# Ontario Provincial Standards for Roads and Public Works




- Volume 3 -

## MUNICIPAL AND PROVINCIAL COMMON

DRAWINGS FOR ROADS, BARRIERS, DRAINAGE,
SANITARY SEWERS, WATERMAINS,
AND STRUCTURES

Ontario

OPS is co-owned by the
Ministry of Transportation, Ontario
and the
Municipal Engineers Association

Municipal
Engineers
Association

## MANUAL REVISION RECORD

## Municipal and Provincial Common

## Volume 3 – Drawings for Roads, Barriers, Drainage, Sanitary Sewers, Watermains, and Structures

This record should remain in the manual at all times. Revisions are numbered sequentially. This sheet should be filled in after each revision has been placed into the manual. It will quickly indicate to users whether the contents of the manual are up-to-date.

| REVISION NUMBER | REVISION DATE | ENTERED BY | REVISION NUMBER | DATE | ENTERED BY |
|---|---|---|---|---|---|
| 51 | APRIL 2005 | Included in new manuals | 77 | | |
| 52 | NOV 2005 | Included in new manuals | 78 | | |
| 53 | NOV 2006 | Included in new manuals | 79 | | |
| 54 | APRIL 2007 | Included in new manuals | 80 | | |
| 55 | NOV 2007 | Included in new manuals | 81 | | |
| 56 | APRIL 2008 | Included in new manuals | 82 | | |
| 57 | NOV 2008 | Included in new manuals | 83 | | |
| 58 | NOV 2009 | Included in new manuals | 84 | | |
| 59 | APRIL 2010 | Included in new manuals | 85 | | |
| 60 | NOV 2010 | Included in new manuals | 86 | | |
| 61 | APRIL 2011 | Included in new manuals | 87 | | |
| 62 | NOV 2011 | Included in new manuals | 88 | | |
| 63 | NOV 2012 | Included in new manuals | 89 | | |
| 64 | APRIL 2013 | Included in new manuals | 90 | | |
| 65 | NOV 2013 | Included in new manuals | 91 | | |
| 66 | NOV 2014 | Included in new manuals | 92 | | |
| 67 | APRIL 2015 | Included in new manuals | 93 | | |
| 68 | NOV 2015 | Included in new manuals | 94 | | |
| 69 | | | 95 | | |
| 70 | | | 96 | | |
| 71 | | | 97 | | |
| 72 | | | 98 | | |
| 73 | