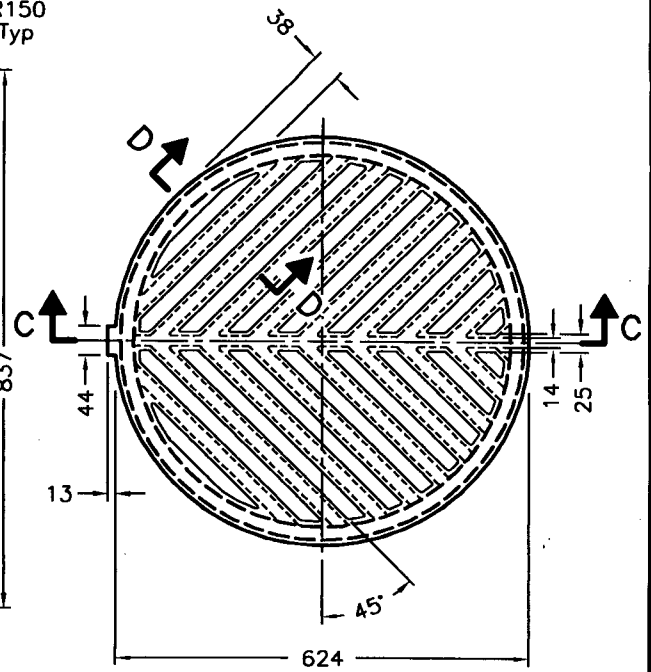
NOTES:

- A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.
- B All dimensions are in millimetres unless otherwise shown.

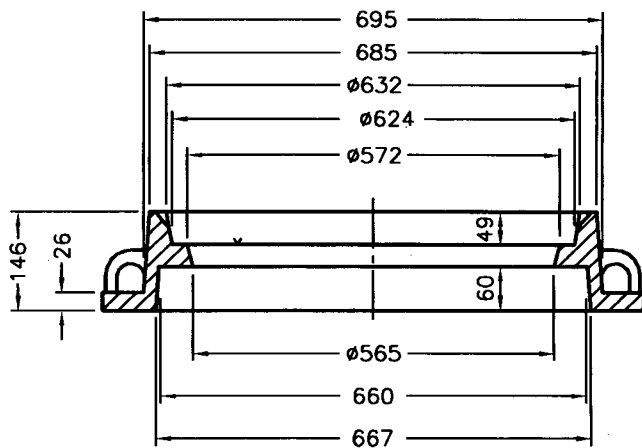
<p>ONTARIO PROVINCIAL STANDARD DRAWING</p> <p>CAST IRON, SQUARE FRAME WITH SQUARE FLAT GRATE FOR CATCH BASINS, HERRING BONE OPENINGS</p>	<p>Nov 2013 Rev 2</p>	
<p>OPSD 400.020</p>		



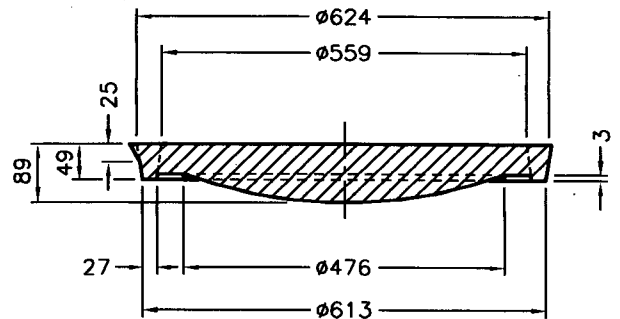
FRAME PLAN



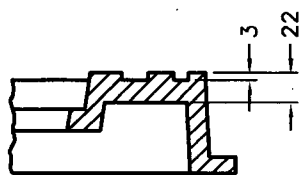
GRATE PLAN



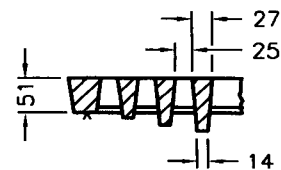
SECTION A-A



SECTION C-C



SECTION B-B



SECTION D-D

NOTES:

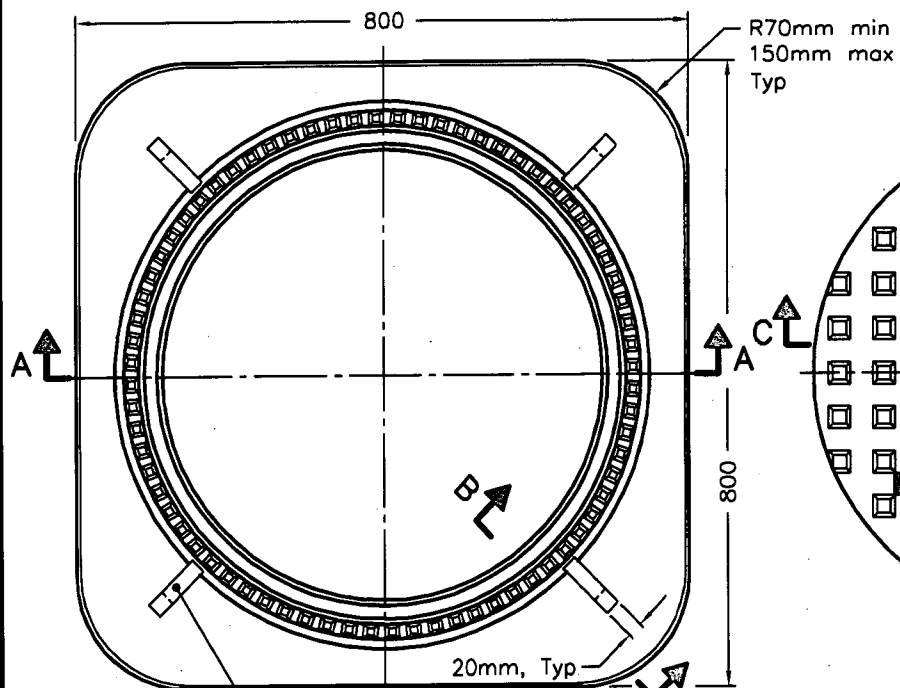
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING
 CAST IRON, RAISED SQUARE FRAME
 WITH CIRCULAR FLAT GRATE FOR
 CATCH BASINS, HERRING BONE OPENINGS

Nov 2014 Rev 5

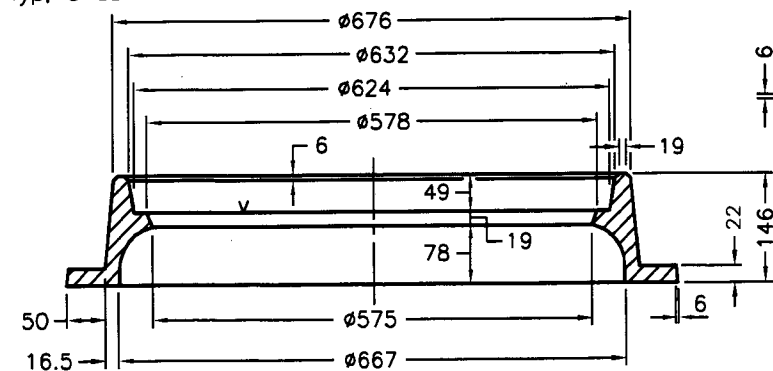


OPSD 400.070

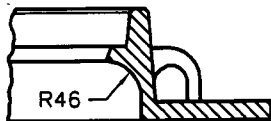


Hoisting hook rib,
Typ. OPSD 400.001

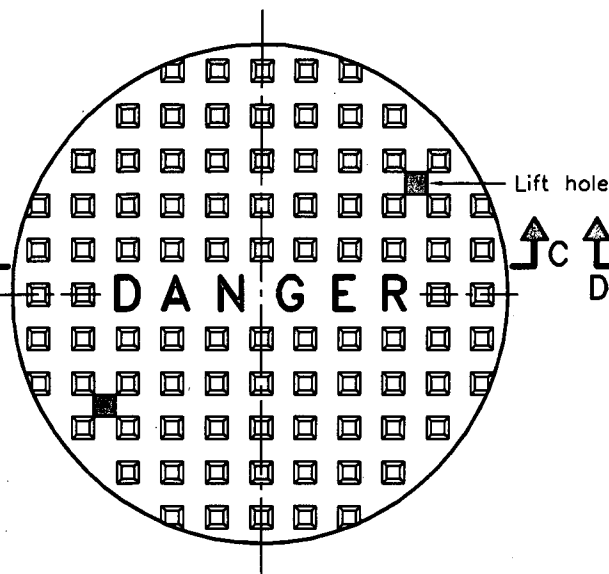
FRAME PLAN



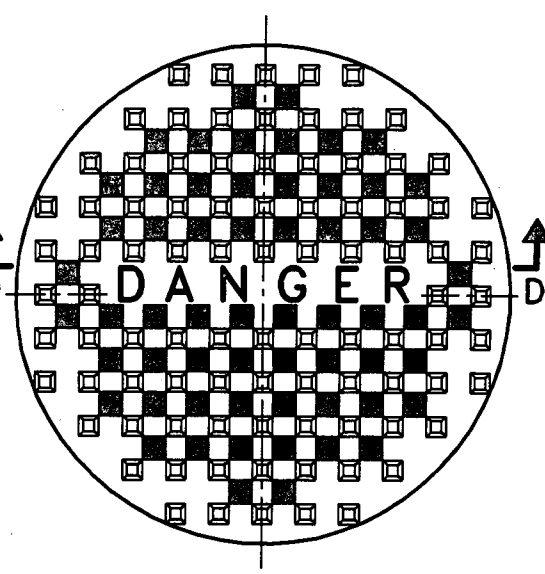
SECTION A-A



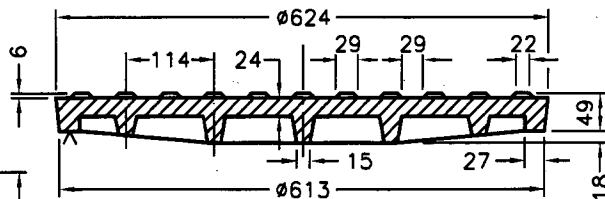
SECTION B-B



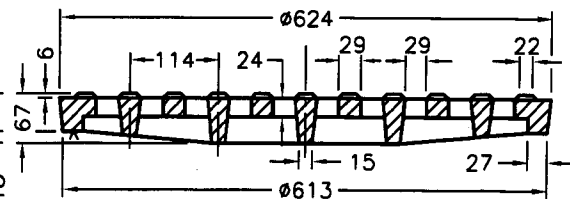
**TYPE A
CLOSED COVER**



**TYPE B
OPEN COVER**



SECTION C-C



SECTION D-D

NOTES:

A Covers shall be Type A or Type B, as specified.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

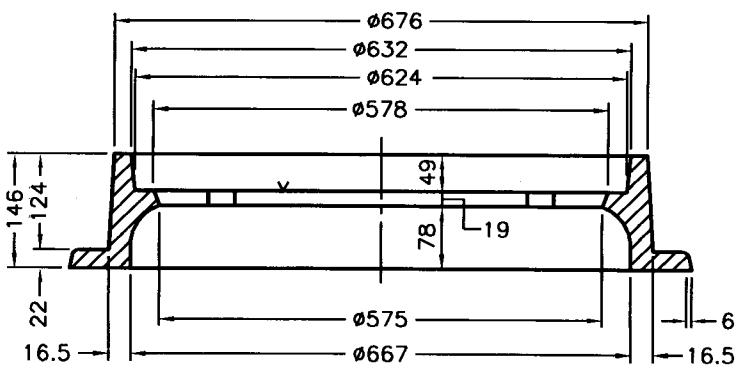
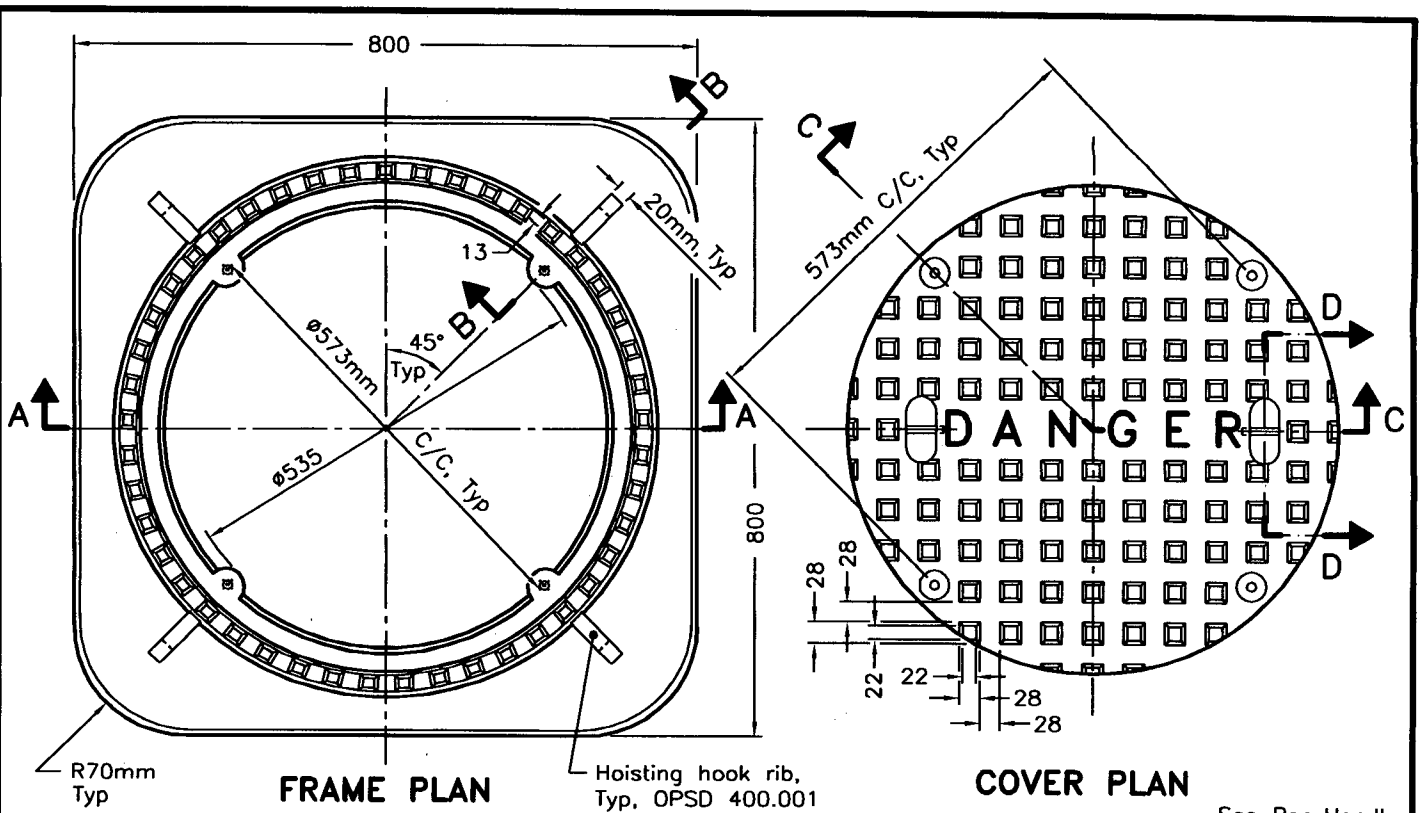
**CAST IRON, SQUARE FRAME WITH
CIRCULAR CLOSED OR OPEN COVER
FOR MAINTENANCE HOLES**

Nov 2013

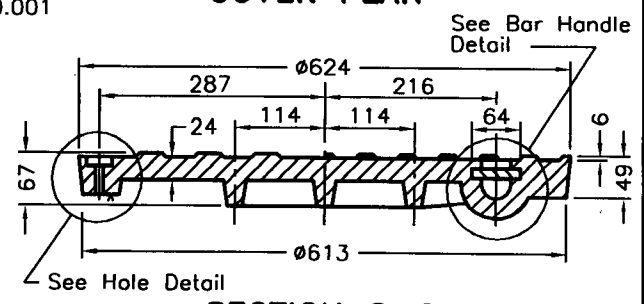
Rev 3



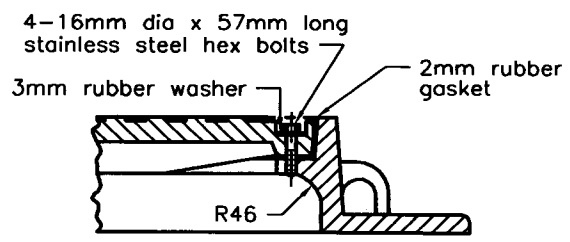
OPSD 401.010



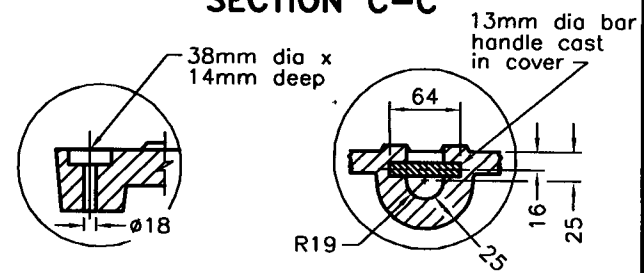
SECTION A-A



SECTION C-C

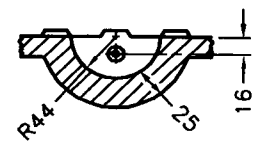


SECTION B-B



HOLE DETAIL

BAR HANDLE DETAIL



SECTION D-D

NOTE:

A All dimensions are in millimetres unless otherwise shown.

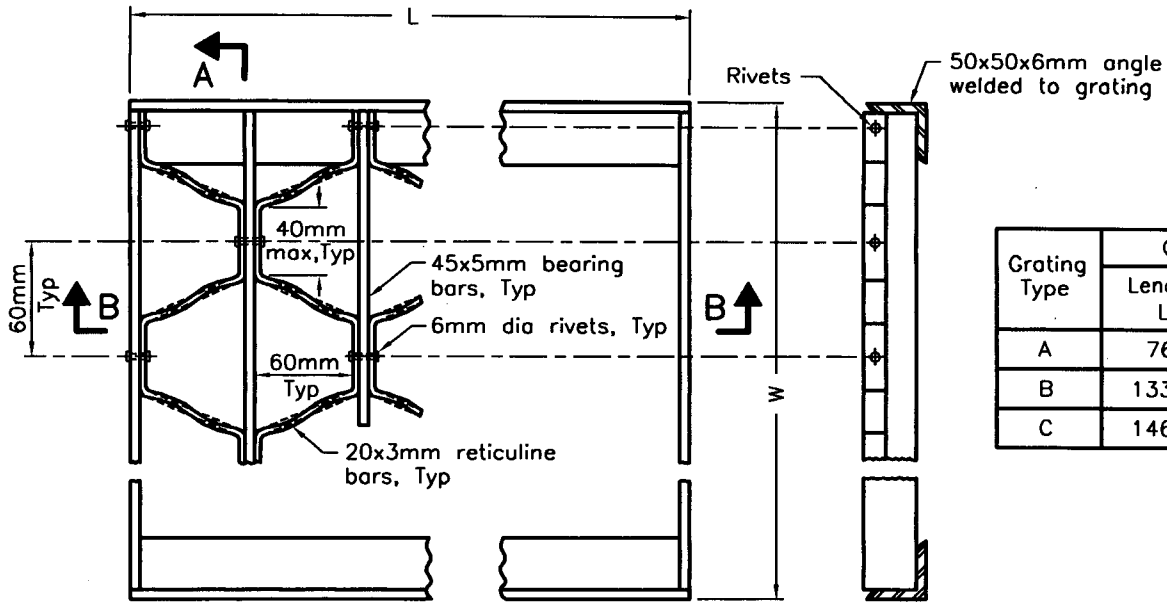
ONTARIO PROVINCIAL STANDARD DRAWING

CAST IRON, SQUARE FRAME WITH
CIRCULAR WATERTIGHT COVER
FOR MAINTENANCE HOLES

Nov 2013 Rev 3



OPSD 401.030

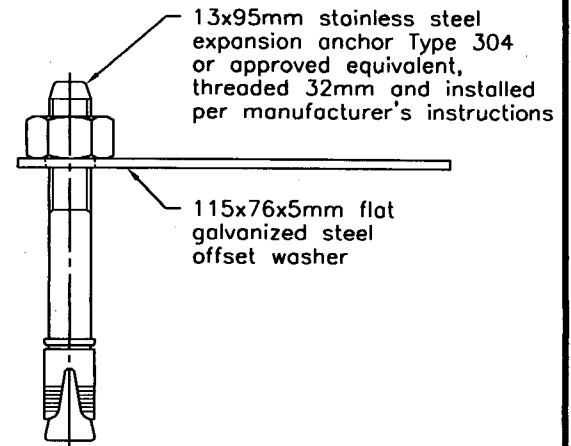


PLAN OF GRATE

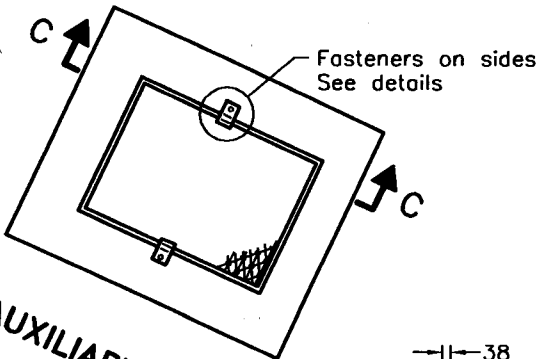
SECTION A-A



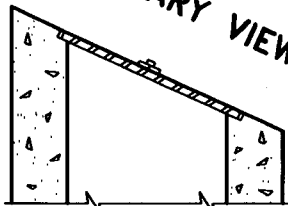
SECTION B-B



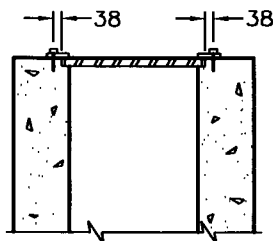
FASTENER DETAIL



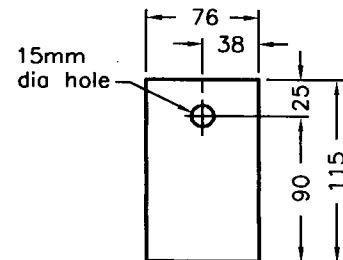
AUXILIARY VIEW



SECTION C-C



FASTENER EMBEDMENT DETAIL



OFFSET WASHER DETAIL

NOTES:

- A Fastener shall be inserted to maintain minimum concrete cover requirements.
- B All steel components and rivets shall be galvanized.
- C All dimensions are in millimetres unless otherwise shown.

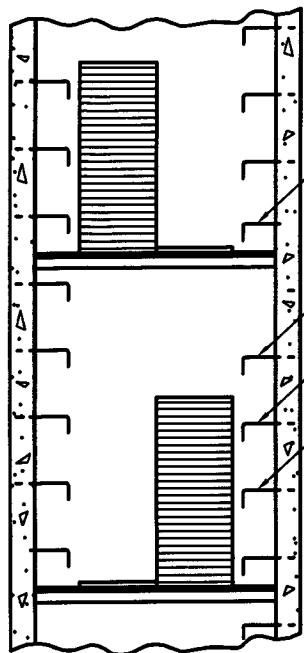
ONTARIO PROVINCIAL STANDARD DRAWING

GALVANIZED STEEL
HONEYCOMB GRATING
FOR DITCH INLETS

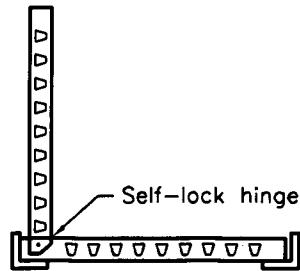
Nov 2013 Rev 2



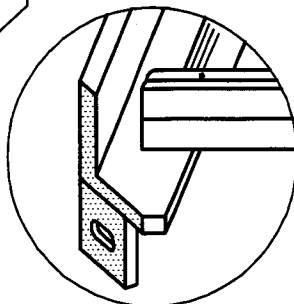
OPSD 403.010



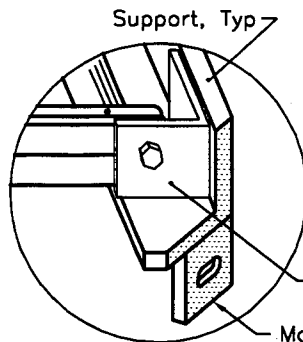
GRATING OPEN SECTION A-A



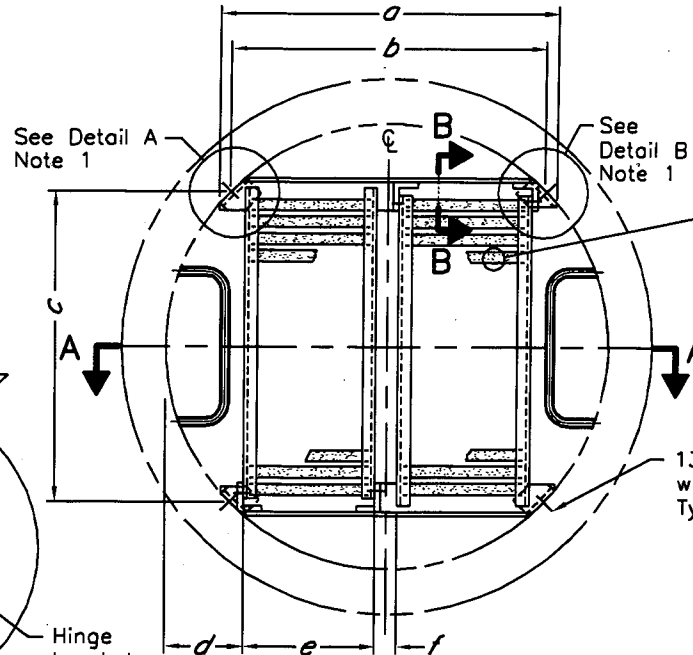
OPEN POSITION SIDE VIEW



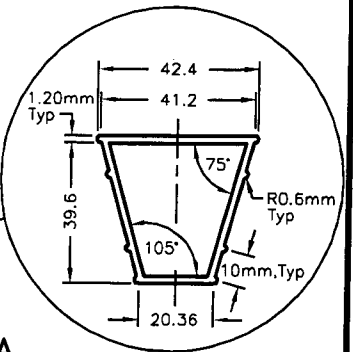
DETAIL A



DETAIL B

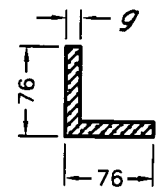


DETAIL OF GRATING AND BOLT-ON SUPPORT PLAN



GRATING RUNG DETAIL

13mm dia x 95mm long wedge anchor, stainless steel Typ



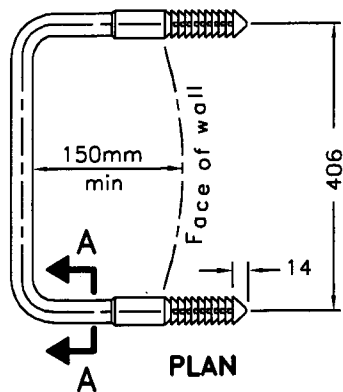
SECTION B-B

NOTES:

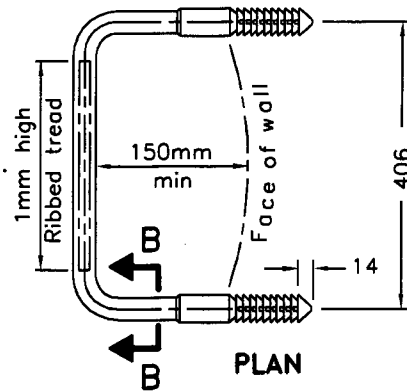
- 1 All hinge brackets and mounting brackets shall be welded all around to support angle.
- A All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.
- B Maintenance hole depth between 5.0m and 10.0m, grate shall be placed at midpoint. Maintenance hole depth between 10.0m and 15.0m, grates shall be placed at third-points.
- C All fasteners shall be 304 stainless steel.
- D All welding shall be according to CSA W47.2 and W59.2.
- E All aluminum components shall be 6000 series structural aluminum.
- F All dimensions are in millimetres unless otherwise shown.

MH Diameter	No of Grates	a	b	c	d	e	f	g
1200	2	900	850	850	225	352	65	10
1500	2	1128	1078	1078	311	419	65	12
1800	3	1344	1293	1293	308	360	65	12
2400	4	1774	1724	1724	401	360	65	12

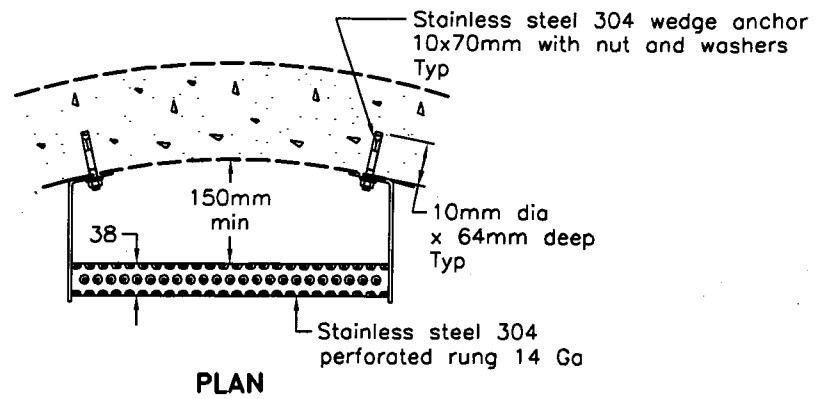
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013 Rev 3	
ALUMINUM SAFETY PLATFORM FOR CIRCULAR MAINTENANCE HOLES	----- ----- OPSD 404.020	



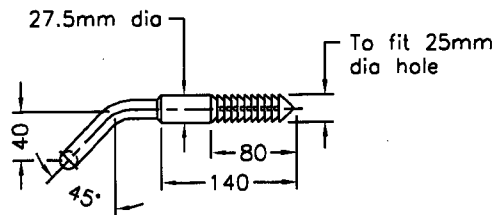
PLAN



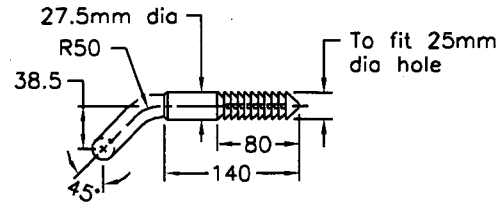
PLAN



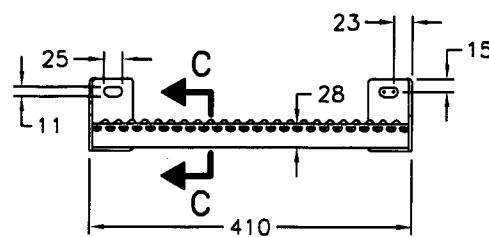
PLAN



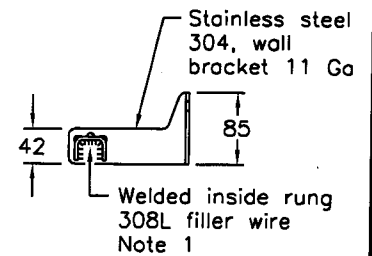
SIDE VIEW



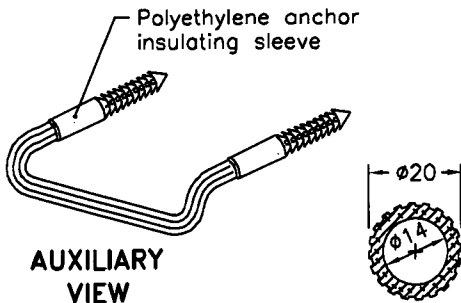
SIDE VIEW



FRONT VIEW

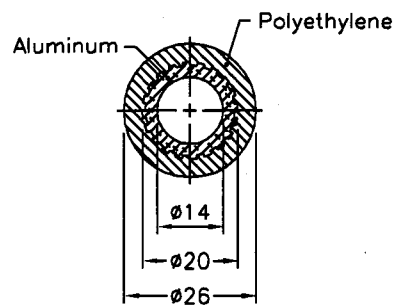


SECTION C-C

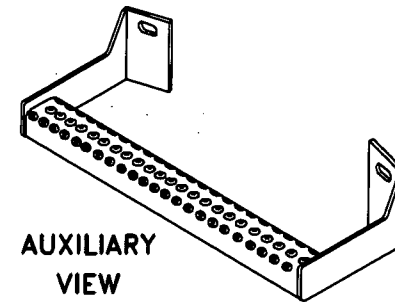


AUXILIARY VIEW

EXTRUDED CIRCULAR SECTION A-A



SECTION B-B



AUXILIARY VIEW

CIRCULAR ALUMINUM

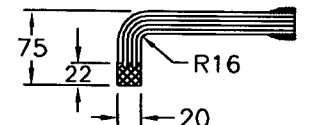
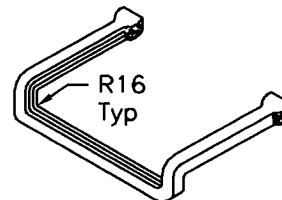
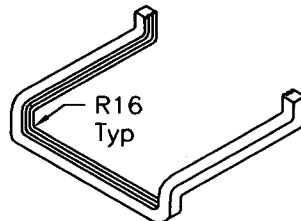
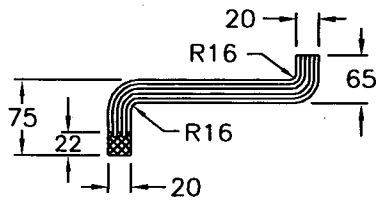
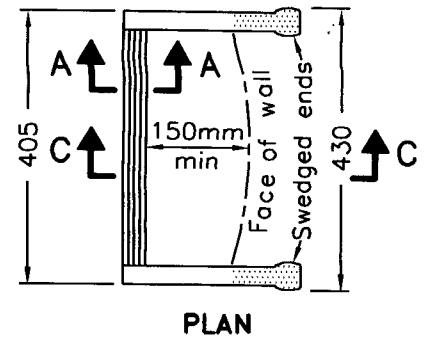
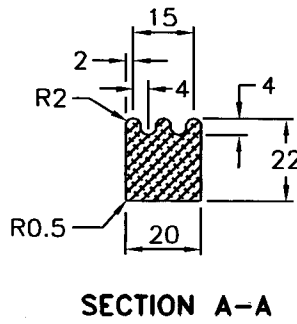
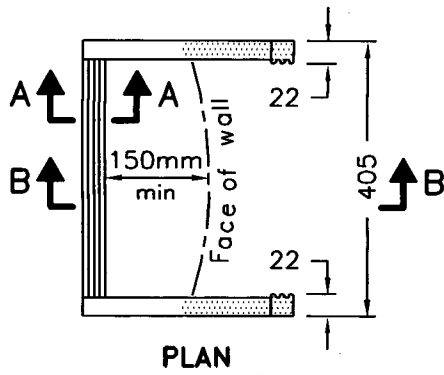
CIRCULAR ALUMINUM WITH POLYETHYLENE ENCASEMENT

RECTANGULAR STAINLESS STEEL

NOTE:

- 1 The company undertaking welded fabrication shall be certified according to CSA W47.1. All welding shall be according to CSA W59.
- A All aluminum components shall be 6000 series structural aluminum.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev 3	
MAINTENANCE HOLE STEPS			
HOLLOW			
OPSD 405.010			



SECTION B-B

AUXILIARY VIEW

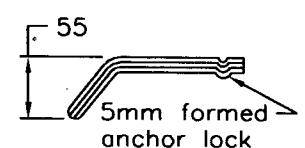
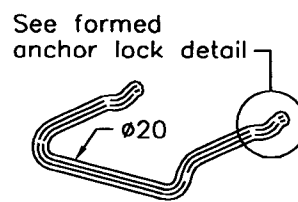
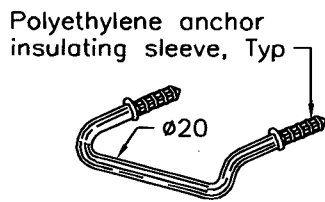
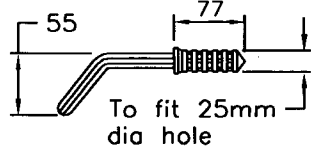
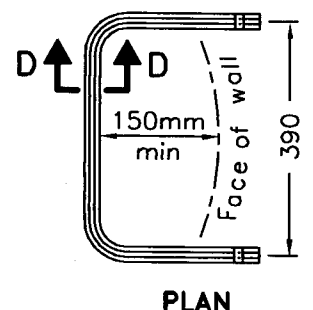
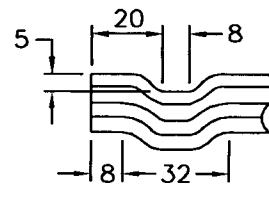
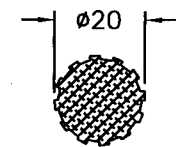
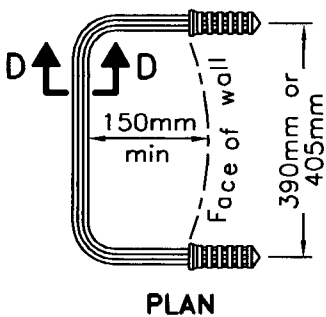
AUXILIARY VIEW

SECTION C-C

TYPE A

TYPE B

RECTANGULAR ALUMINUM



SIDE VIEW

AUXILIARY VIEW

AUXILIARY VIEW

SIDE VIEW

TYPE A

TYPE B

CIRCULAR ALUMINUM

NOTES:

A All aluminum components shall be 6000 series structural aluminum.

B All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013

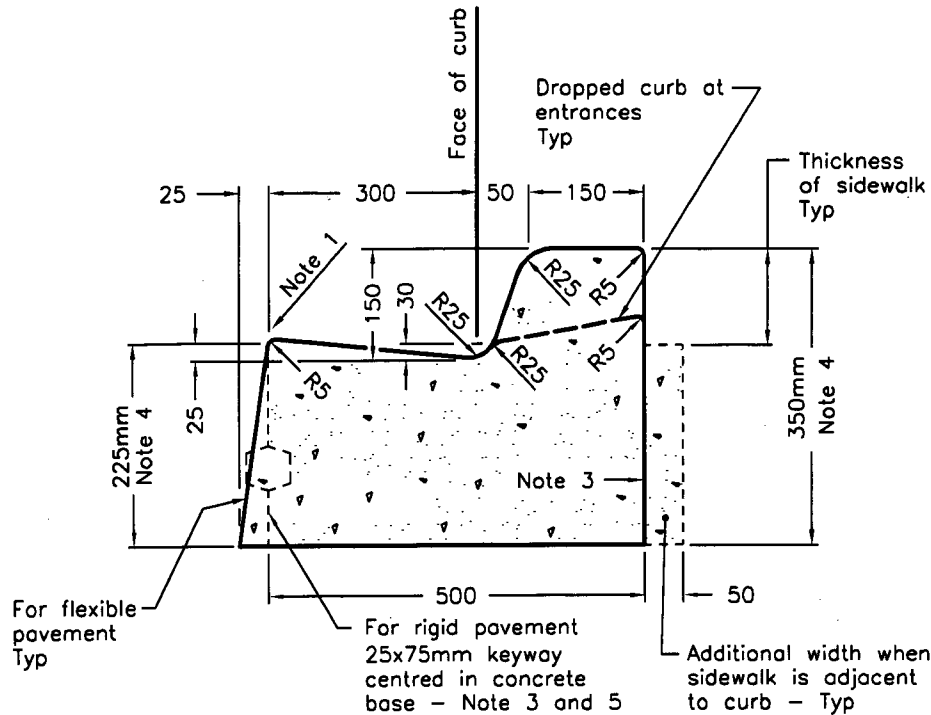
Rev 3

MAINTENANCE HOLE STEPS

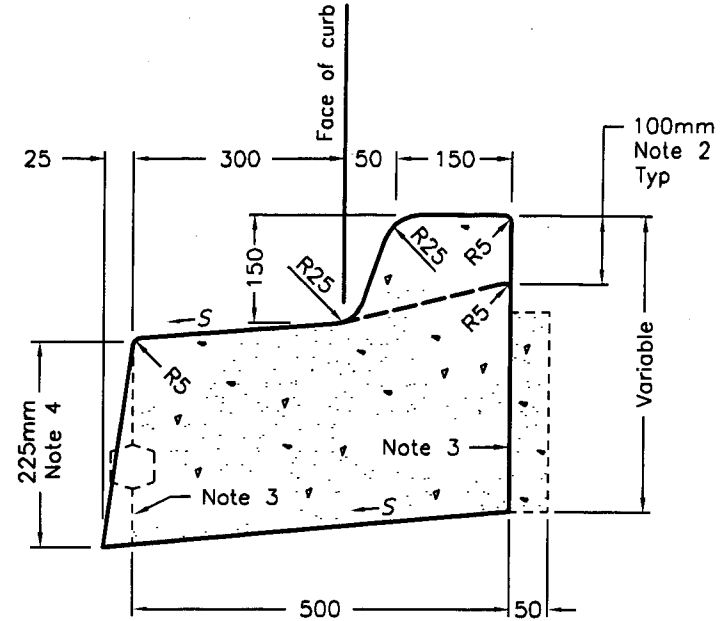
SOLID



OPSD 405.020



TANGENT




SUPERELEVATED

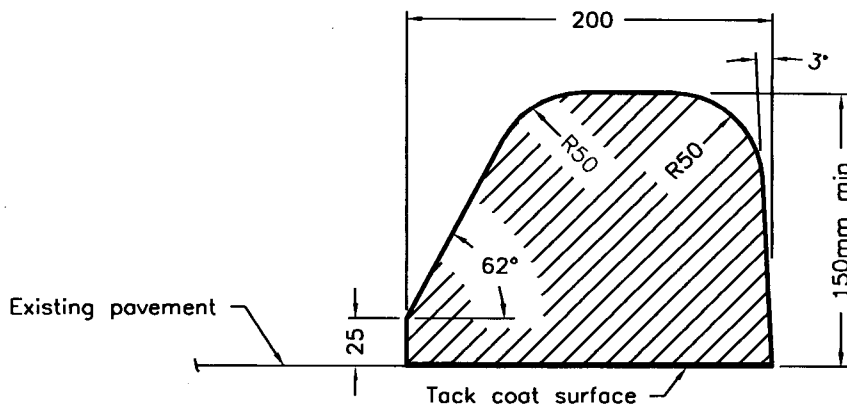
LEGEND:

S - Rate of pavement superelevation in percent, %.

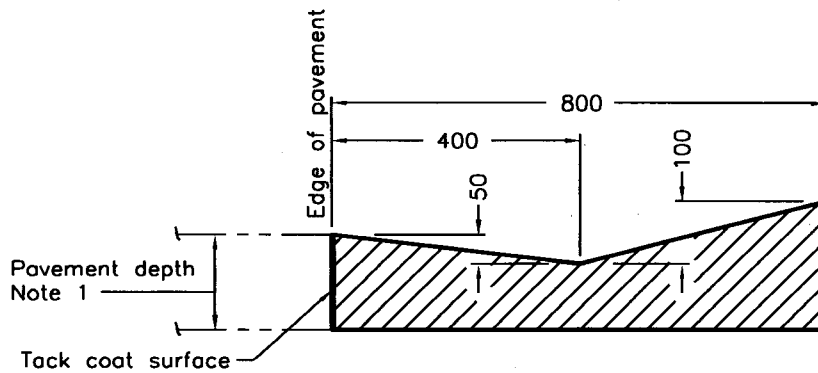
NOTES:

- 1 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
 - 2 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
 - 3 For slipforming procedure a 5% batter is acceptable.
 - 4 For composite pavement the depth of concrete curb shall be adjusted to depth of concrete pavement.
 - 5 When tie bars are specified, refer to OPSD 552.010 and 552.020 for details.
- A Treatment at entrances shall be according to OPSD 351.010.
- B Outlet treatment shall be according to the OPSD 610 Series.
- C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev	2
CONCRETE BARRIER CURB WITH STANDARD GUTTER			
OPSD 600.040			



**ASPHALT BARRIER CURB
(MACHINE LAID)**



ASPHALT MOUNTABLE CURB WITH WIDE GUTTER

NOTES:

1 Depth of asphalt curb with gutter at pavement edge shall equal depth of new pavement, but in no case less than 130mm.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

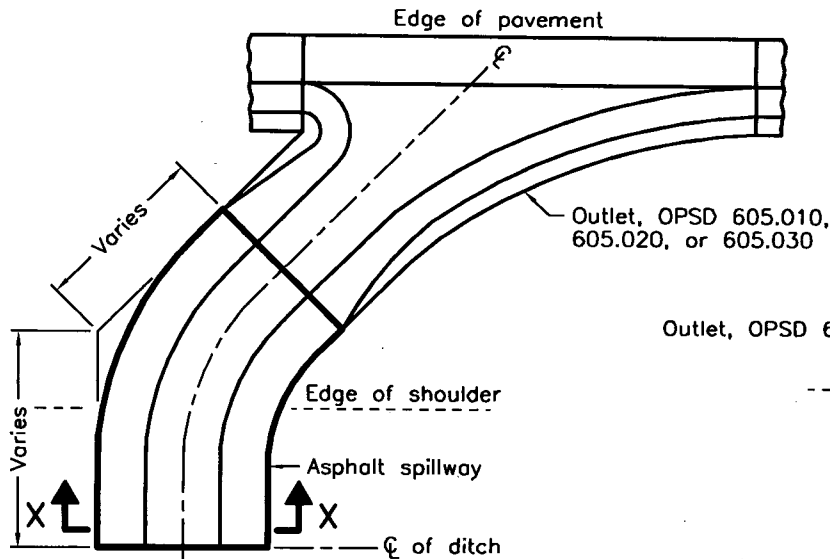
Nov 2013

Rev 2

**ASPHALT CURB AND
ASPHALT CURB WITH GUTTER**

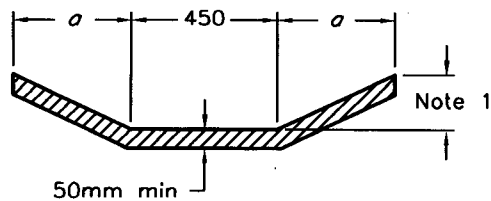


OPSD 601.010



PLAN

WITH 30° or 45° ASPHALT OR CONCRETE OUTLET

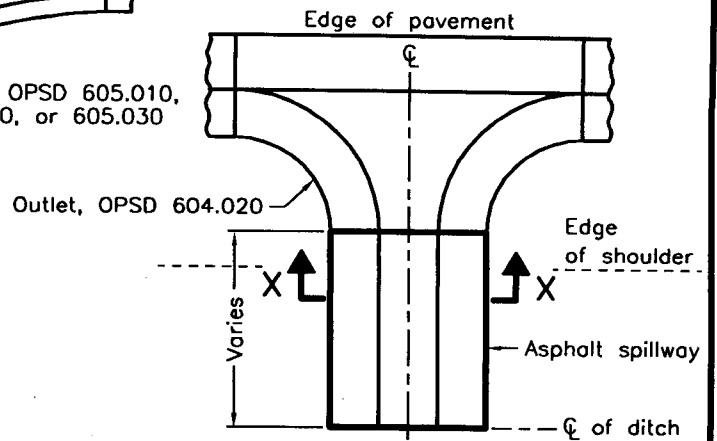


SECTION X-X

Outlet OPSD	Curb with Gutter Type	a	b
604.020	Mountable	400	-
605.020			
605.010	Barrier	200	-
605.030	Semi-mountable	300	-
	Mountable	400	-
604.010	Barrier	-	200
	Semi-mountable	-	300
	Mountable	-	400

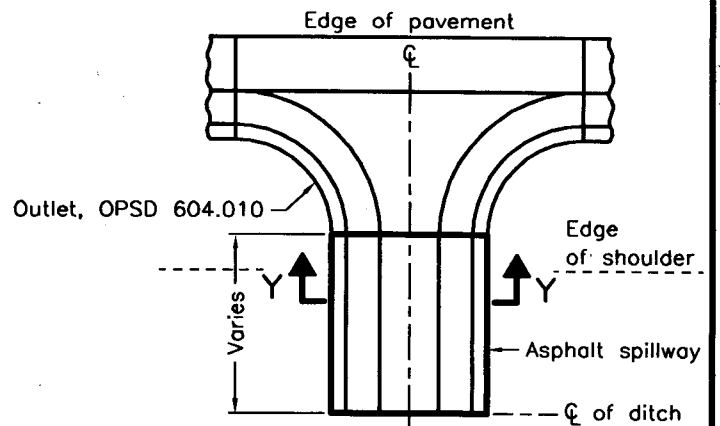
NOTES:

- 1 Depression of spillway shall coincide with outlet end of gutter outlet.
- 2 All dimensions are in millimetres unless otherwise shown.



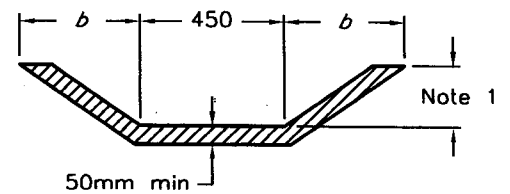
PLAN

WITH 90° ASPHALT OUTLET



PLAN

WITH 90° CONCRETE OUTLET



SECTION Y-Y

ONTARIO PROVINCIAL STANDARD DRAWING

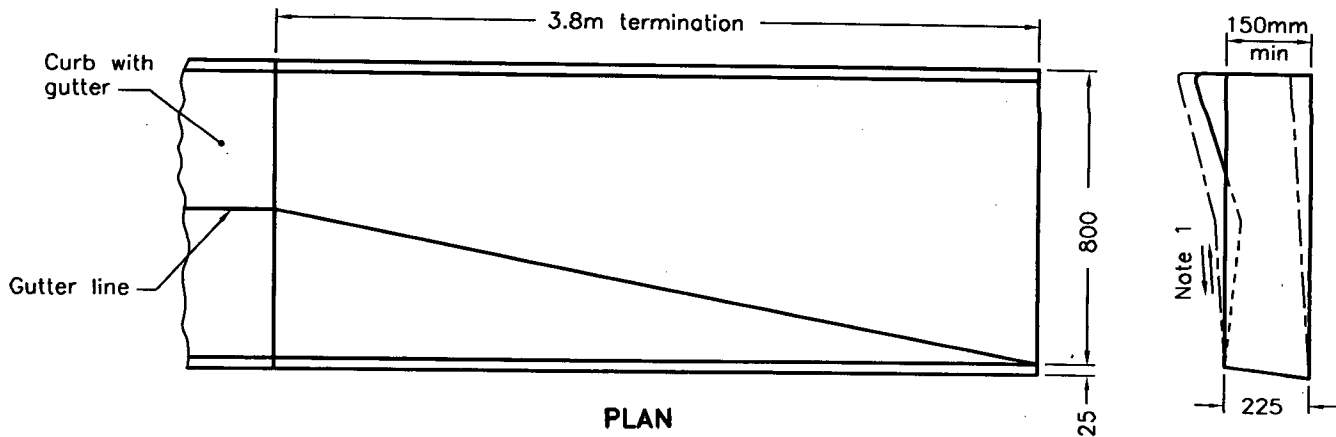
Nov 2013

Rev 2

ASPHALT SPILLWAYS



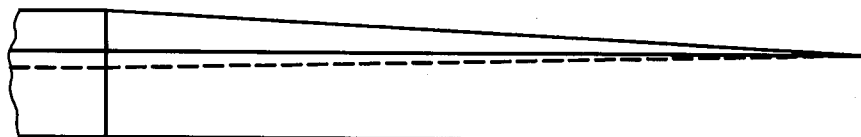
OPSD 605.040



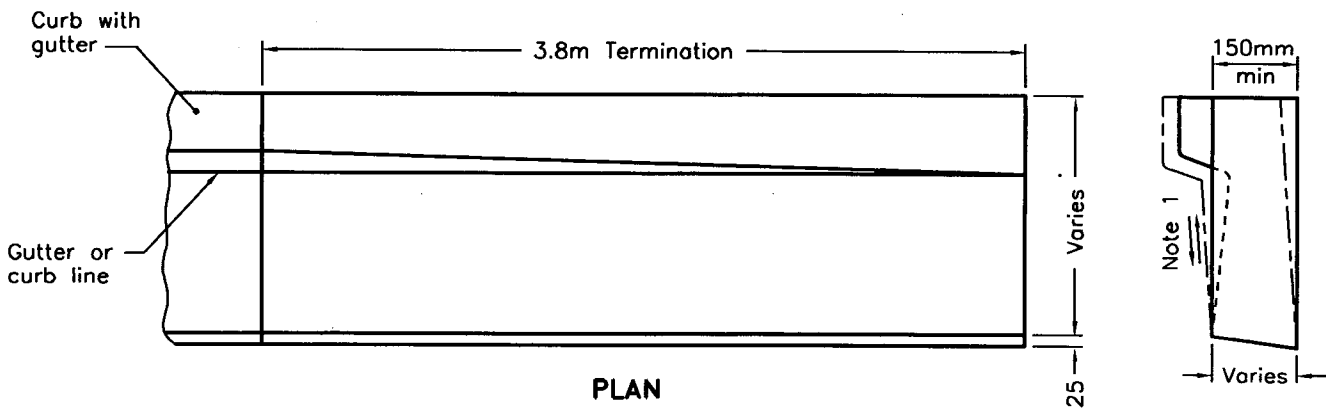
PLAN

Note 1

END VIEW



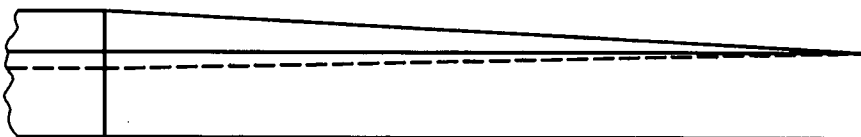
ELEVATION
MOUNTABLE CURB WITH GUTTER



PLAN

Note 1

END VIEW



ELEVATION
BARRIER AND SEMI-MOUNTABLE CURB WITH GUTTER

NOTES:

- 1 Slope shall match existing shoulder.
- A This drawing shall be read in conjunction with OPSD 600 series curb with gutter drawings.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 Rev 2

**METHOD OF TERMINATION
FOR CONCRETE CURB WITH GUTTER**



OPSD 608.010

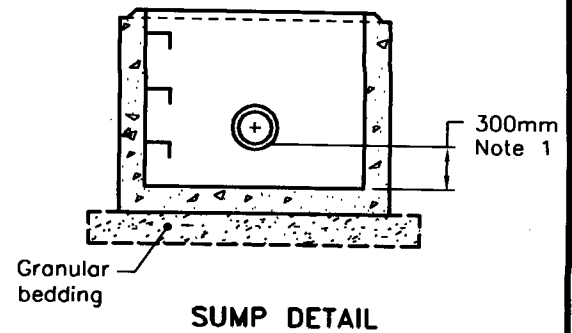
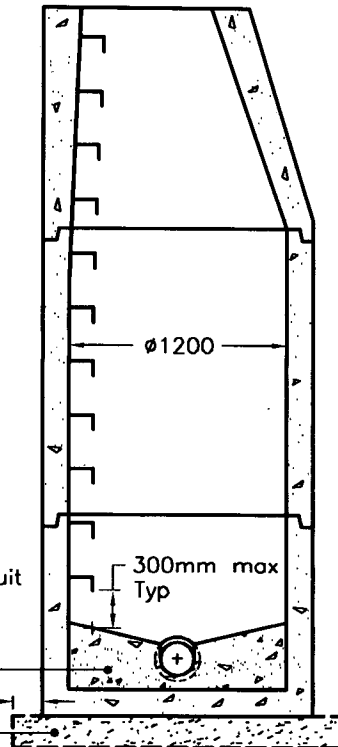
Tapered top
See alternative C

Riser sections
as required

Monolithic base with inlet
and outlet openings to suit
See alternatives A and B

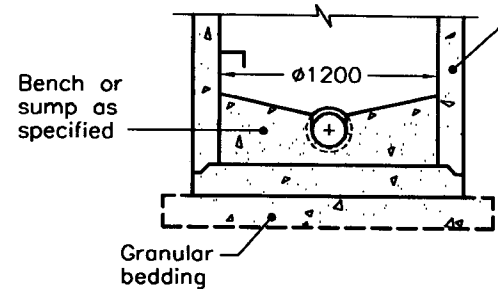
Bench or sump
as specified

300mm, Typ
Granular bedding

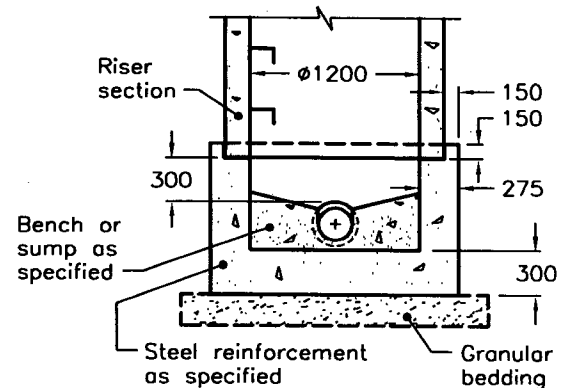


ALTERNATIVES

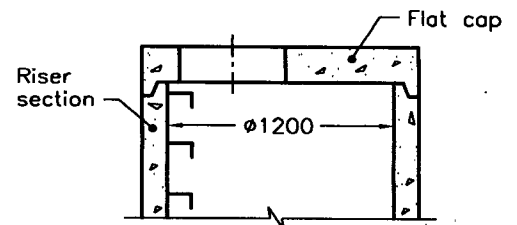
Bottom riser section with
inlet and outlet openings to suit



A PRECAST SLAB BASE



B CAST-IN-PLACE BASE



C PRECAST FLAT CAP

NOTES:

- 1 The sump is measured from the lowest invert.
- A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
- B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
- C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
- D Pipe support according to OPSD 708.020.
- E For benching and pipe opening details, see OPSD 701.021.
- F For adjustment unit and frame installation, see OPSD 704.010.
- G All dimensions are nominal.
- H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
MAINTENANCE HOLE
1200mm DIAMETER**

Nov 2014 Rev 5



OPSD 701.010

Tapered top
See alternatives D
and E

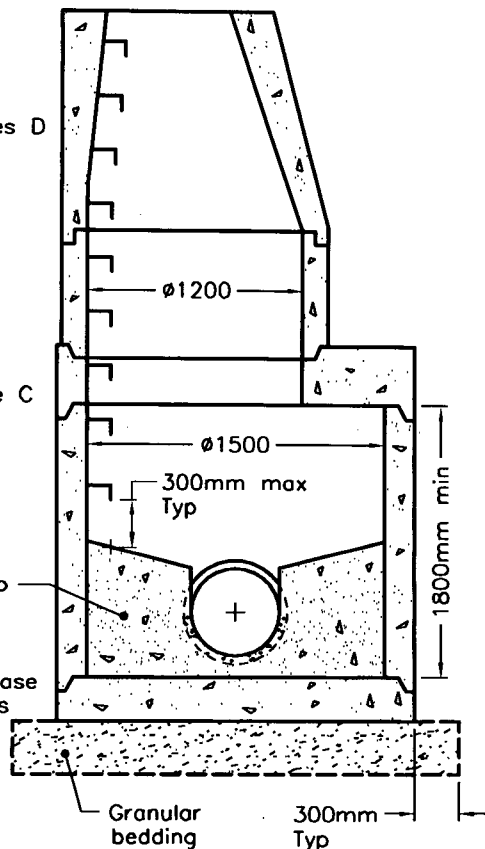
Riser sections
as required

Transition slab
See alternative C

Riser sections
as required

Bench or sump
as specified
Note 1

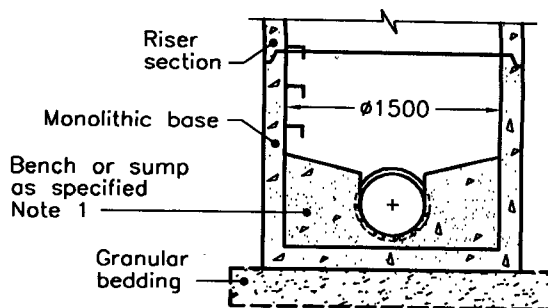
Precast slab base
See alternatives
A and B



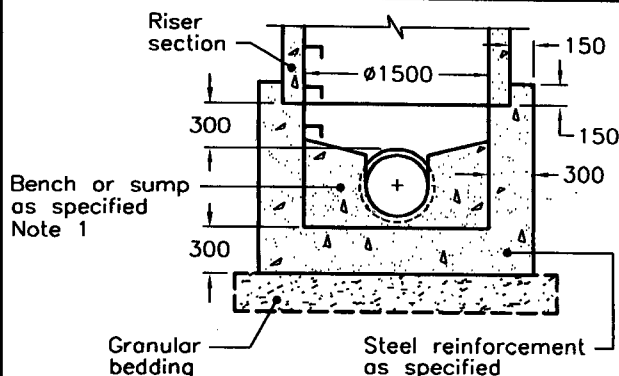
NOTES:

- 1 For sump detail, see OPSD 701.010.
- A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
- B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.040, 701.041, 703.011, 703.021, and 706.010.
- C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020 or 404.021.
- D Pipe support shall be according to OPSD 708.020.
- E For benching and pipe opening details, see OPSD 701.021.
- F For adjustment unit and frame installation, see OPSD 704.010.
- G All dimensions are nominal.
- H All dimensions are in millimetres unless otherwise shown.

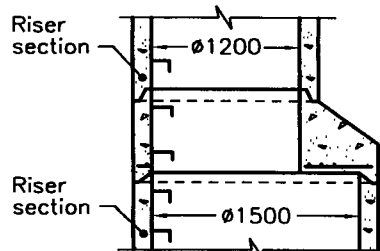
ALTERNATIVES



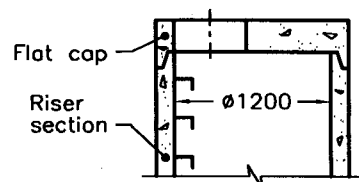
A PRECAST MONOLITHIC BASE



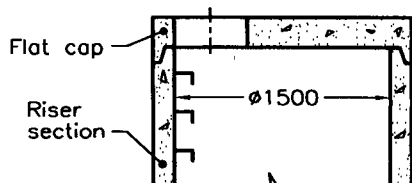
B CAST-IN-PLACE BASE



C TAPERED TRANSITION SLAB



D 1200mm PRECAST FLAT CAP



E 1500mm PRECAST FLAT CAP

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014

Rev 5

**PRECAST CONCRETE
MAINTENANCE HOLE
1500mm DIAMETER**



OPSD 701.011

Tapered top
See alternatives C
and D

Riser sections
as required

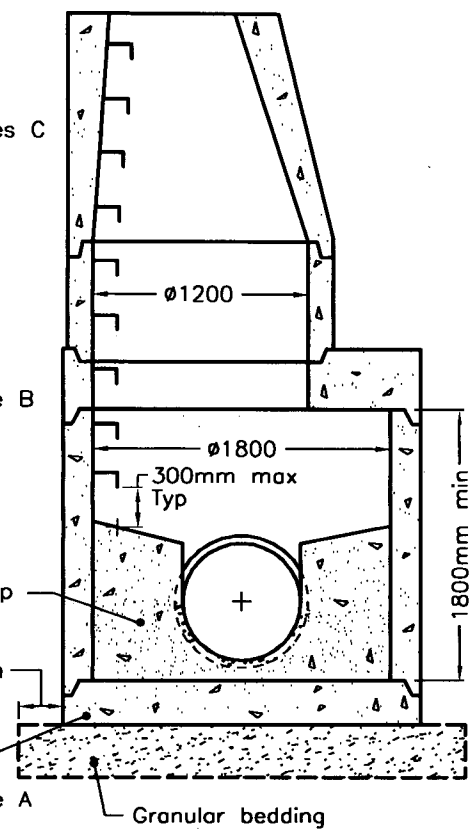
Transition slab
See alternative B

Riser sections
as required

Bench or sump
as specified
Note 1

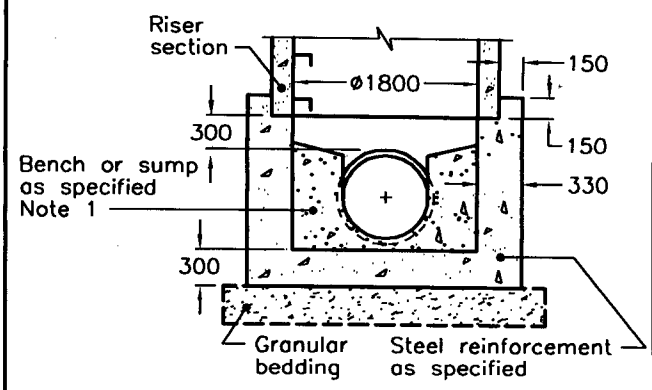
300mm
Typ

Precast slab
base
See alternative A

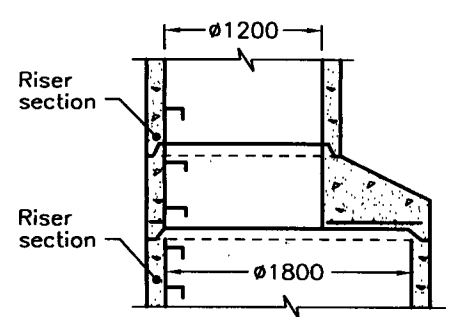


Granular bedding

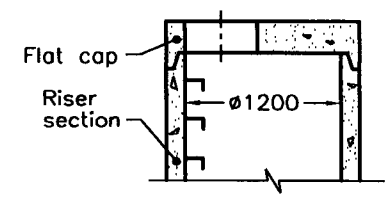
ALTERNATIVES



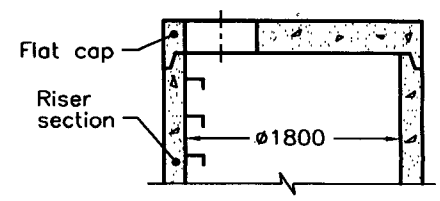
A CAST-IN-PLACE BASE



B TAPERED TRANSITION SLAB



C 1200mm PRECAST FLAT CAP



D 1800mm PRECAST FLAT CAP

NOTES:

- 1 For sump detail, see OPSD 701.010.
- A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
- B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.050, 701.051, 703.012, 703.022, and 706.020.
- C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020 or 404.022.
- D Pipe support shall be according to OPSD 708.020.
- E For benching and pipe opening details, see OPSD 701.021.
- F For adjustment unit and frame installation, see OPSD 704.010.
- G All dimensions are nominal.
- H All dimensions are in millimetres unless otherwise shown.

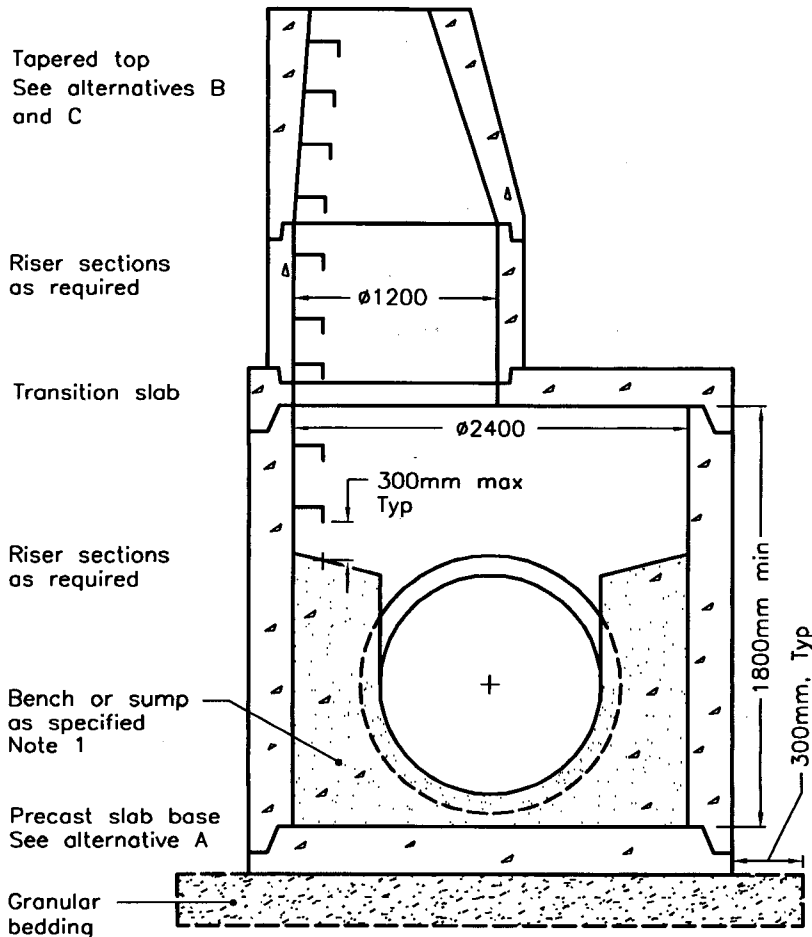
ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
MAINTENANCE HOLE
1800mm DIAMETER**

Nov 2014 Rev 5



OPSD 701.012



Tapered top
See alternatives B
and C

Riser sections
as required

Transition slab

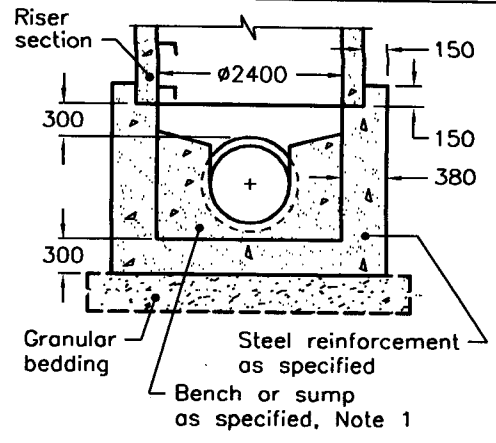
Riser sections
as required

Bench or sump
as specified
Note 1

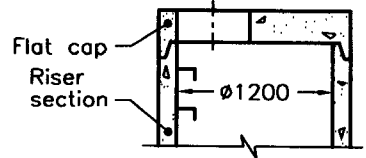
Precast slab base
See alternative A

Granular
bedding

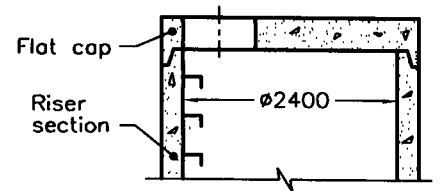
ALTERNATIVES



A CAST-IN-PLACE BASE



B 1200mm PRECAST FLAT CAP



C 2400mm PRECAST FLAT CAP

NOTES:

- 1 For sump detail, see OPSD 701.010.
- A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
- B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.060, 701.061, 703.013, 703.023, 706.030 and 706.031.
- C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
- D Pipe support shall be according to OPSD 708.020.
- E For benching and pipe opening details, see OPSD 701.021.
- F For adjustment unit and frame installation, see OPSD 704.010.
- G All dimensions are nominal.
- H All dimensions are in millimetres unless otherwise shown.

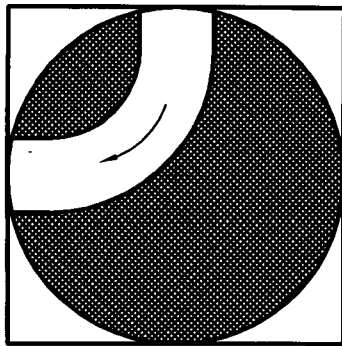
ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
MAINTENANCE HOLE
2400mm DIAMETER**

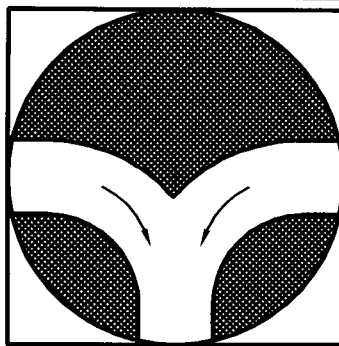
Nov 2014 | Rev | 5



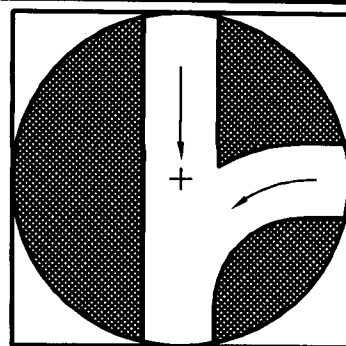
OPSD 701.013



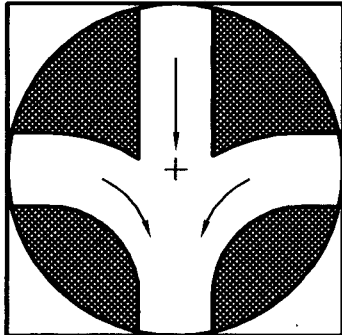
1. Right angle bend



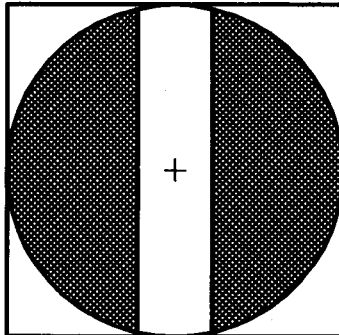
2. Tee connection



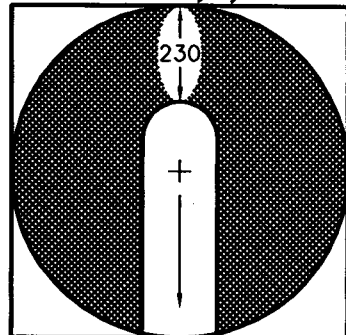
3. Three way junction



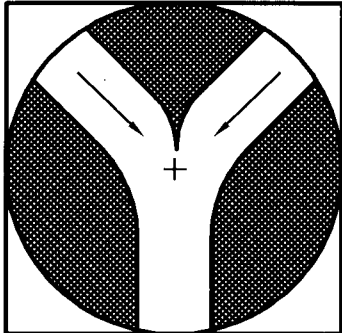
4. Four way junction



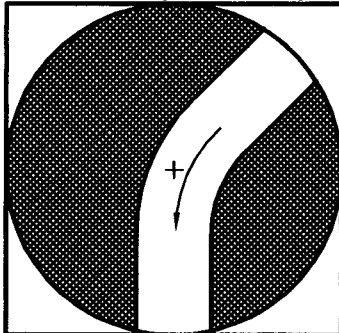
5. Straight through



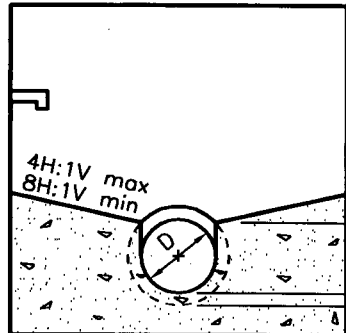
6. Dead end



7. Wye connection



8. 45° bend



Section

MAXIMUM SIZE HOLE IN THE WALL IN PRECAST RISER SECTIONS

Maintenance Hole Diameter	No. 1-4	No. 5 and 6	No. 8	No. 7	
				Inlet Hole	Outlet Hole
1200	700	860	780	700	860
1500	860	1220	960	860	1170
1800	1220	1485	1220	1220	1485
2400	1485	2020	1760	1485	2020
3000	1930	2450	2300	1930	2450
3600	2470	3085	2730	2470	3085

NOTES:

- 1 Slopes shall be maintained from the outlet hole opening for top of benching.
- A Concrete for benching shall be 30MPa.
- B When benching is hand-finished, it shall be given wood float finish, channel shall be given steel trowel finish.
- C Benchng slope and height shall be as specified.
- D When specified, maintenance holes that are 1200mm in diameter with a uniform channel for 200 or 250mm pipe may be prebenched at the manufacturer with standardized benching slope and channel orientation.
- E All dimensions are nominal.
- F All dimensions are in millimetres unless otherwise shown.

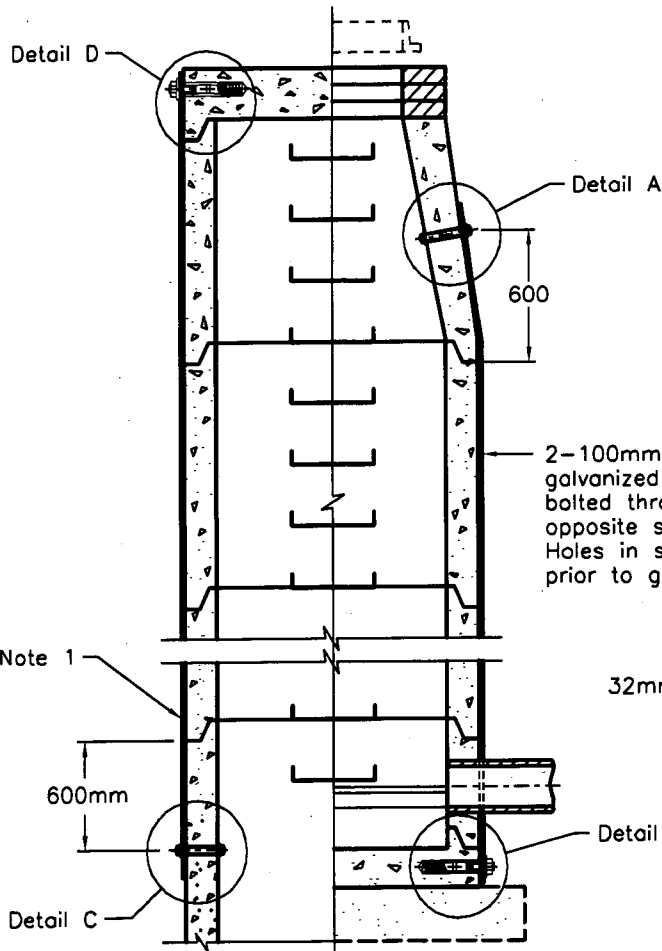
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 4

MAINTENANCE HOLE BENCHING
AND PIPE OPENING ALTERNATIVES



OPSD 701.021



Note 1

600mm

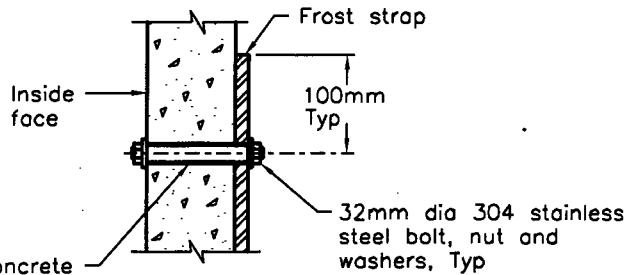
Detail A

600

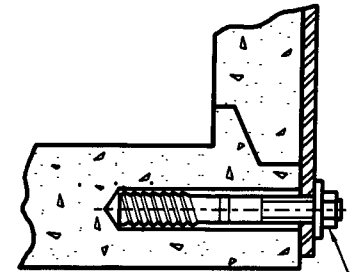
2-100mm wide x 10mm thick galvanized steel frost straps bolted through concrete on opposite sides of structure. Holes in strap to be drilled prior to galvanizing

Detail B

Detail C

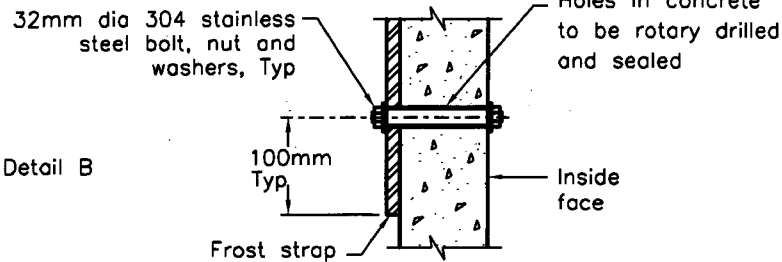


DETAIL A

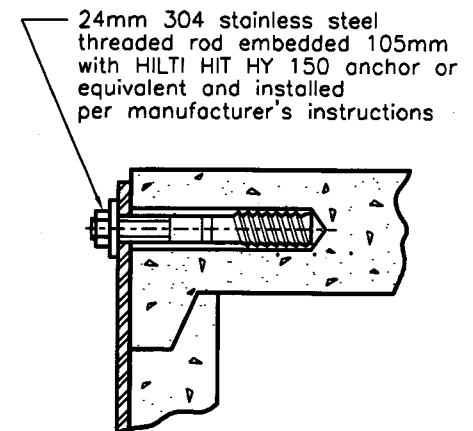


24mm 304 stainless steel threaded rod embedded 105mm with HILTI HIT HY 150 anchor or equivalent and installed per manufacturer's instructions

DETAIL B



DETAIL C




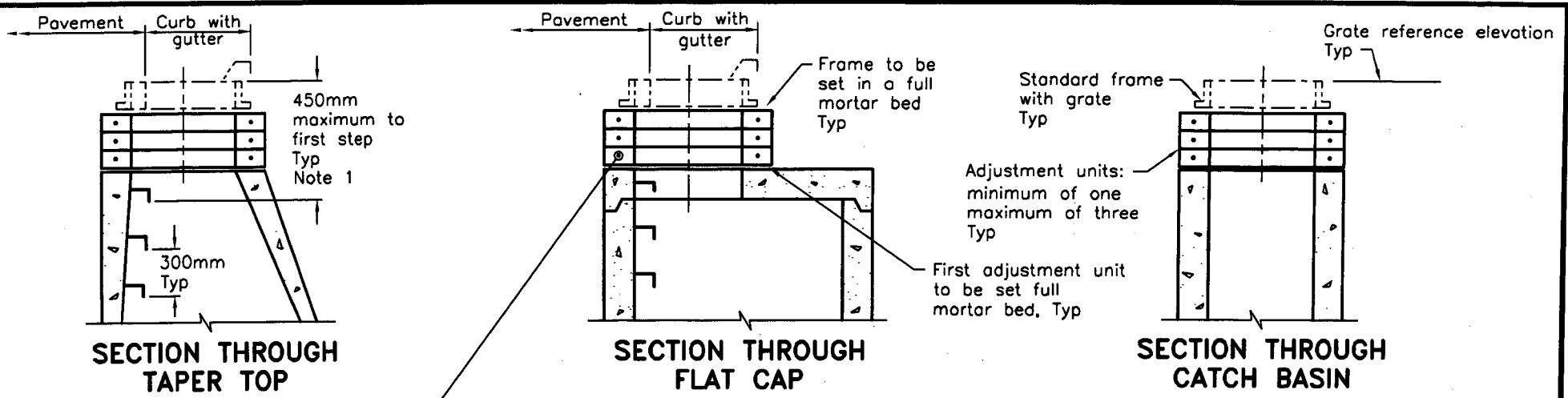
DETAIL D

NOTES:

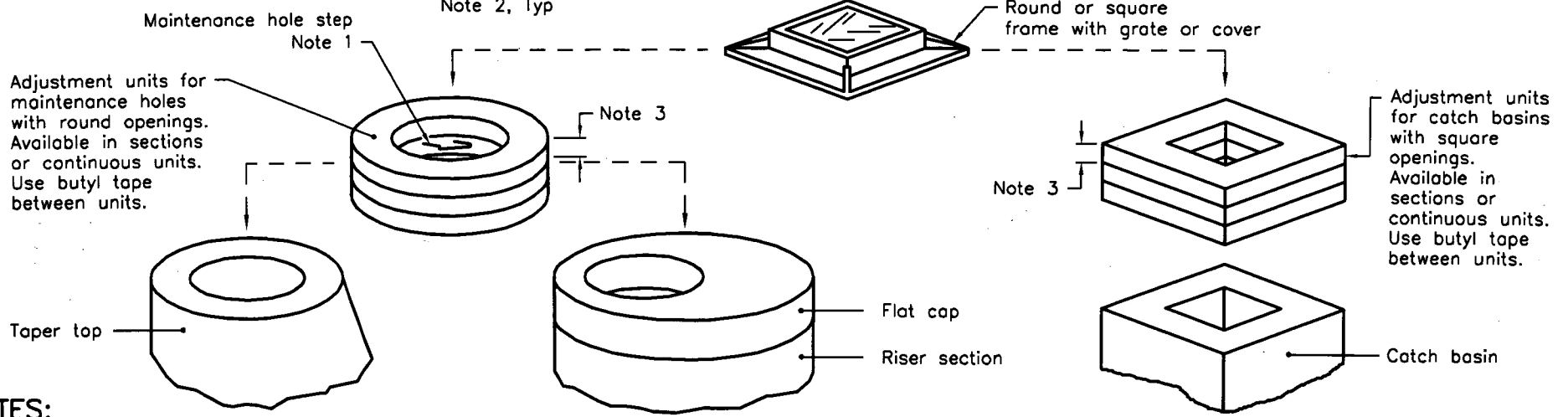
- 1 Depth of frost strap shall be as specified.
- A Frost straps shall be placed so they do not interfere with sewer pipe openings and the steps.
- B Frost straps shall be placed when specified.
- C Galvanizing shall be according to CAN/CSA G164.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2010	Rev	2
FROST STRAP INSTALLATION		-----		

				
		OPSD 701.100		



Reinforce each adjustment unit with a minimum of 1 wire with an end area of at least 15mm². Lap wire 150mm or butt weld. Note 2, Typ



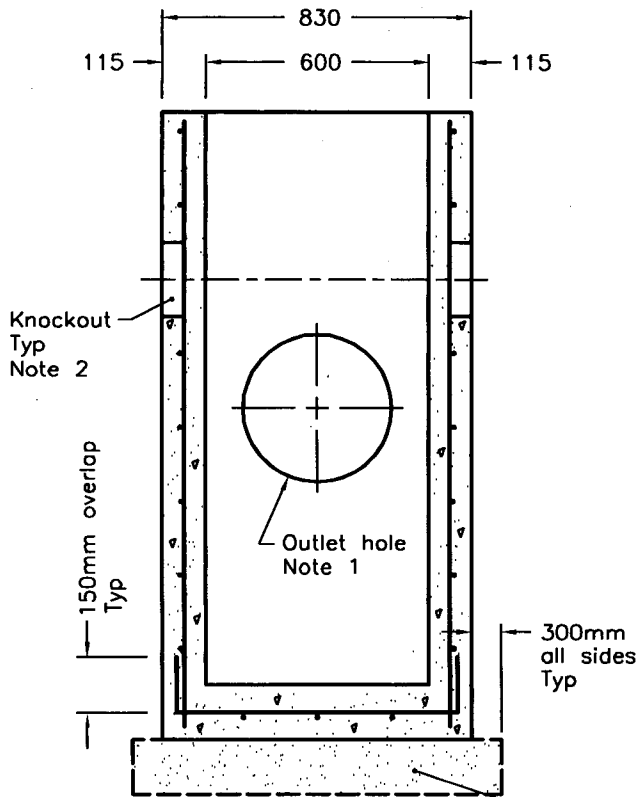
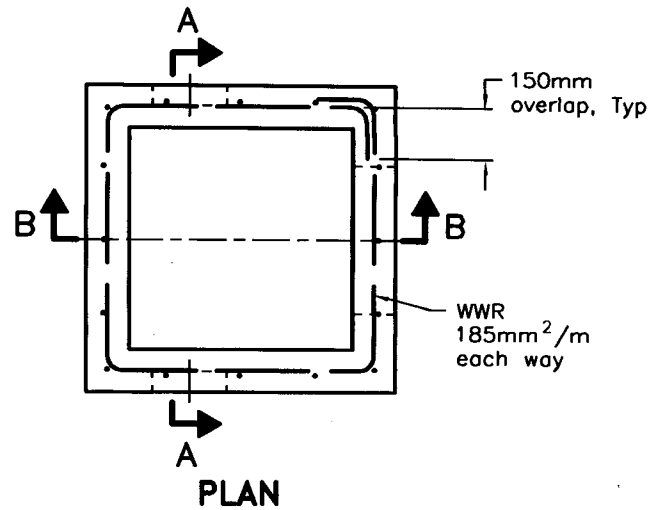
NOTES:

- 1 If first step is in an adjustment unit, the adjustment unit shall be of the type manufactured with a step in place.
- 2 Centre reinforcing in adjustment unit ± 10 mm.
- 3 Round and square adjustment units are available in sizes of 50, 75, 100, 150, and 300mm.

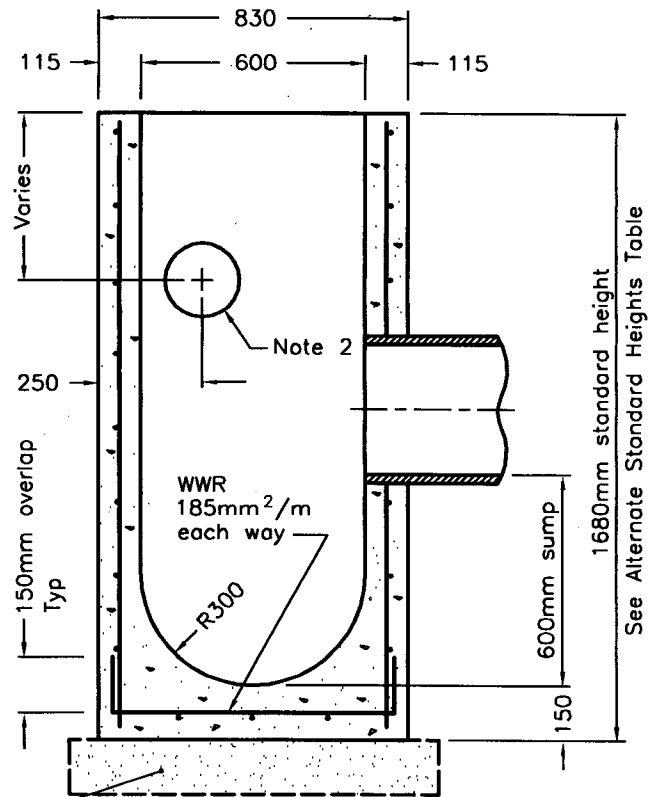
A Adjustment units shall not extend beyond the outside edge of the structure.
 B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3	
PRECAST CONCRETE ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS	----- -----		
OPSD 704.010			

ALTERNATE STANDARD HEIGHTS	
ALTERNATIVE	DIMENSION
A	1980
B	1830
C	1520
D	1380



SECTION A-A



SECTION B-B

NOTES:

- 1 Outlet hole size 525mm diameter maximum, location as required.
- 2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
- A Centre reinforcing in base slab and walls ± 20 mm.
- B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.

- C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
- D Pipe support shall be according to OPSD 708.020.
- E All dimensions are nominal.
- F All dimensions are in millimetres unless otherwise shown.

See Alternate Standard Heights Table

ONTARIO PROVINCIAL STANDARD DRAWING

PRECAST CONCRETE CATCH BASIN

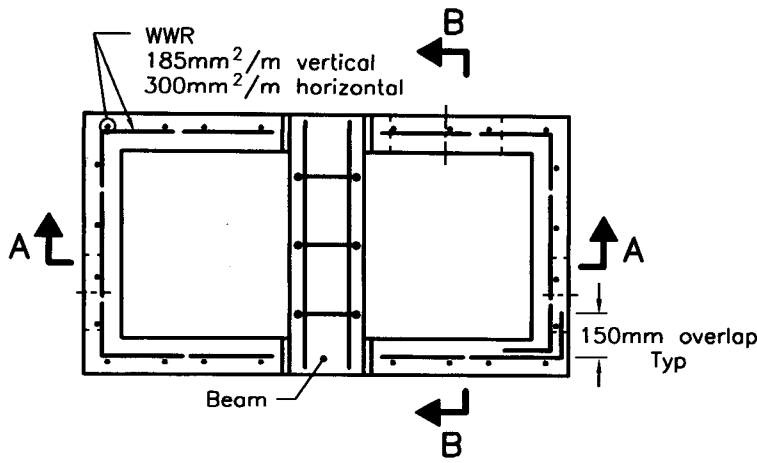
600x600mm

Nov 2014

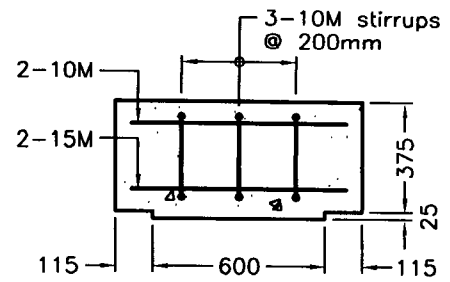
Rev 3



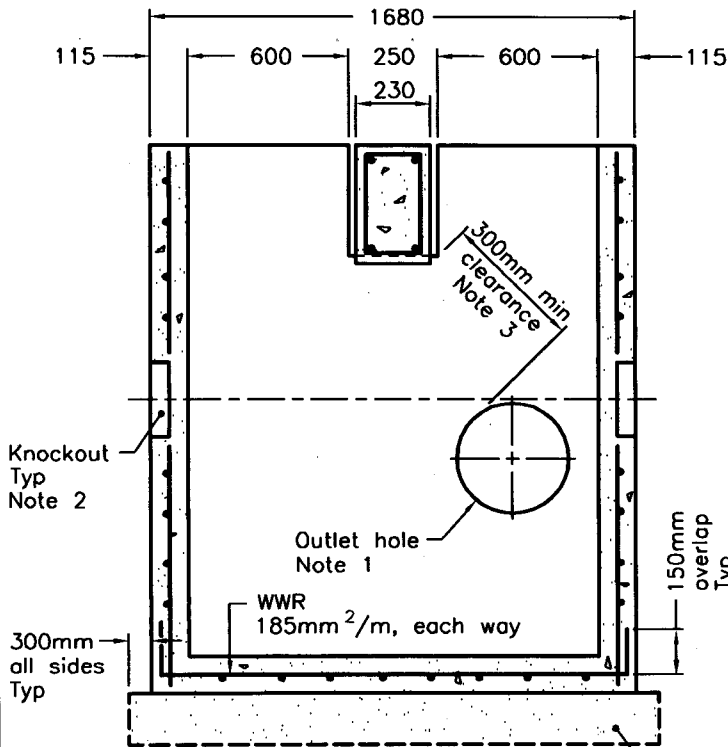
OPSD 705.010



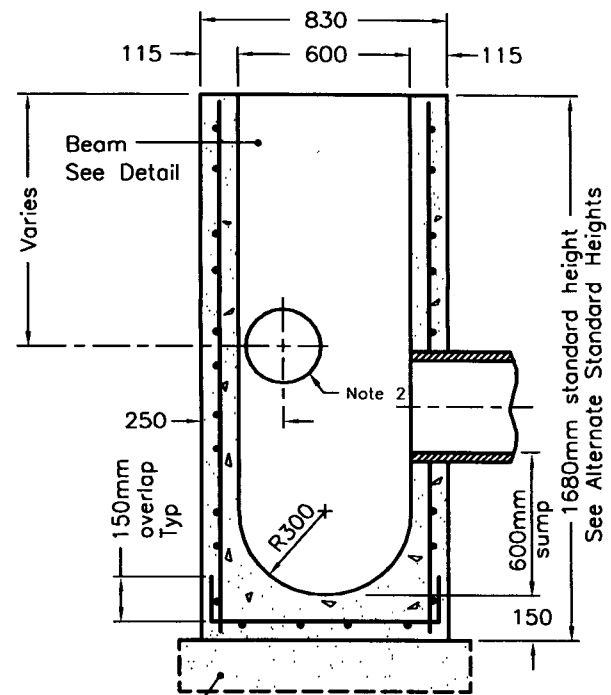
PLAN



BEAM DETAIL



SECTION A-A



SECTION B-B

NOTES:

- 1 Outlet hole size 525mm diameter maximum, location as required.
- 2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
- 3 Minimum clearance between beam recess and hole for pipe shall be 300mm or minimum clearance can be 150mm with addition of two 15M size rebar on 45 degree diagonal.
- A Centre reinforcing in base slab and walls ±20mm.
- B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
- C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
- D Pipe support shall be according to OPSD 708.020.
- E All dimensions are nominal.
- F All dimensions are in millimetres unless otherwise shown.

ALTERNATE STANDARD HEIGHTS	
ALTERNATIVE	DIMENSION
A	1980
B	1830
C	1680

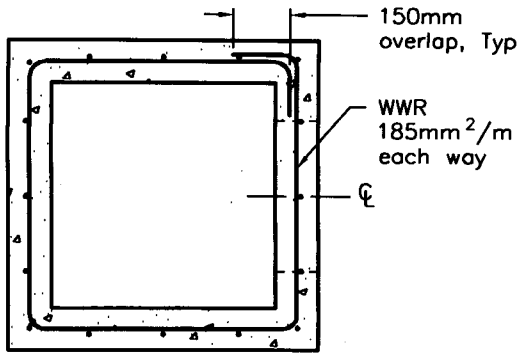
ONTARIO PROVINCIAL STANDARD DRAWING

**PRECAST CONCRETE
TWIN INLET CATCH BASIN
600 x 1450mm**

Nov 2014 | Rev | 3



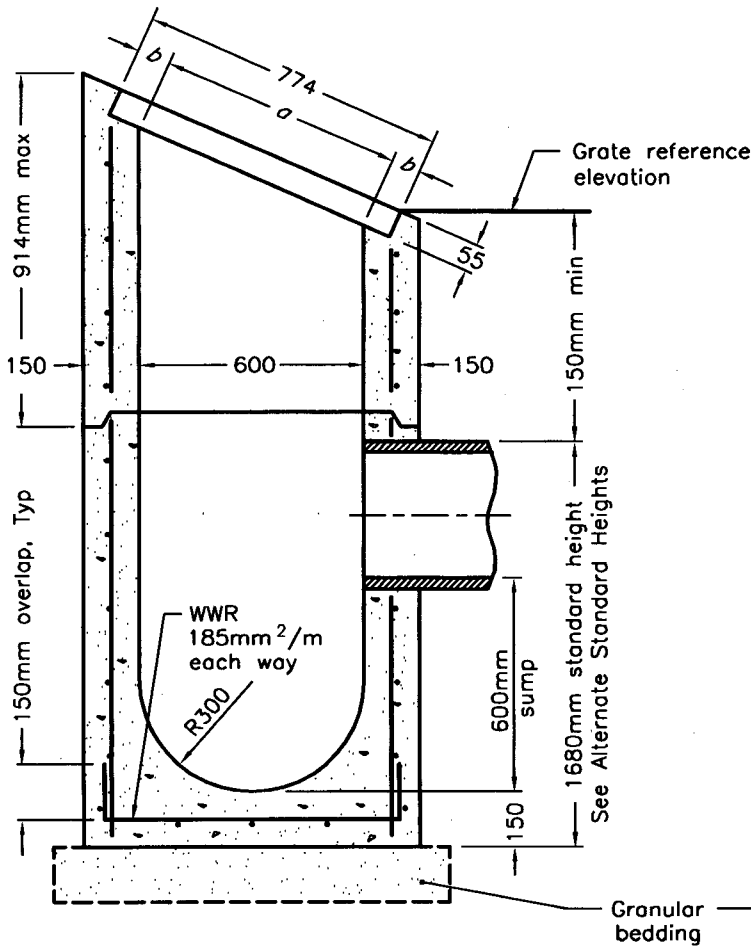
OPSD 705.020



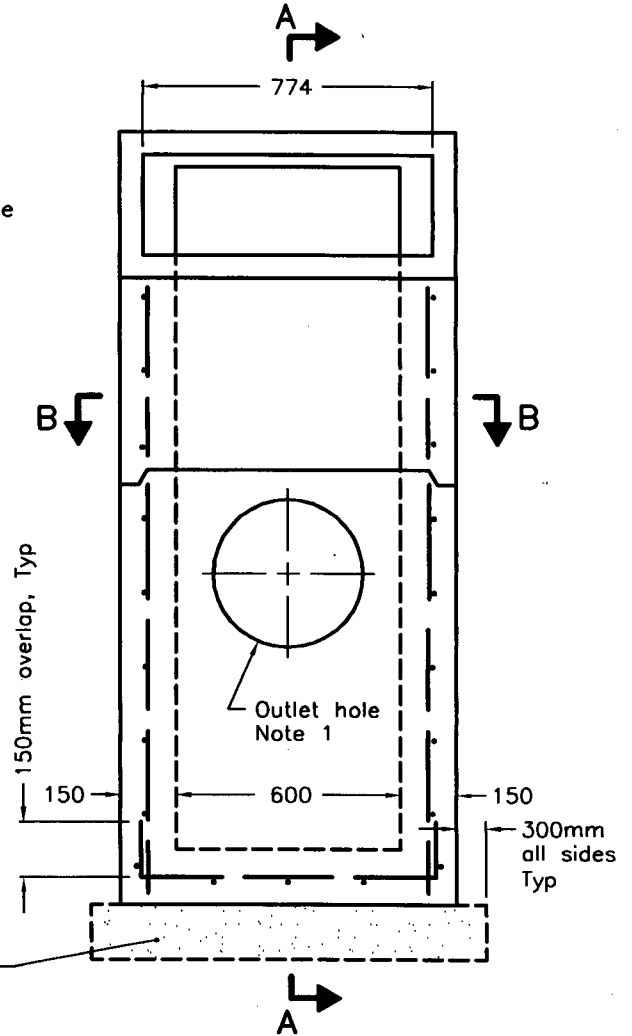
SECTION B-B

Alternate Standard Heights	
Alternate	Dimension
A	1980
B	1520
C	1380

Opening Dimensions			
Grate		a	b
Type	Slope		
A	2H:1V	670	52
	3H:1V	632	71
	4H:1V	618	78
	6H:1V	608	83
	HOR	600	87



SECTION A-A



FRONT VIEW

NOTES:

- 1 Outlet hole size 525mm maximum diameter, location as required.
- A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
- B Center reinforcing in wall and slab ± 25 mm.
- C Granular backfill shall be placed to a minimum thickness of 300mm all around the ditch inlet.
- D Grating shall be according to OPSD 403.010.
- E Pipe support shall be according to OPSD 708.020.
- F All dimensions are nominal.
- G All dimensions are in millimetres unless otherwise shown.

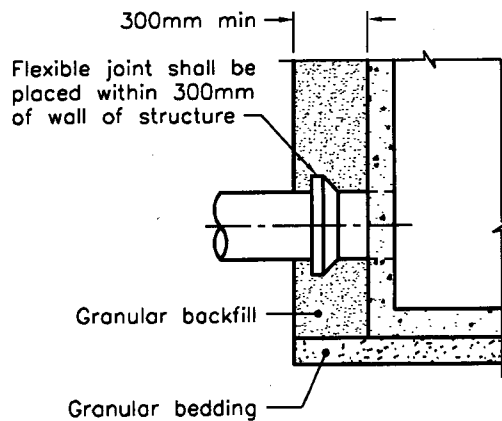
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 Rev 3

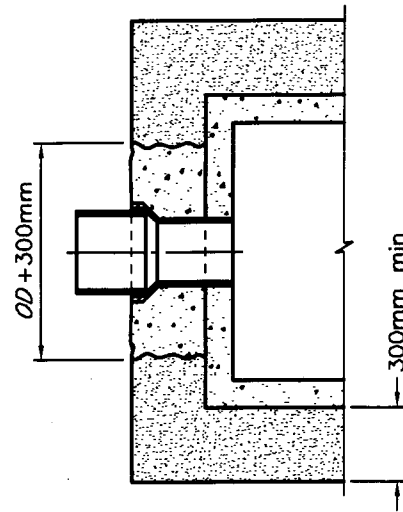
PRECAST CONCRETE DITCH INLET
600 x 600mm



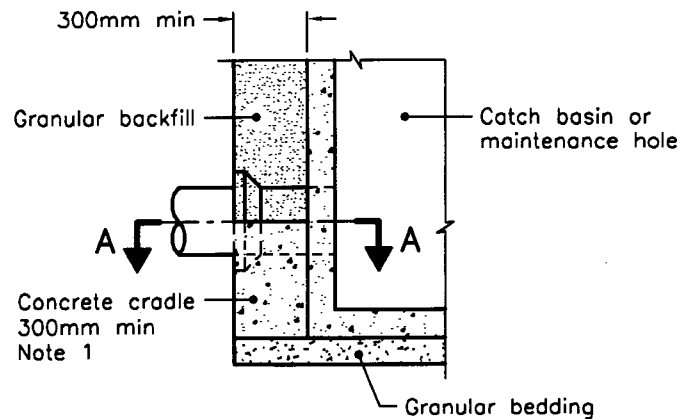
OPSD 705.030



**ELEVATION
FLEXIBLE JOINT
RIGID AND FLEXIBLE PIPE**



SECTION A-A




**ELEVATION
CONCRETE CRADLE
RIGID PIPE**

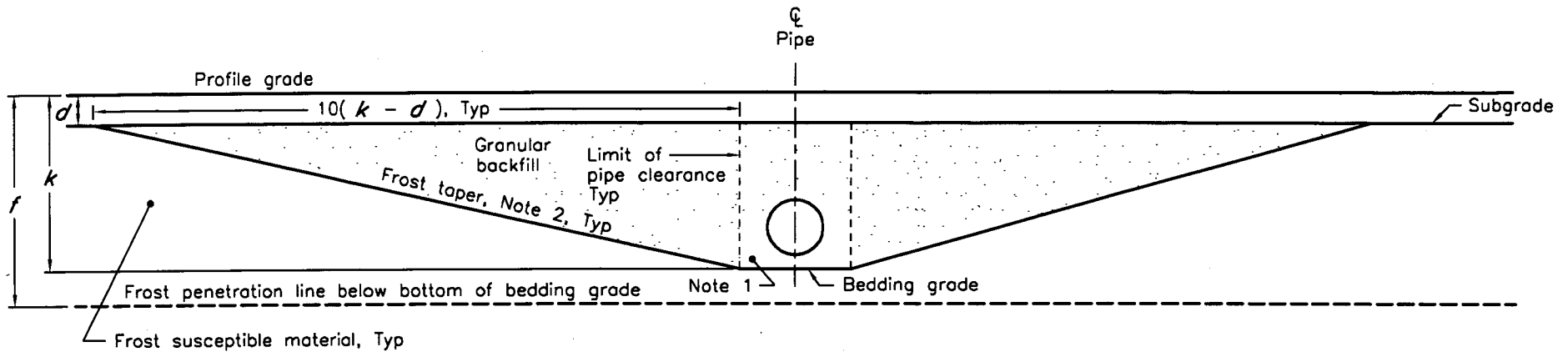
For installation of these connectors refer to manufacturer's instructions.
A full length of pipe may be used in conjunction with a flexible watertight connector.

**FLEXIBLE, WATERTIGHT CONNECTOR
RIGID AND FLEXIBLE PIPE**

NOTES:

- 1 Pipe shall be supported with concrete or unshrinkable fill to the first pipe joint.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2011	Rev 3	
SUPPORT FOR PIPE AT CATCH BASIN OR MAINTENANCE HOLE			
OPSD 708.020			



FROST TREATMENT – RIGID AND FLEXIBLE PIPE

NOTES:

- 1 Pipe embedment or bedding, cover, and backfill shall be according to:
- Flexible – OPSD 802.010, 802.013, 802.014, 802.020, 802.023, and 802.024
 - Rigid – OPSD 802.030, 802.031, 802.032, 802.033, 802.034, 802.050, 802.051, 802.052, 802.053, and 802.054.
- 2 Frost tapers shall start at bedding grade.

LEGEND:

- d – depth of roadbed granular
- k – depth of frost treatment below profile grade
- f – depth of frost penetration below profile grade

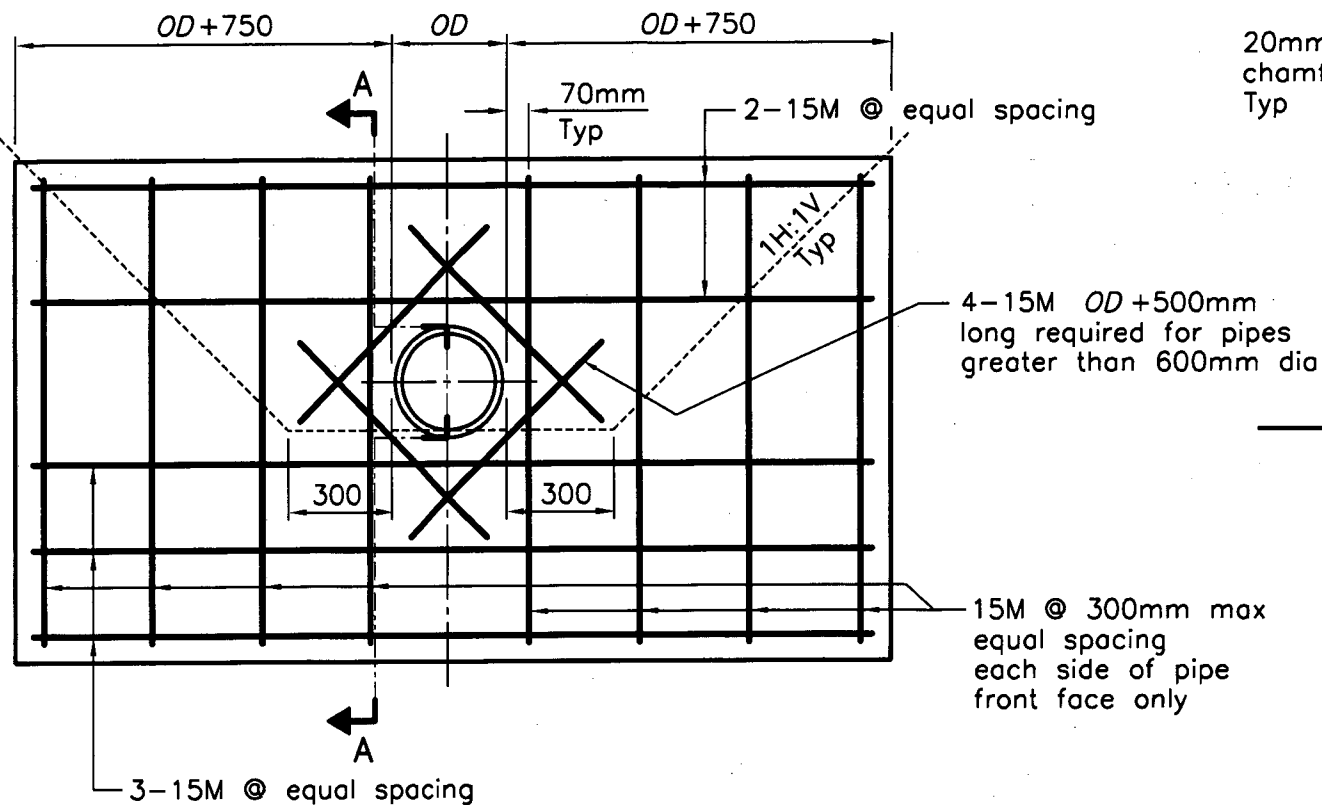
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 2

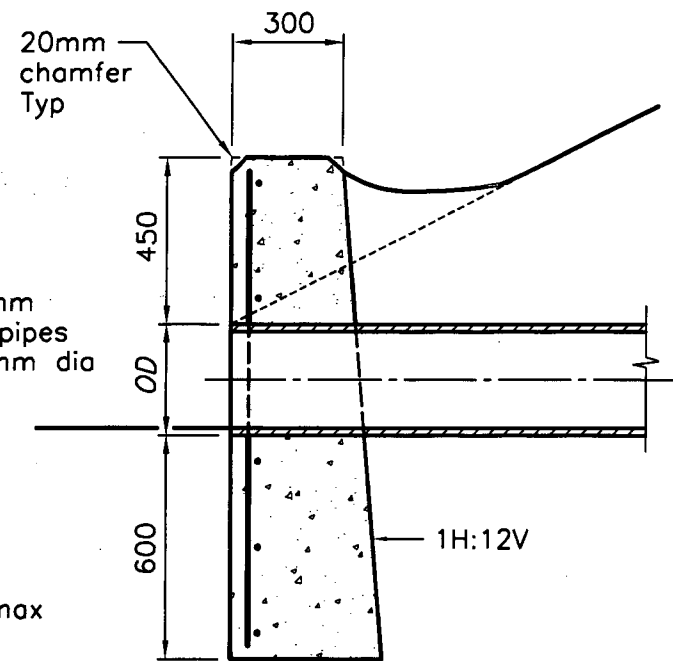
FROST TREATMENT – PIPE CULVERTS
FROST PENETRATION LINE BELOW
BEDDING GRADE



OPSD 803.030



FRONT ELEVATION




SECTION A-A

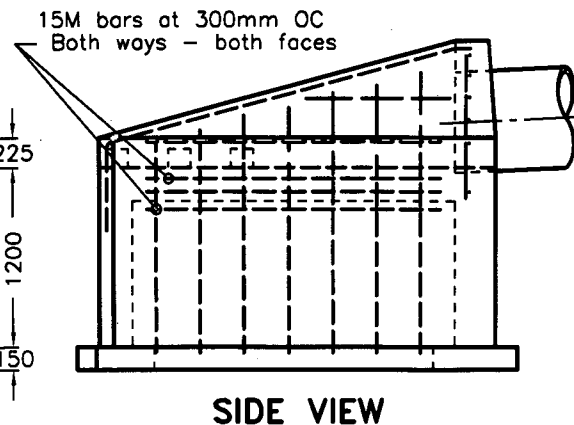
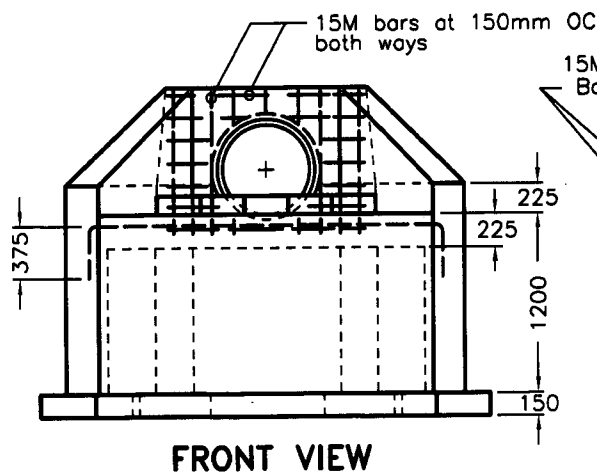
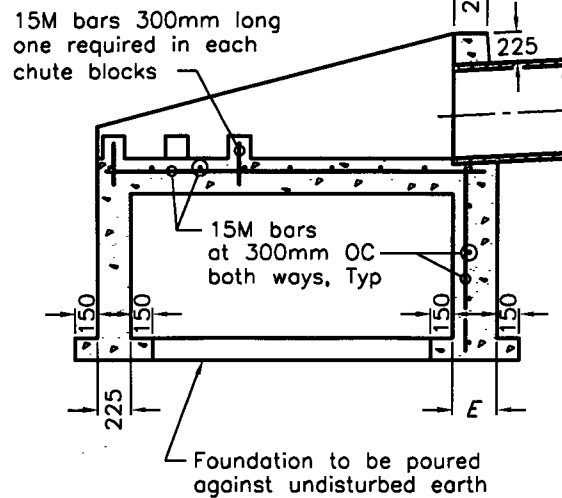
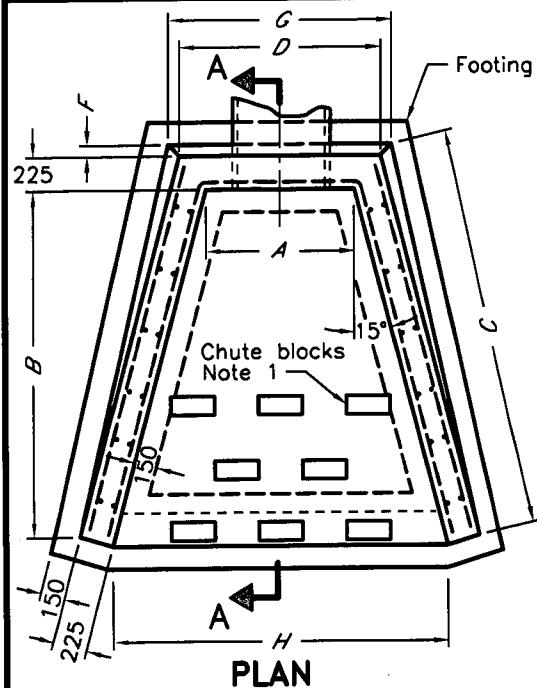
LEGEND:

OD - Outside diameter of pipe

NOTES:

- A This OPSD to be read in conjunction with OPSD 3940.150.
- B If a steel grate is required, refer to OPSD 804.05.
- C Class of concrete: 30MPa.
- D Cover to reinforcing bars 75mm ± 20mm.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev 1	
CONCRETE HEADWALL			
FOR PIPE LESS THAN 900mm DIAMETER			OPSD 804.030

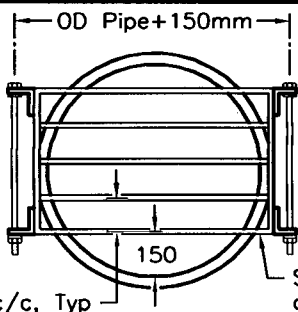


PIPE DIA	ENDWALL DIMENSIONS							
	A	B	C	D	E	F	G	H
600	1050	2400	2725	1400	300	75	1525	2350
675	1125	2400	2725	1475	300	75	1600	2425
750	1200	2400	2725	1550	300	75	1675	2500
825	1275	2400	2725	1625	300	75	1755	2575
900	1350	2400	2725	1700	300	75	1825	2650
975	1425	2400	2725	1775	375	150	1975	2725
1050	1500	3000	3400	1850	375	150	2050	3100
1200	1650	3000	3400	2000	375	150	2200	3250
1350	1800	3000	3400	2150	375	150	2350	3400
1500	1950	3000	3400	2300	375	150	2500	3550
1650	2100	3000	3400	2450	375	150	2650	3700
1800	2250	3000	3400	2600	375	150	2800	3850
2400	3000	3000	3400	3350	375	150	3550	4600

NOTES:

- 1 Poured concrete chute blocks 300x200x100mm high.
- A This OPSD to be read in conjunction with OPSD 3940.150.
- B Class of concrete: 30MPa.
- C Cover to reinforcing bars: 75mm ±20mm.
- D Granular backfill to be placed to 300mm min thickness on all sides.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev 0	
CONCRETE HEADWALL			
FOR SEWER OR CULVERT PIPE OUTLET			
OPSD 804.040			



125mm c/c, Typ

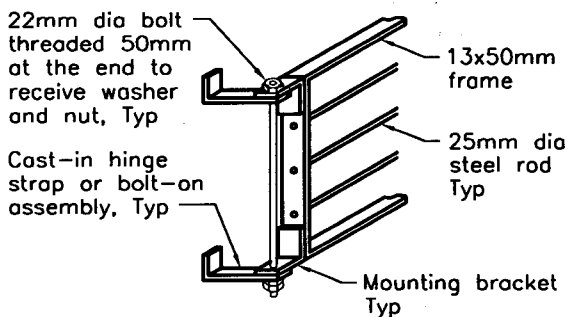
See assembly details and Table 1

TABLE 1 - NUMBER OF RODS IN FRAME	
PIPE DIA	No of RODS
450	1
525	1
600	2
675	3
750	3
825	4
900	4
975	5
1050	6
1200	7

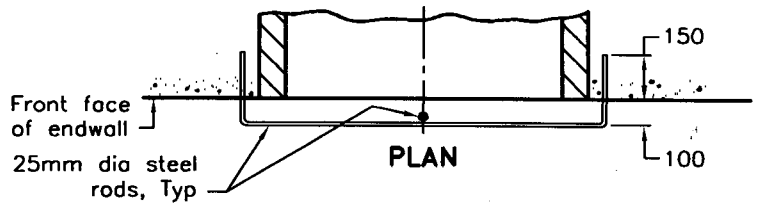
PIPE DIA up to 1200mm

TABLE 2 - NUMBER OF RODS IN FIXED UPPER FRAME	
PIPE DIA	No of RODS
1350	1
1500	2
1650	3
1800	4
1950	5
2100	6
2250	7
2400	8

PIPE DIA 1350 to 2400mm



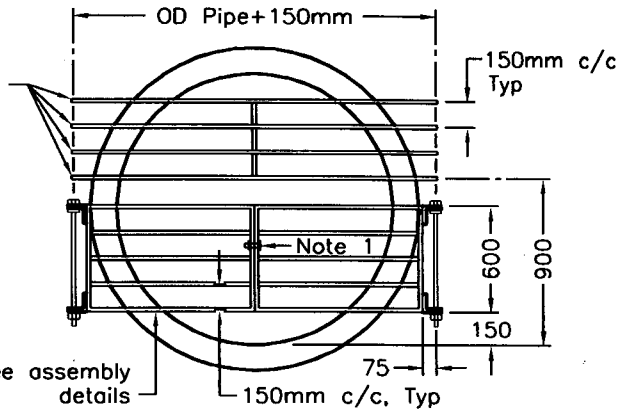
ASSEMBLY



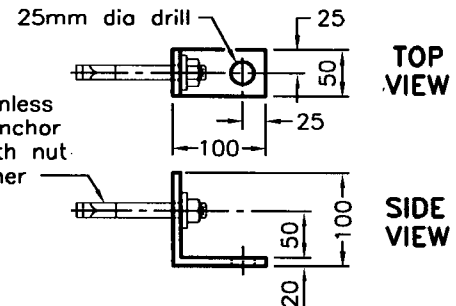
Front face of endwall
25mm dia steel rods, Typ

PLAN

Fixed rods Table 2



See assembly details

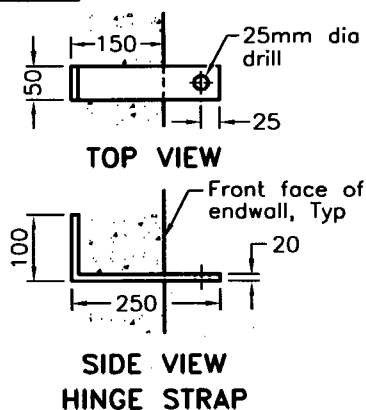


Type 304 stainless steel wedge anchor 16x150mm with nut and lock washer

TOP VIEW

SIDE VIEW

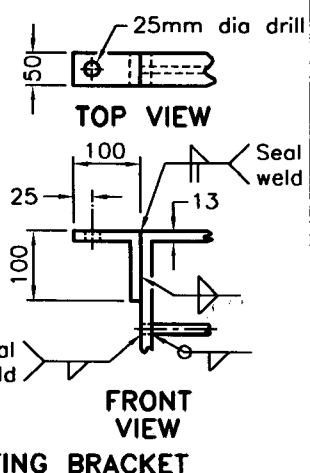
BOLT-ON ASSEMBLY DETAIL



TOP VIEW

Front face of endwall, Typ

SIDE VIEW
HINGE STRAP



TOP VIEW

Seal weld

SIDE VIEW

FRONT VIEW

MOUNTING BRACKET

CAST-IN HINGE STRAP ASSEMBLY DETAILS

NOTES:

- 1 Grates shall be secured by either a bolt and nut or a locking device as specified.
- A Metal surfaces shall be either painted with 2 coats of self priming abrasion resistant immersion grade epoxy or hot dip galvanized, as specified.
- B Frame, hinge strap, mounting bracket, and steel rods shall be medium grade steel.
- C All welding shall be according to CSA W59 and W47.1.
- D All dimensions are in millimetres unless otherwise shown.

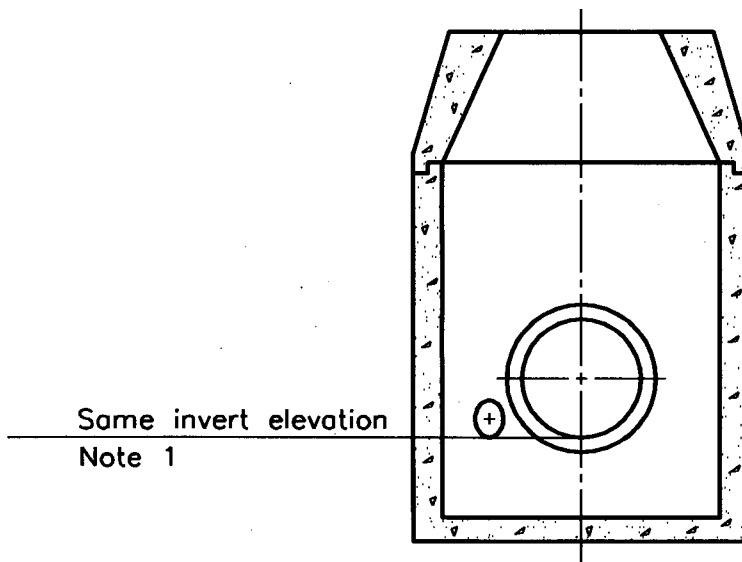
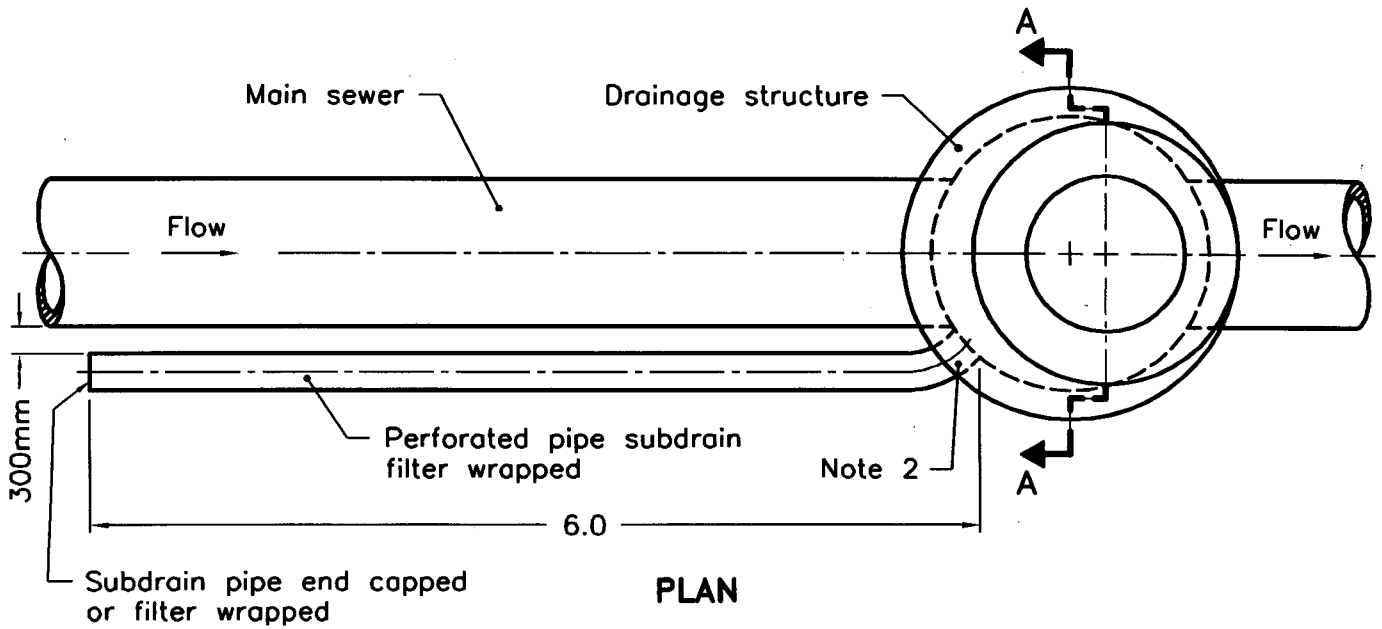
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 Rev 1

GRATING
FOR CONCRETE ENDWALL



OPSD 804.050



NOTES:

- 1 Where concrete bedding is used for the main sewer, the pipe subdrain shall be placed 150mm above the top of such bedding.
 - 2 Subdrain pipe shall be cored into maintenance hole.
- A Maintenance hole benching shall accommodate pipe subdrain, as required.
 B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

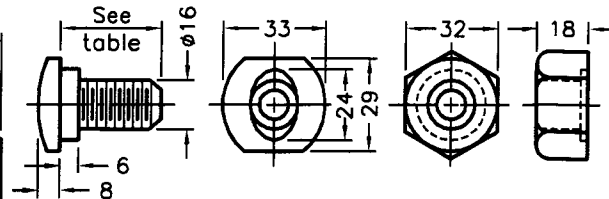
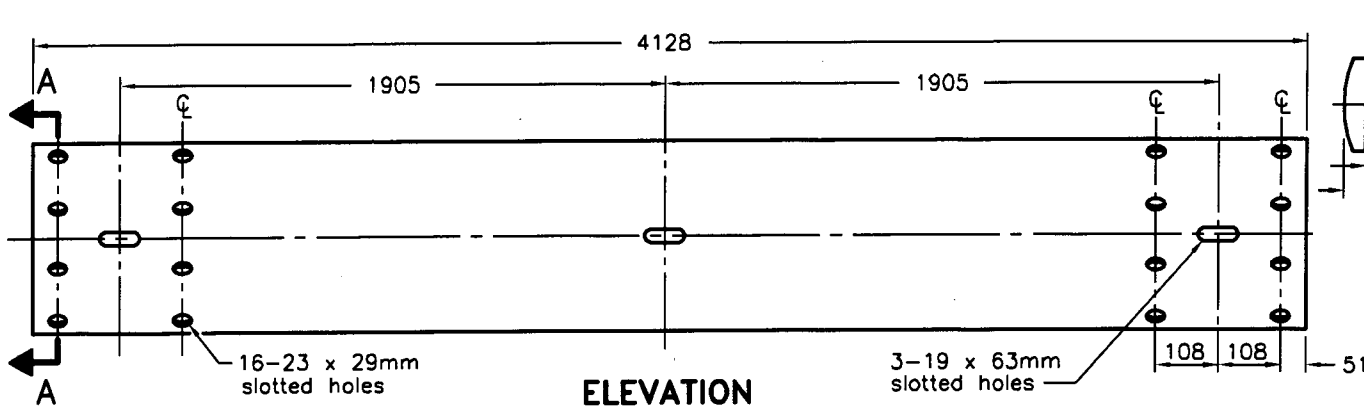
**PERFORATED PIPE SUBDRAIN
 IN GRANULAR TRENCH
 MAIN STORM SEWER CONNECTION
 TO DRAINAGE STRUCTURE**

Nov 2013

Rev 3

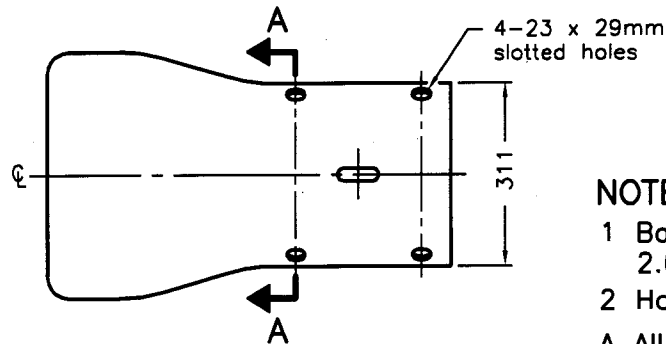
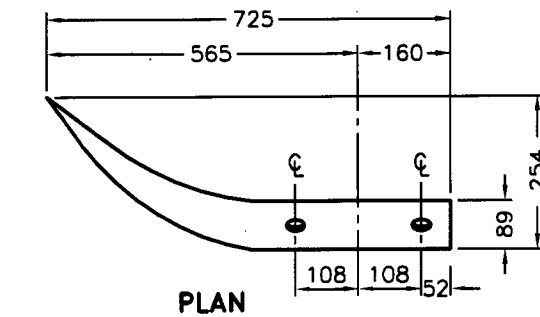
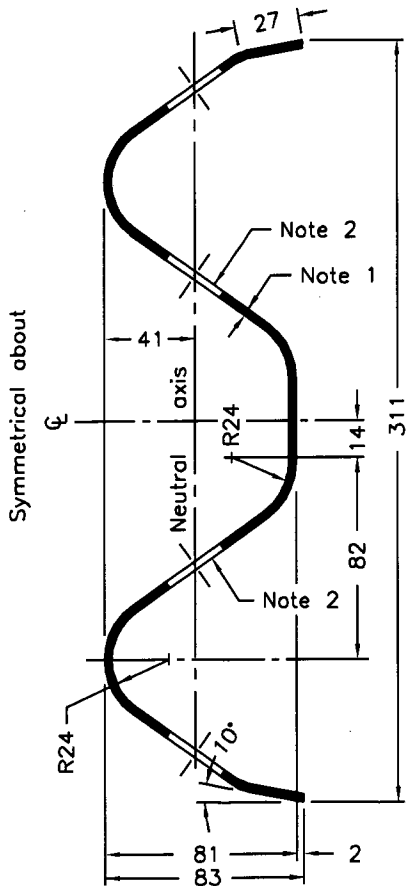


OPSD 809.010

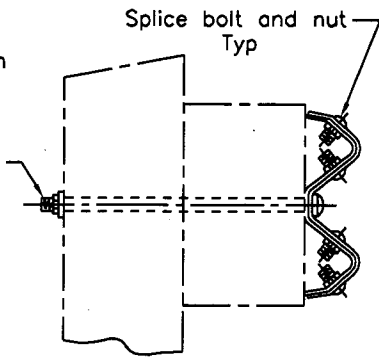


SPLICE BOLT AND NUT

SPLICE BOLT LENGTH	
LOCATION	LENGTH
At posts	32
At structure anchor	38



Post bolt and nut with washer as specified on assembly drawings OPSD 912.130, 912.140, and 912.141



ARRANGEMENT AT POST WOODEN POST SHOWN

NOTES:

- 1 Base metal thickness of rail shall be 2.67mm nominal and 2.44mm minimum.
 - 2 Holes only in rail.
- A All dimensions subject to manufacturing tolerances unless otherwise indicated.
- B All dimensions are in millimetres unless otherwise shown.

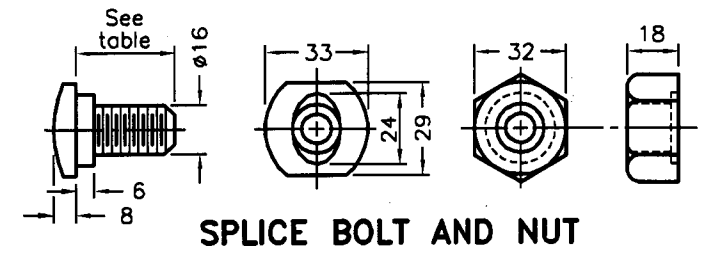
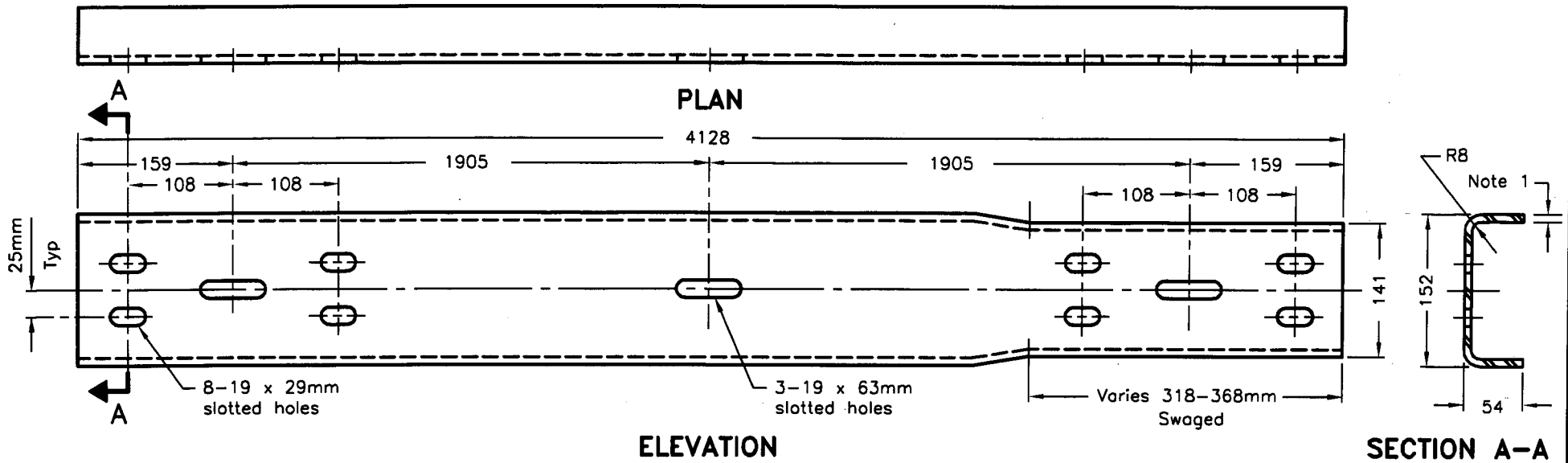
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 2

GUIDE RAIL SYSTEM, STEEL BEAM
RAIL
COMPONENT

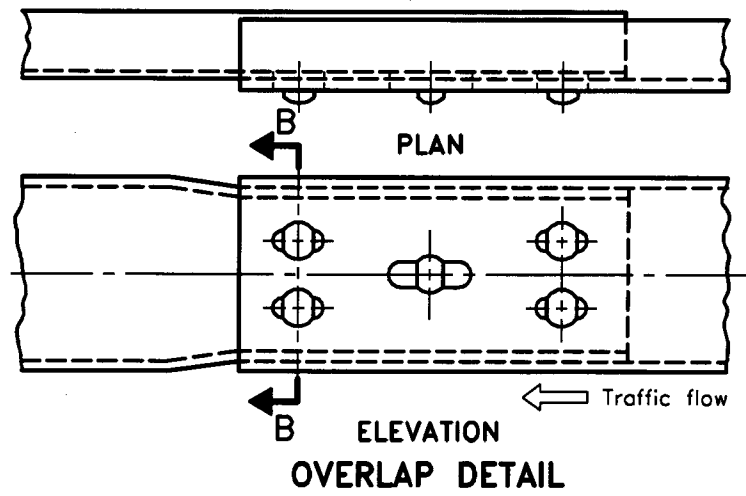


OPSD 912.101



SPLICE BOLT AND NUT

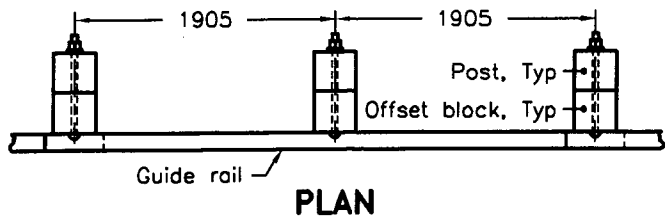
SPLICE BOLT LENGTH	
LOCATION	LENGTH
At posts	32
At structures	64



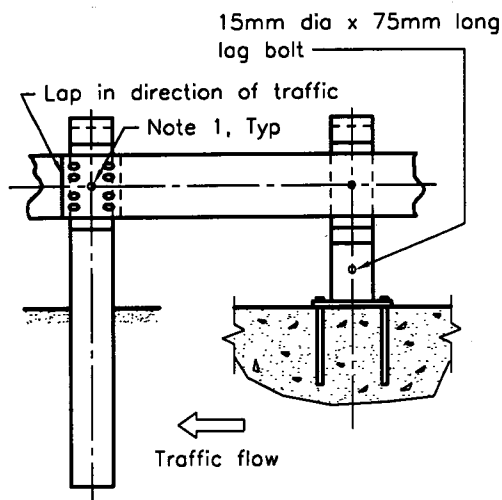
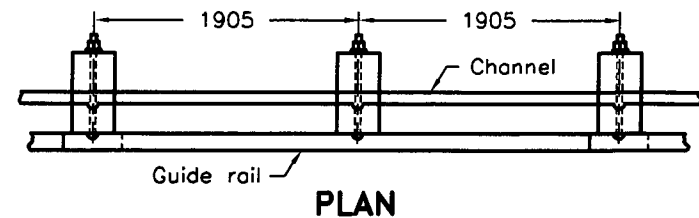
OVERLAP DETAIL

NOTES:
 1 Base metal thickness of channel shall be 4.0mm nominal and 3.8mm minimum.
 A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING GUIDE RAIL SYSTEM, STEEL BEAM CHANNEL COMPONENT	Nov 2010 Rev 1 _____ _____ OPSD 912.102	
---	---	--

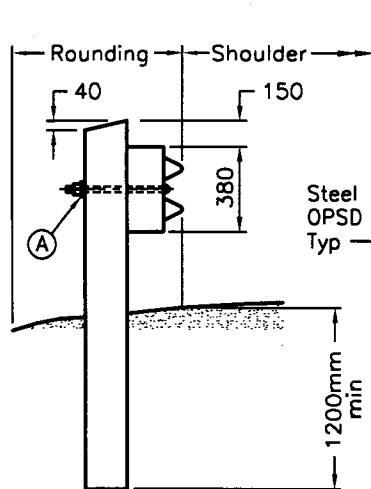


POST BOLT AND HOLE	
Hole Dia	Post Bolt Size and Type
(A) 18	16x460 BH
(B) 18	16x310 CaB

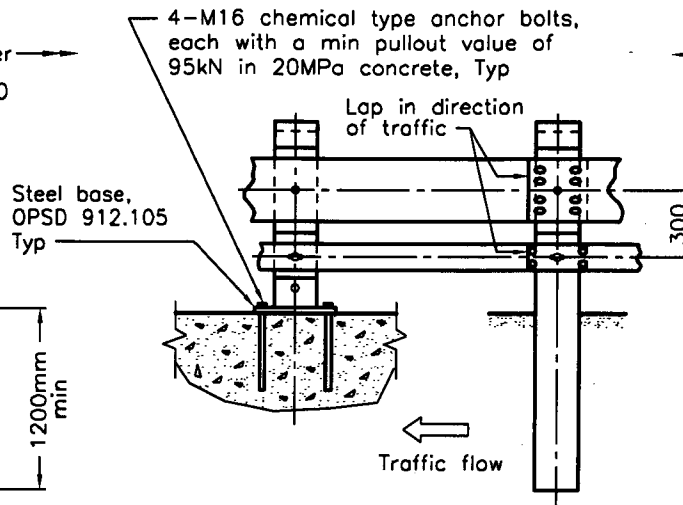


ELEVATION

SINGLE RAIL

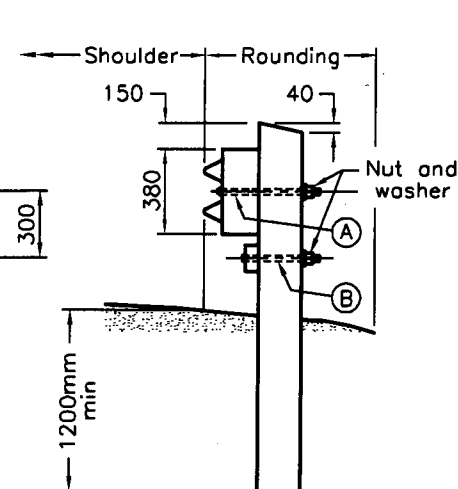


SIDE VIEW



ELEVATION

SINGLE RAIL WITH CHANNEL



SIDE VIEW

NOTES:

1 Washer shall not be installed at front face of rail. One bolt located at centre of steel beam guide rail.

A Wooden posts and offset blocks shall be 190x190mm. Tops to have 25mm chamfer.

B Steel beam guide rail mounting heights shall be as specified.

C This OPSD to be read in conjunction with OPSD 912.101 and 912.102.

D All dimensions are in millimetres unless otherwise shown.

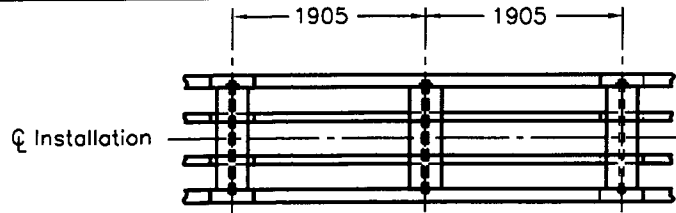
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 Rev 2

GUIDE RAIL SYSTEM, STEEL BEAM
WOODEN POST ASSEMBLY
INSTALLATION - SINGLE RAIL

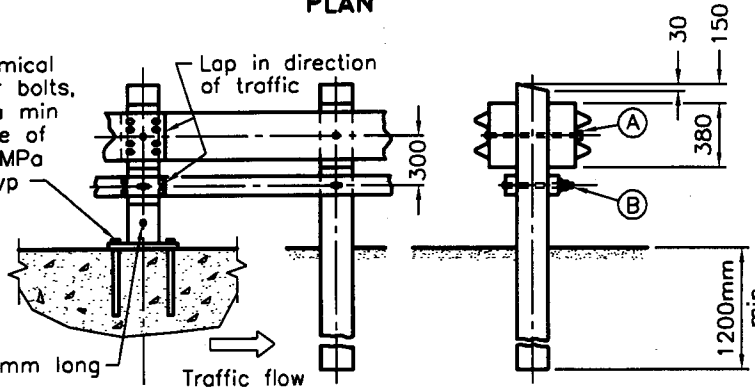


OPSD 912.140



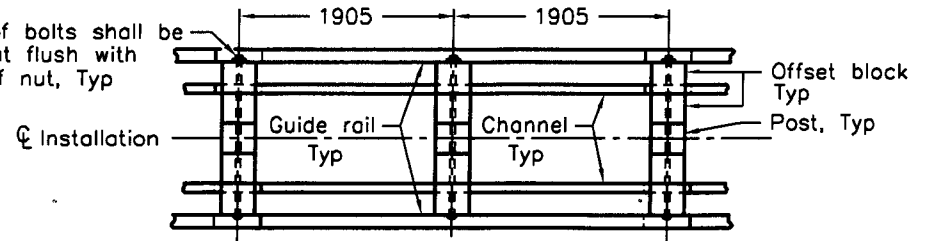
PLAN

4-M16 chemical type anchor bolts, each with a min pullout value of 95kN in 20MPa concrete, Typ

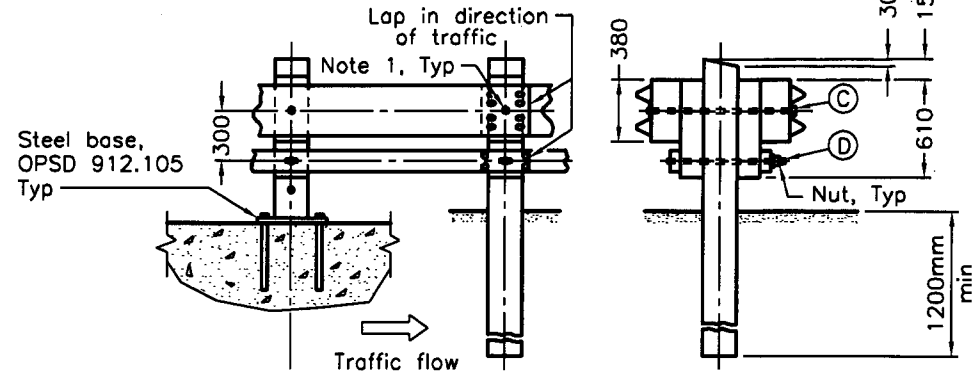


ELEVATION SIDE VIEW
DOUBLE RAIL WITH CHANNEL

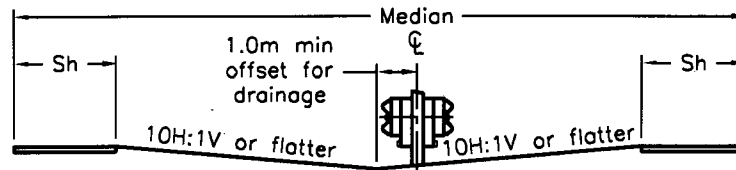
Ends of bolts shall be saw cut flush with face of nut, Typ



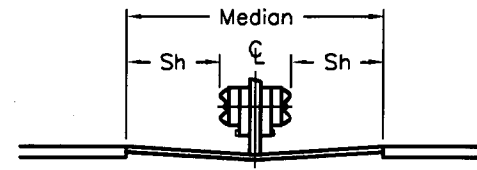
PLAN



ELEVATION SIDE VIEW
DOUBLE OFFSET RAIL WITH CHANNEL



WIDE MEDIAN



NARROW MEDIAN

NOTES:

- 1 Washer shall not be installed at front face of rail. One bolt located at centre of steel beam guide rail.
- A For double rail with channel, wooden posts and offset blocks shall be 190x190mm. Tops to have 25mm chamfer.
- B For double offset rail with channel, wooden posts shall be 190x190mm and offset blocks shall be 190x140mm. Tops to have 25mm chamfer.
- C Steel beam guide rail mounting heights shall be as specified.

- D This OPSD to be read in conjunction with OPSD 912.101 and 912.102.
- E All dimensions are in millimetres unless otherwise shown.

POST BOLT AND HOLE

	Hole Dia	Post Bolt Size and Type
(A)	18	16x660 BH
(B)	18	16x355 CaB
(C)	18	16x860 BH
(D)	18	16x660 CaB

ONTARIO PROVINCIAL STANDARD DRAWING

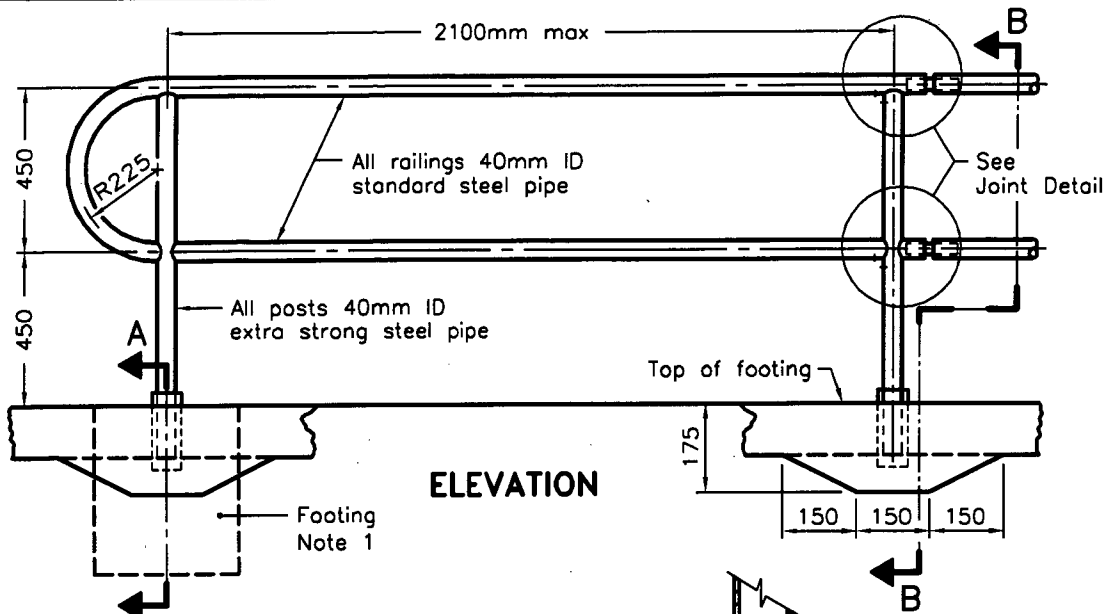
Nov 2010

Rev 2

GUIDE RAIL SYSTEM, STEEL BEAM
WOODEN POST ASSEMBLY
INSTALLATION - DOUBLE RAIL

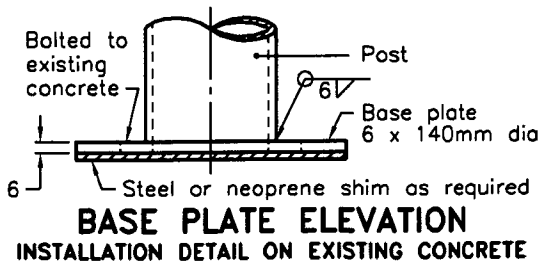
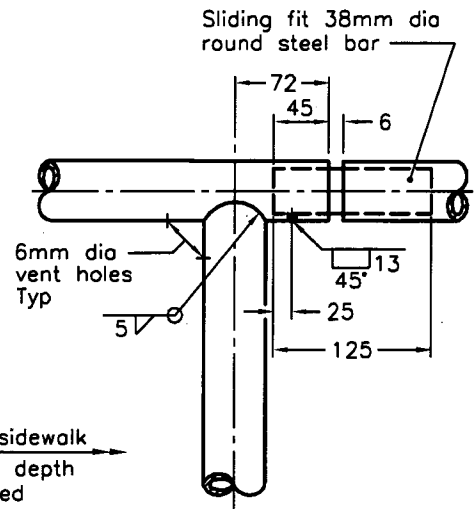
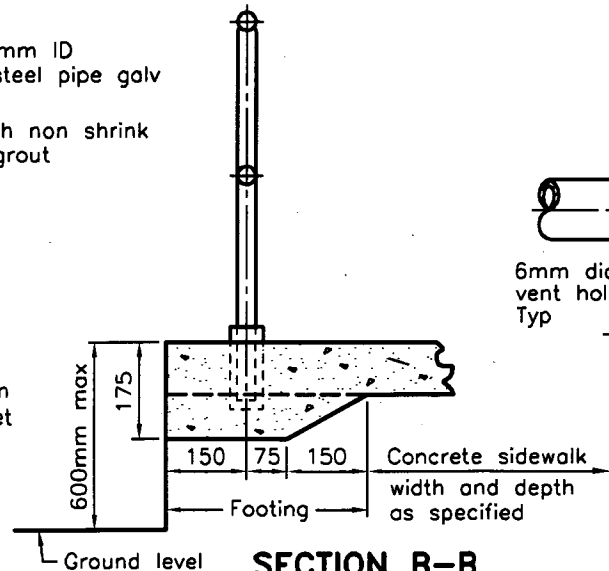
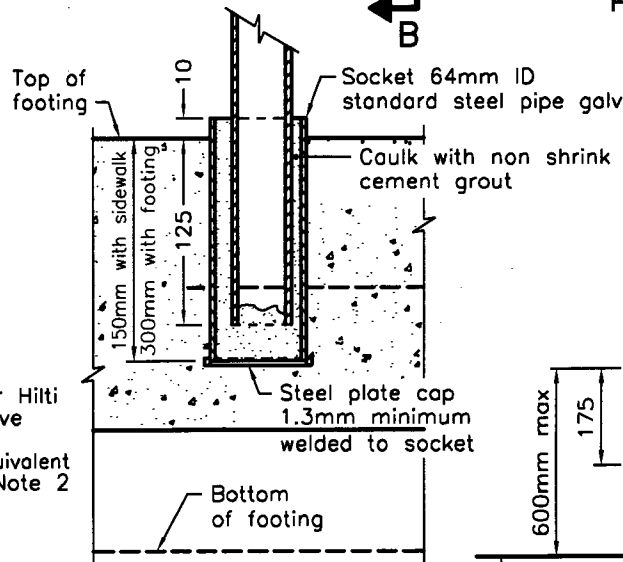
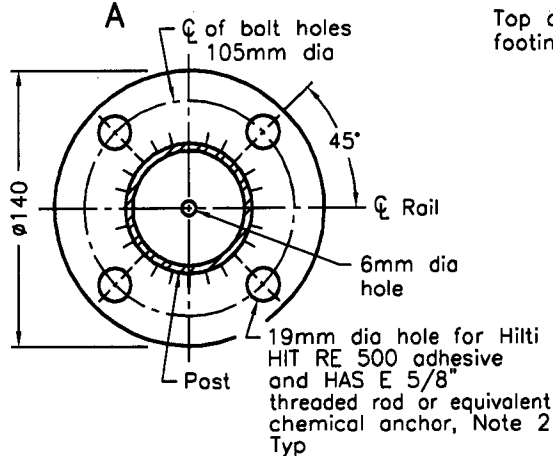
OPSD 912.141




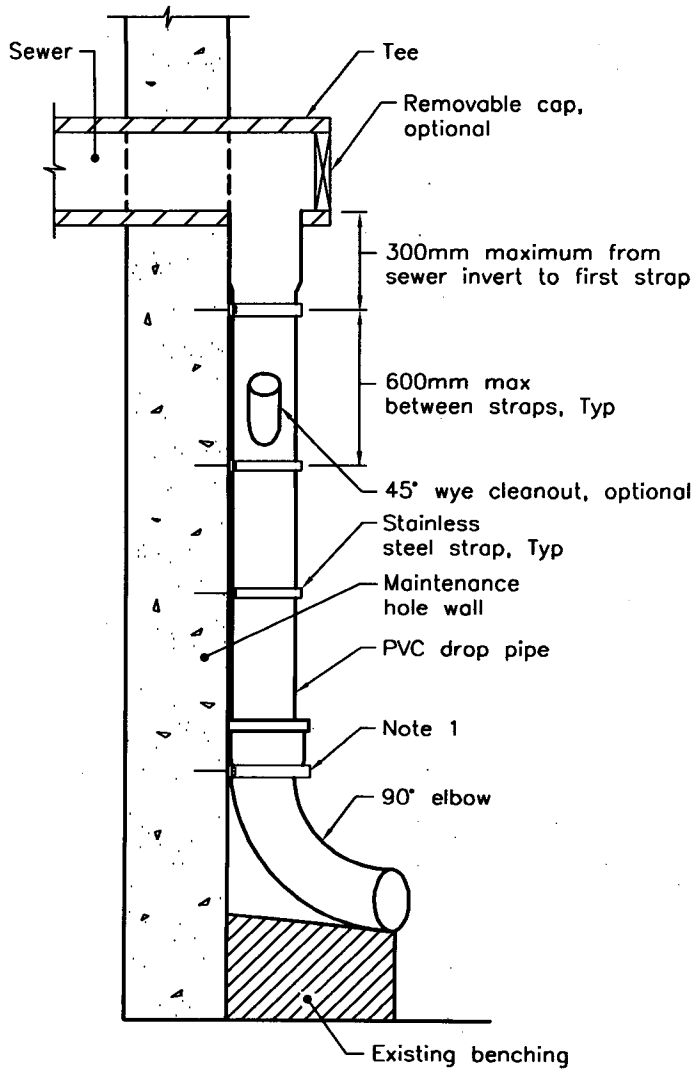


NOTES:

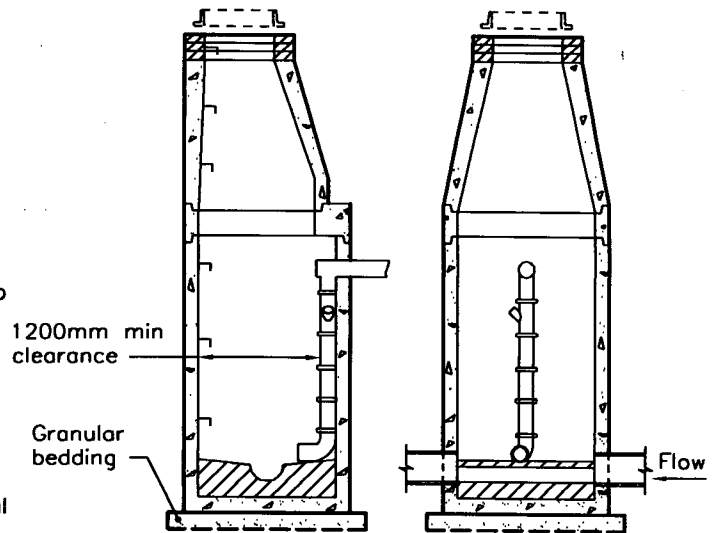
- 1 When sidewalk is not specified, posts shall be set in centre of 300mm dia x 450mm deep or 300 x 300 x 375mm deep concrete footings.
 - 2 Anchors shall be installed according to manufacturer's specifications.
- A Concrete shall have a nominal minimum 28-Day compressive strength of 20MPa.
- B Posts and railings shall be hot dip galvanized according to CSA G164 after fabrication.
- C Posts shall be vertical. All exposed corners shall be ground smooth.
- D Welding shall be according to CSA W59.
- E All joints shall be shop welded.
- F Pipe shall be according to ASTM A 53.
- G A difference in elevation between the adjacent ground level and top of footing shall not exceed 600mm.
- H All dimensions are in millimetres unless otherwise shown.



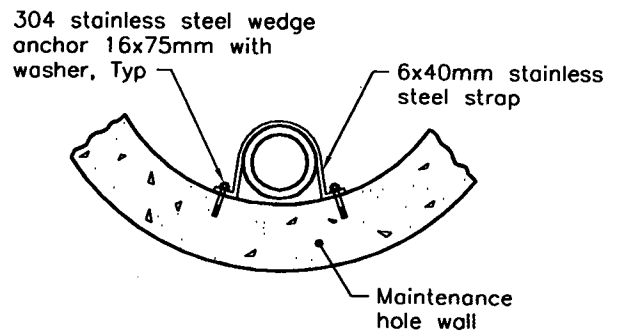
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2009	Rev 2
PEDESTRIAN BARRICADE INSTALLATION		OPSD 980.101	
			



INTERNAL DROP STRUCTURE DETAIL




**SIDE VIEW FRONT VIEW
MAINTENANCE HOLE IN SECTION**

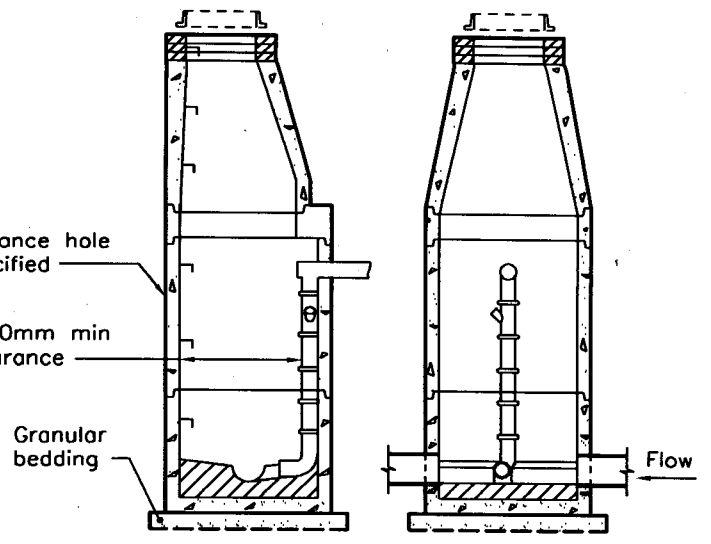
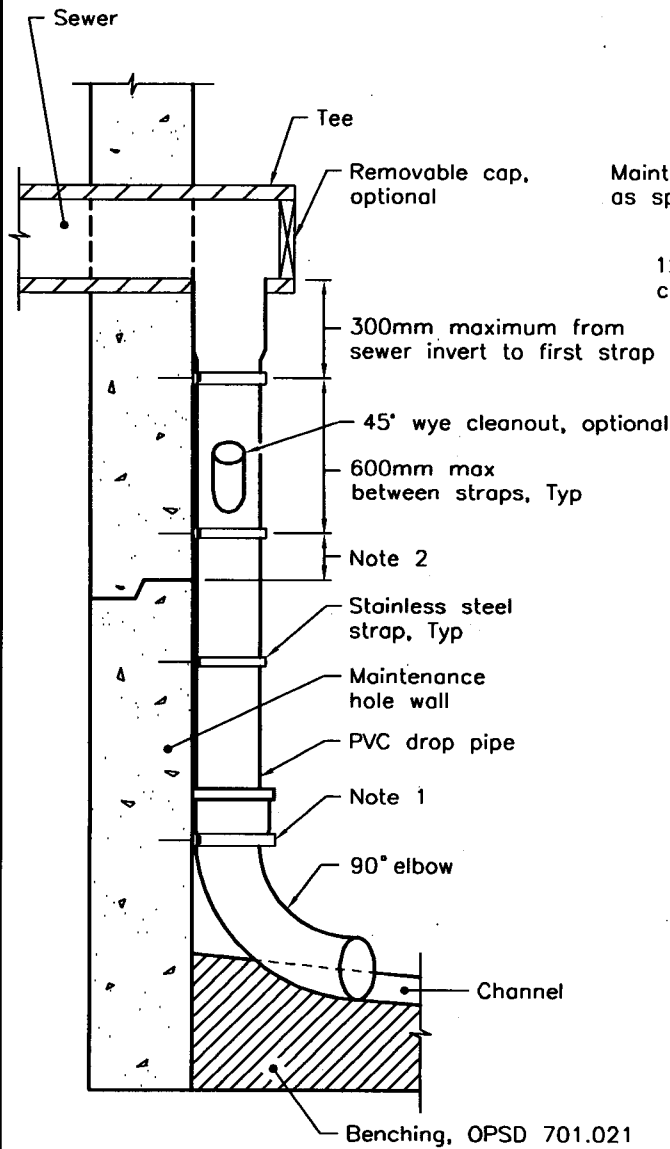


FASTENER DETAIL

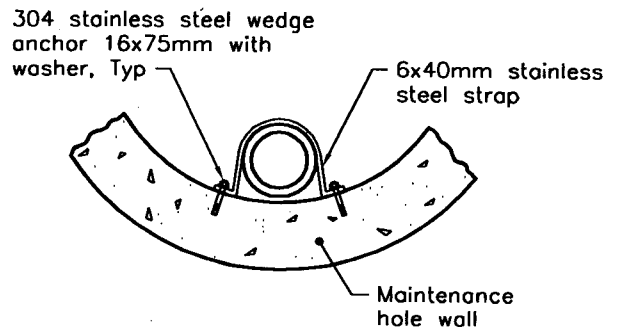
NOTES:

- 1 At the elbow, a stainless steel strap is required at bottom of bell.
- A Internal drop structure shall be used on existing maintenance holes 1500mm diameter and larger with a minimum height of 600mm from the inlet pipe invert to the top of benching. The existing benching shall be modified as required.
- B Drop pipe shall be one size smaller than the incoming sewer with a minimum 150mm diameter and maximum of 375mm diameter. A maximum of 300mm diameter for 1500mm maintenance holes.
- C Straps shall not be placed within 150mm of any maintenance hole section joint.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev	3	
INTERNAL DROP STRUCTURE				
FOR EXISTING MAINTENANCE HOLES				
OPSD 1003.030				



**SIDE VIEW FRONT VIEW
MAINTENANCE HOLE IN SECTION**



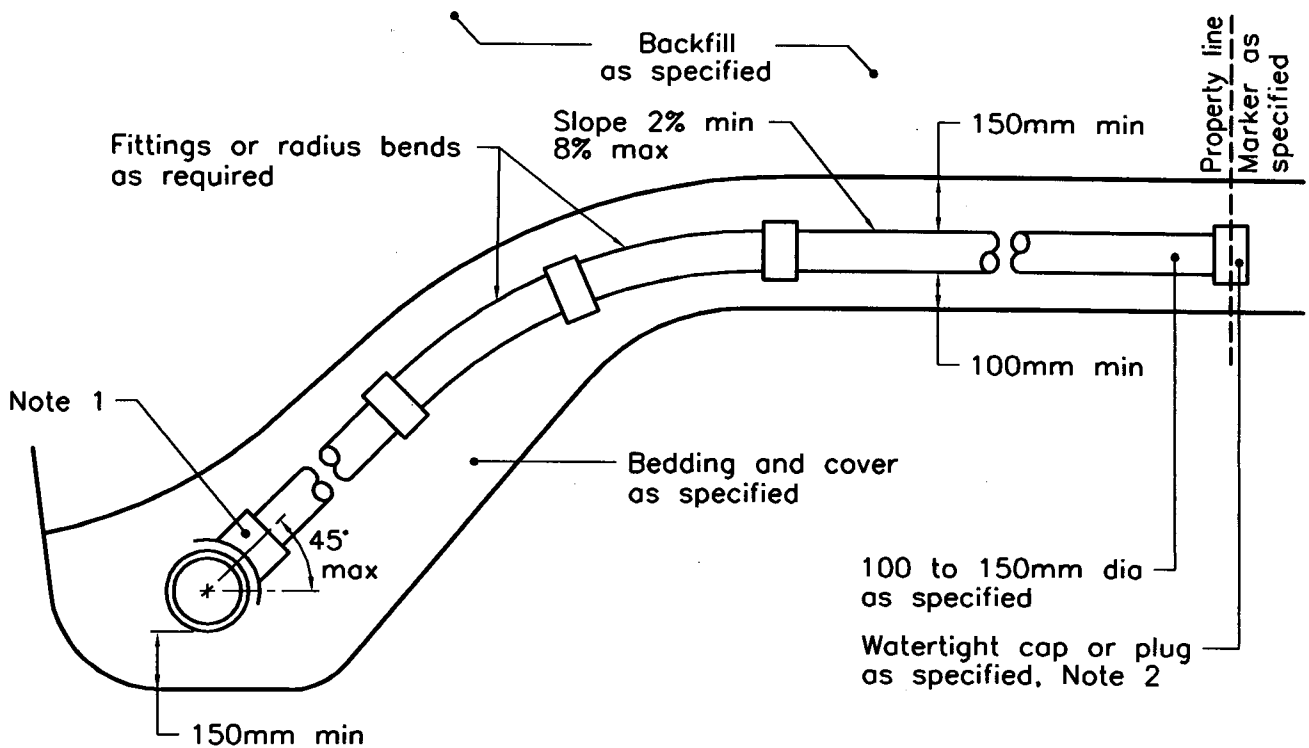
FASTENER DETAIL

INTERNAL DROP STRUCTURE DETAIL

NOTES:

- 1 At the elbow, a stainless steel strap is required at bottom of bell.
- 2 Straps shall not be placed within 150mm of any maintenance hole section joint.
- A Internal drop structure shall be used in maintenance holes 1500mm diameter and larger with a minimum height of 600mm from the inlet pipe invert to the bottom of channel.
- B Drop pipe shall be one size smaller than the incoming sewer with a minimum 150mm diameter and maximum of 375mm diameter. A maximum of 300mm diameter for 1500mm maintenance holes.
- C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev 2	
INTERNAL DROP STRUCTURE			
FOR NEW MAINTENANCE HOLES			
OPSD 1003.031			



NOTES:

- 1 Sewer service connections to the main pipe sewer shall be made using factory made tees or wyes, strap-on-saddles, or other approved saddles.
- 2 Cap or plug at property line shall be adequately braced.
- A Maintenance holes shall be used at the main sewer to connect service connections greater than or equal to 200mm.
- B For new construction, saddles shall be installed on the main pipe before that pipe is laid.
- C Approved cut-in tool shall be used for field made connections.
- D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

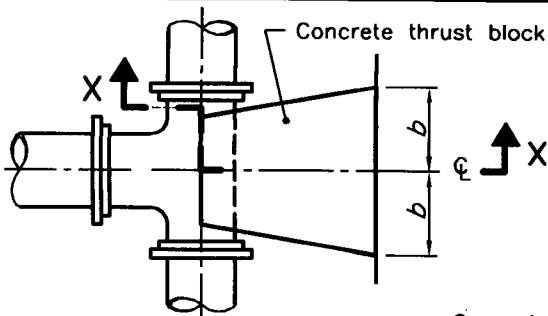
Nov 2011

Rev 2

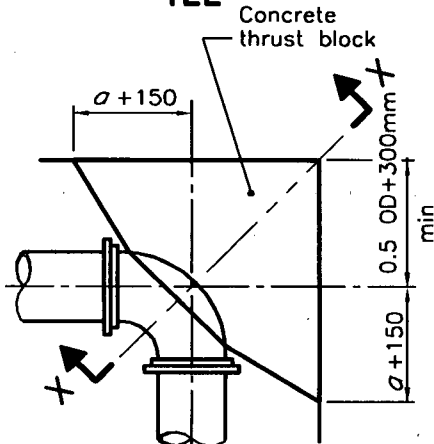
**SEWER SERVICE CONNECTIONS
FOR FLEXIBLE MAIN PIPE SEWER**

OPSD 1006.020

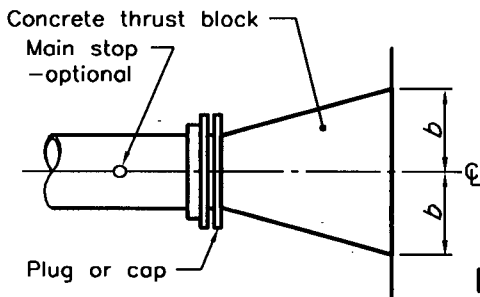




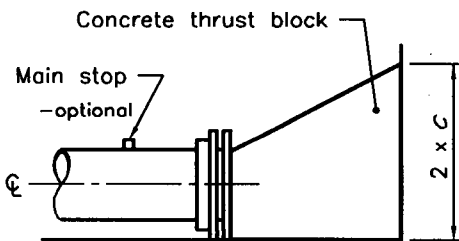
PLAN TEE



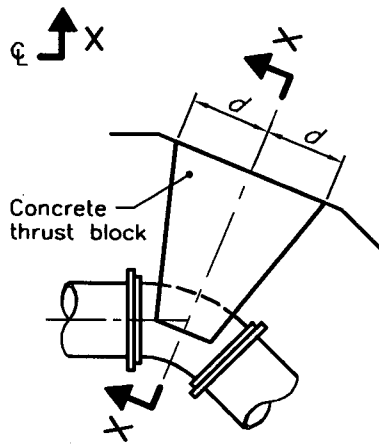
PLAN 90 BEND*



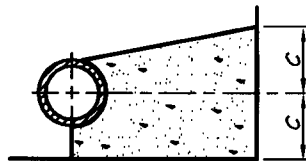
PLAN DEAD END



ELEVATION DEAD END



PLAN TYPICAL BEND



SECTION X-X

NOTES:

- A Concrete shall be placed to within 50mm of the face of the bell.
- B Bond breaker shall be used between concrete and fittings.
- C The above thrust block dimensions meet or exceed the MOE Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit.
- D The assumptions made for the above calculations are:
 - Maximum operating pressure of 690 kPa,
 - Maximum surge pressure with a flow velocity change of 0.6 m/s of 790 kPa for Class 52 DI pipe and 240 kPa for PVC pipe.
- E The tables apply to both ductile iron and PVC pipe. When one length exceeded the other, the longer length was used.
- F All dimensions are in millimetres unless otherwise shown.

SOILS WITH TYPICAL BEARING STRENGTH OF 100 TO 199 kPa

PIPE DIA	Dimensions			
	a	b	c	d
100	150	250	200	200
150	250	400	250	300
200	400	550	300	450
250	500	650	400	500
300	650	800	450	650
350	700	900	550	700
400	900	1050	600	850

SOILS WITH TYPICAL BEARING STRENGTH OF 200 TO 299 kPa

PIPE DIA	Dimensions			
	a	b	c	d
100	150	200	150	150
150	250	250	200	200
200	400	350	250	300
250	500	450	300	350
300	650	500	350	400
350	700	600	400	500
400	900	750	400	600

SOILS WITH TYPICAL BEARING STRENGTH OF 300 kPa AND OVER

PIPE DIA	Dimensions			
	a	b	c	d
100	150	150	150	150
150	250	200	200	200
200	400	300	200	250
250	500	400	250	300
300	650	450	300	300
350	700	550	350	350
400	900	650	350	450

ONTARIO PROVINCIAL STANDARD DRAWING

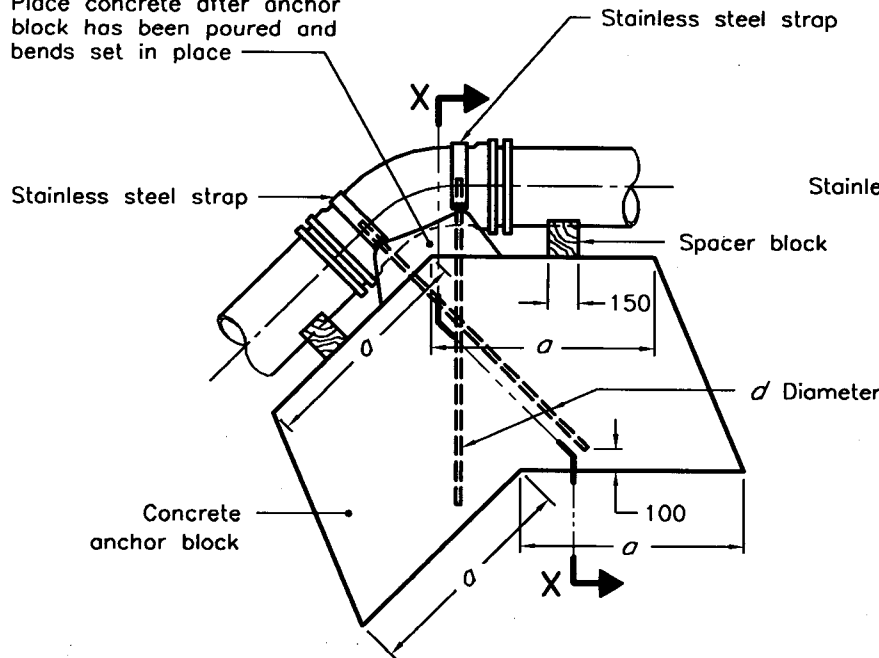
Nov 2013 Rev 2

CONCRETE THRUST BLOCKS FOR TEES, PLUGS, AND HORIZONTAL BENDS

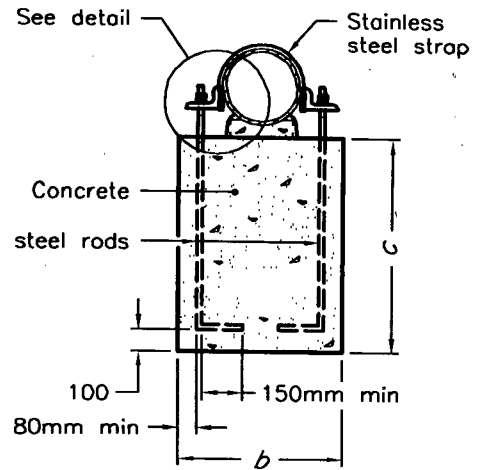


OPSD 1103.010

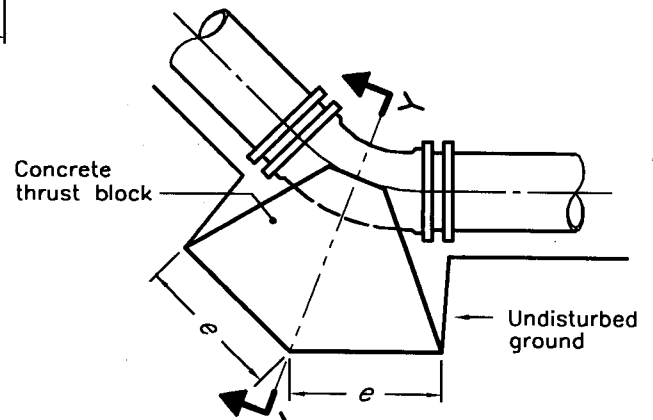
Place concrete after anchor block has been poured and bends set in place



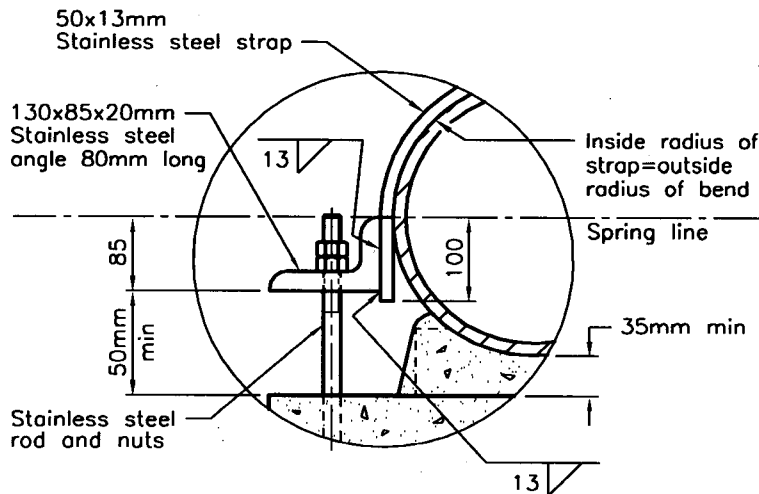
UP-THRUST BLOCK ELEVATION



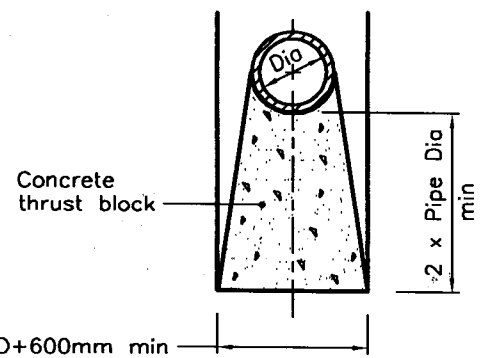
UP-THRUST BLOCK SECTION X-X



DOWN-THRUST BLOCK ELEVATION



DETAIL



DOWN-THRUST BLOCK SECTION Y-Y

NOTES:

- A Concrete shall be placed to within 50mm of the face of the bell.
- B Bond breaker shall be used between concrete and fittings.
- C This blocking is for bends up to 45° for up-thrust and 90° for down-thrust.
- D This OPSD shall be read in conjunction with OPSD 1103.021.
- E All dimensions are in millimetres unless otherwise shown.

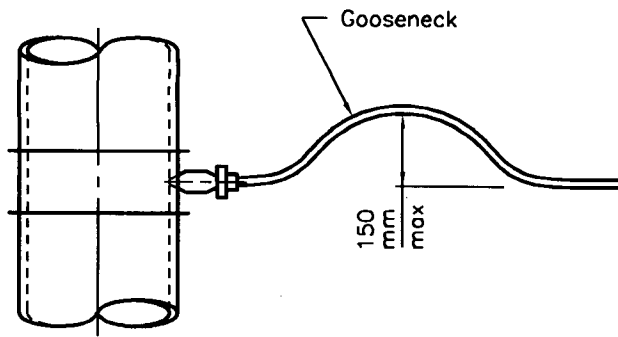
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 Rev 3

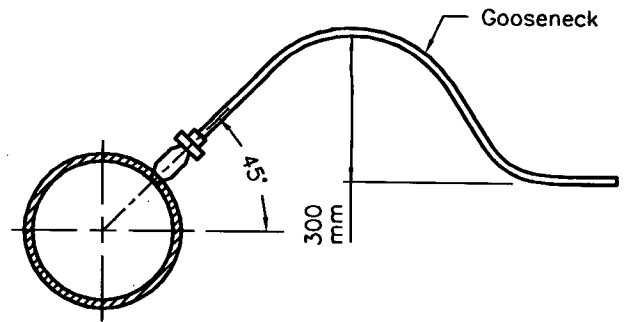
CONCRETE THRUST BLOCKS FOR VERTICAL BENDS



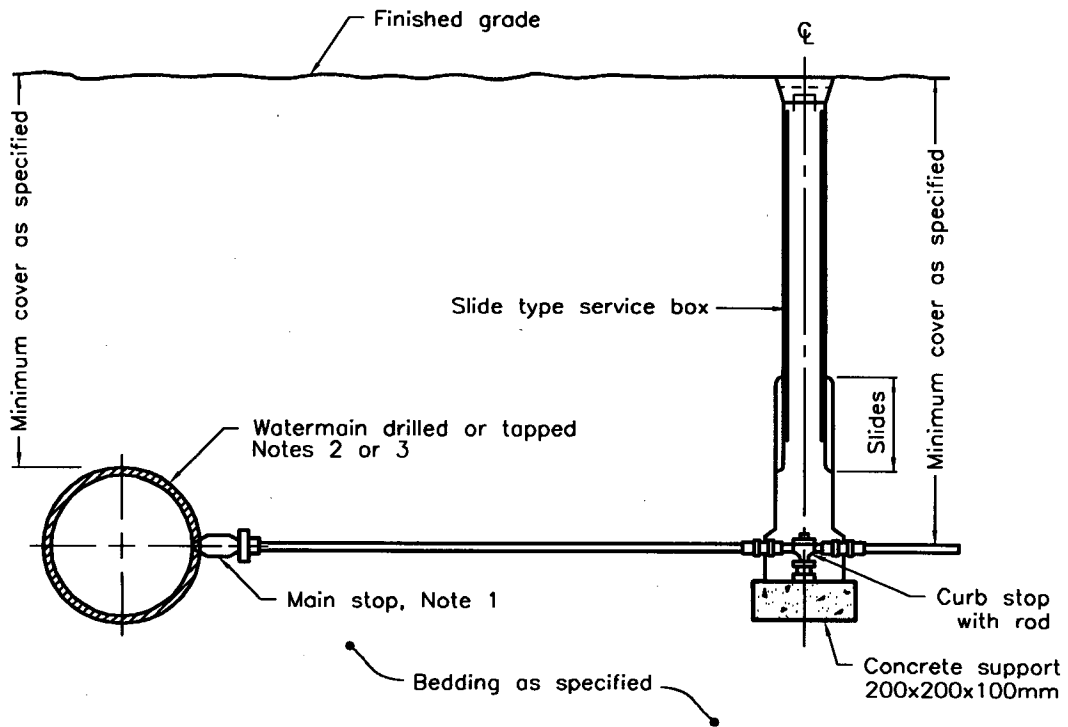
OPSD 1103.020



HORIZONTAL GOOSENECK



VERTICAL GOOSENECK OPTION



VERTICAL SECTION

NOTES:

- 1 For plastic service pipes, install main stop at 15° above horizontal with a minimum 1.2m long gooseneck.
- 2 Direct tap ductile iron pipe with approved tool with standard AWWA inlet thread.
- 3 Service connections to plastic watermains shall be made using service saddles or factory made tees.
- A When specified, the vertical gooseneck option shall be used.
- B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
- C All water services shall be installed 90° to the longitudinal axis of the watermain.
- D Backfill material within 500mm of service box shall be native or imported, as specified.
- E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

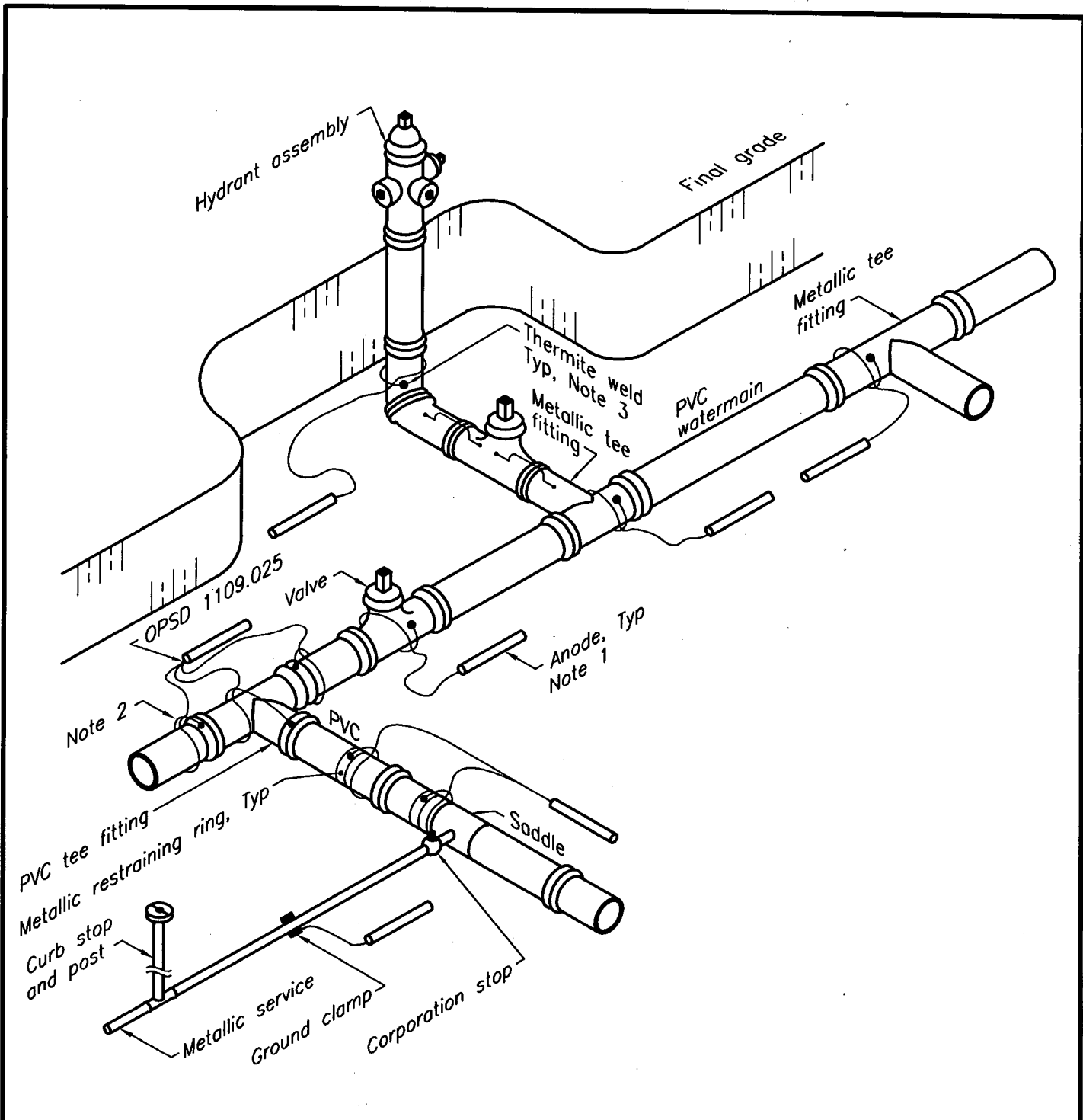
Nov 2013 Rev 3

WATER SERVICE CONNECTION

19 and 25mm DIAMETER SIZES




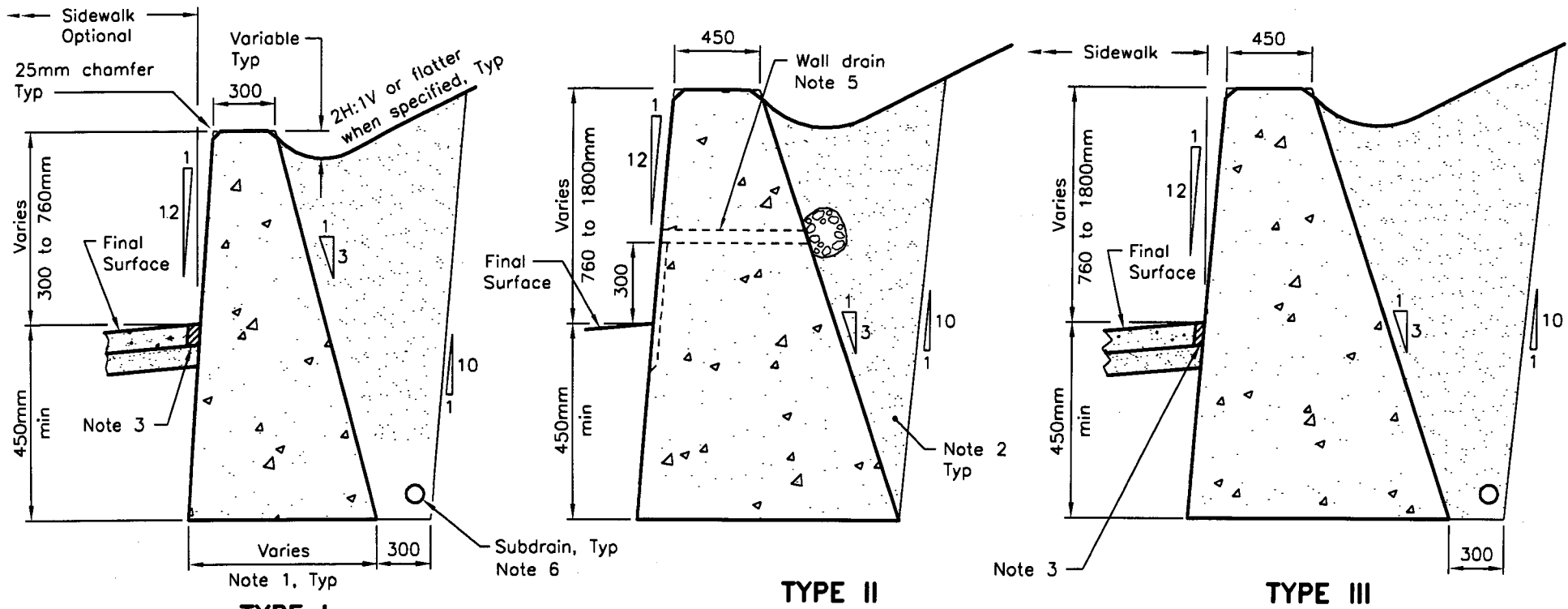
OPSD 1104.010



NOTES:

- 1 Anode shall be placed at least 1.0m away from the water system pipe and appurtenances and as deep as the bottom of the pipe and appurtenances. Minimum distance between anodes shall be 1.0m.
 - 2 Anode connecting wire shall be loosely wrapped around pipes and fittings and knotted.
 - 3 Protective coating shall be applied to all thermite welds.
- A All dimensions are in metres unless otherwise shown.

<p>ONTARIO PROVINCIAL STANDARD DRAWING</p> <p>CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS</p>	<p>Nov 2008 Rev 1</p>	
<p>OPSD 1109.011</p>		



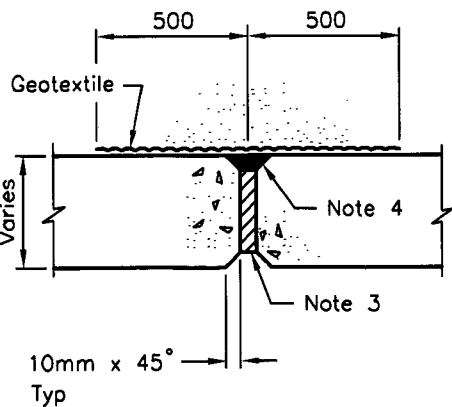
TYPE I

TYPE II

TYPE III

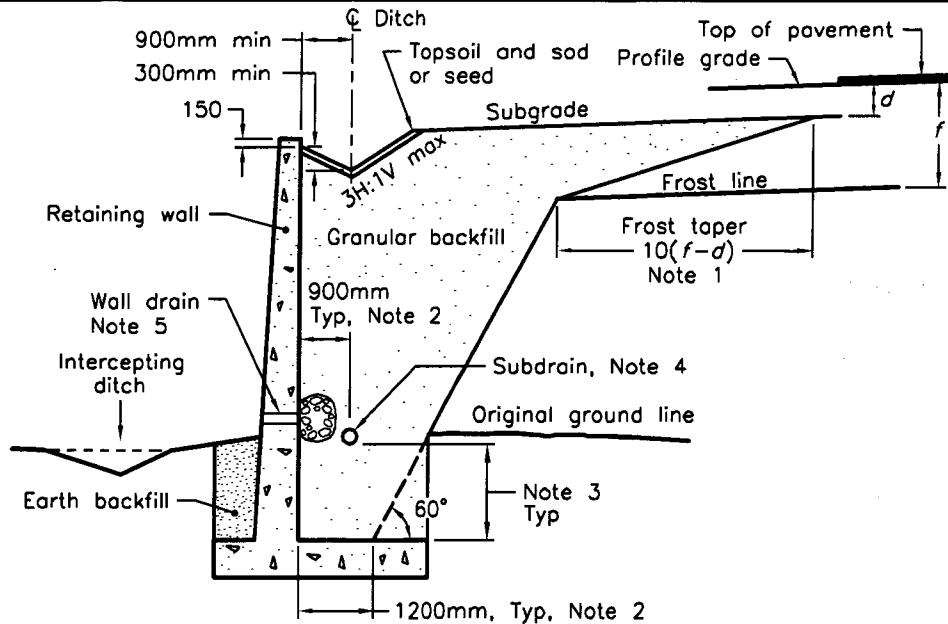
NOTES:

- 1 Walls shall be founded on undisturbed soil having a minimum bearing capacity at ultimate limit states of 200kPa for Type I and 300kPa for Type II and Type III.
 - 2 Excavation for toe walls shall be backfilled with free draining granular material.
 - 3 10mm preformed joint filler, Type A, non-extruding and resilient bituminous type as specified.
 - 4 Cold applied rubber asphalt joint sealing compound.
 - 5 Where specified, wall drains shall be installed as per OPSD 3190.100.
 - 6 150mm dia perforated pipe subdrain wrapped in geotextile.
- A Maximum height of slope above top of wall is 4m.
 B Concrete for toe walls shall be 30MPa.
 C All dimensions are in millimetres unless otherwise shown.

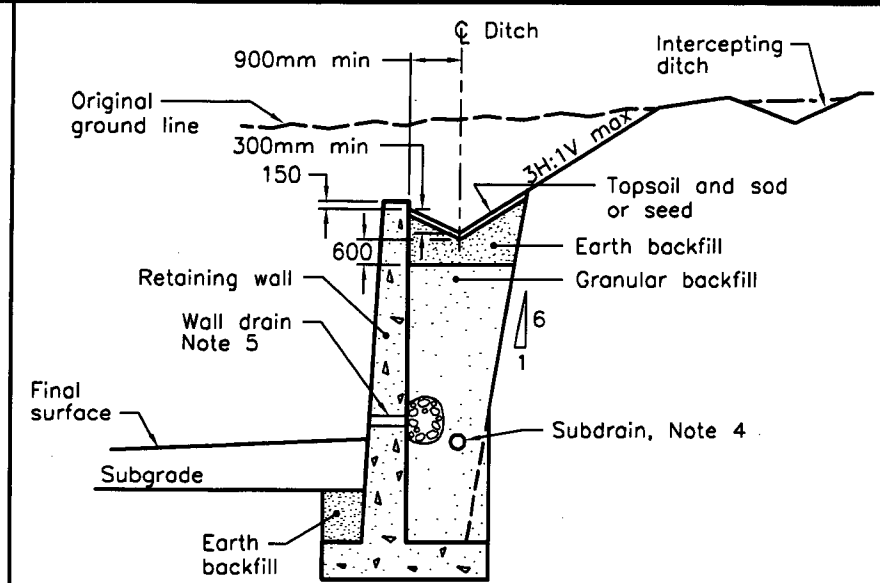


PLAN OF JOINT DETAIL IN CONCRETE TOE WALLS AT 3.0m SPACING

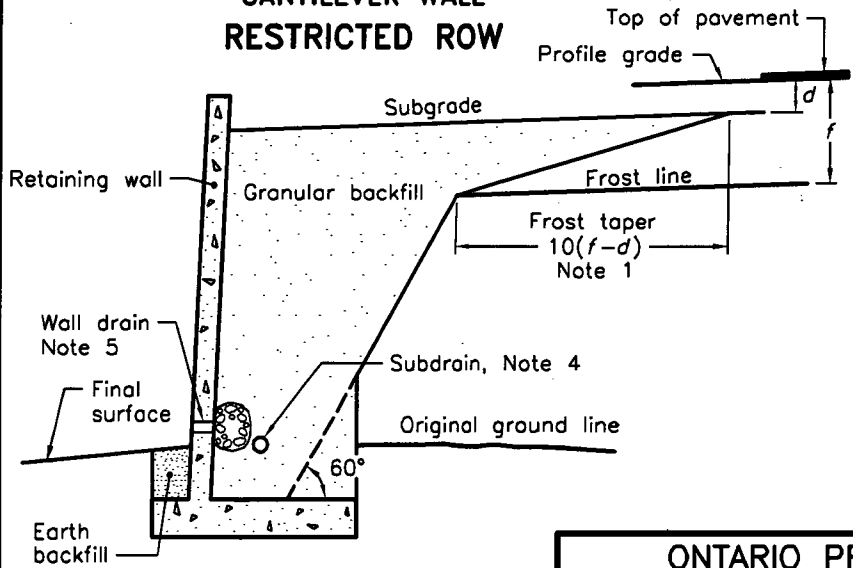
ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2010	Rev 2	
WALLS RETAINING CONCRETE TOE WALL				
OPSD 3120.100				



**CANTILEVER WALL
RESTRICTED ROW**



**CANTILEVER WALL
CUT TREATMENT**




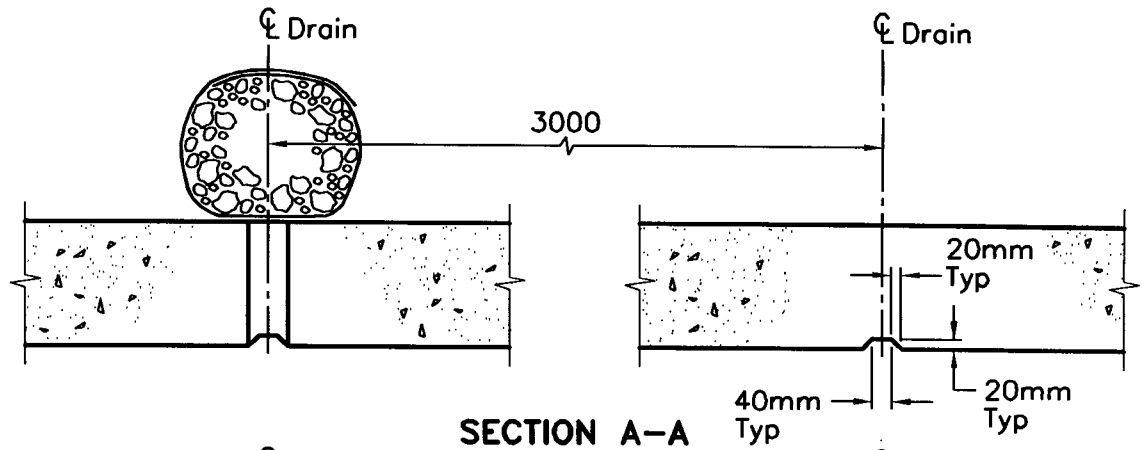
**COUNTERFORT AND
CANTILEVER WALL
FILL TREATMENT**

SHOULDER OVER RETAINING WALL BACKFILL

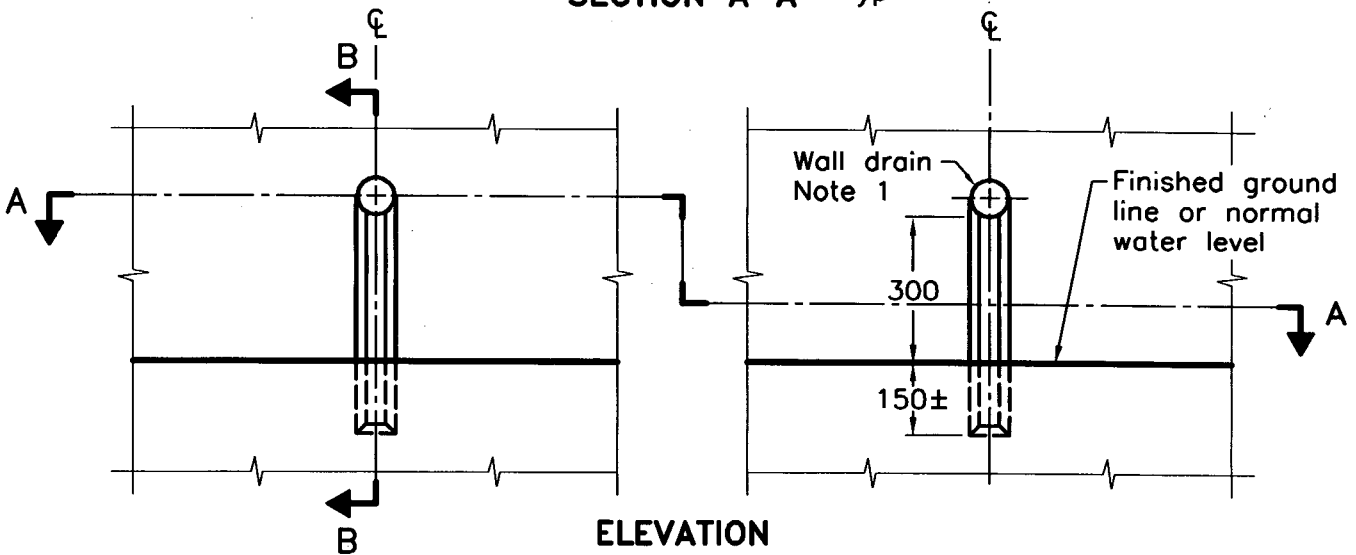
NOTES:

- 1 d = depth of combined base and subbase courses.
 f = frost penetration depth as specified.
 - 2 Dimensions perpendicular to back face of retaining wall.
 - 3 Height to be consistent with positive drainage of subdrain as specified.
 - 4 150mm dia perforated pipe subdrain wrapped with geotextile. Provision shall be made to carry pipe through counterfort wall.
 - 5 Where specified, wall drains shall be installed as per OPSD 3190.100.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev 1	
WALLS RETAINING, BACKFILL MINIMUM GRANULAR REQUIREMENT			
OPSD 3121.150			



SECTION A-A

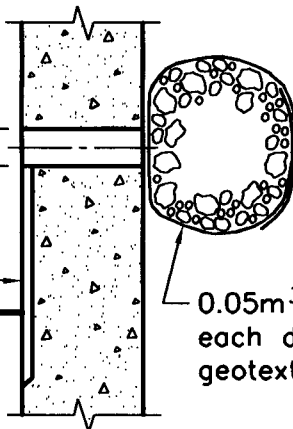


ELEVATION

75mm dia wall drain at 3,000mm C/C formed with non-metallic material

Finished ground line or normal water level

300
Front face



0.05m³ of 19.0mm clear stone for each drain completely wrapped with geotextile and securely tied, Note 2

SECTION B-B

NOTES:

- 1 Bottom half of drain to be contoured to shape of vertical groove after removal of formwork.
- 2 Geotextile shall be non-woven, Class II, with an FOS of 125-250 μ m.
- A Minimum cover to reinforcing bars shall be measured from the base of the groove.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Apr 2011 Rev 2

WALLS
RETAINING AND ABUTMENT
WALL DRAIN

OPSD 3190.100

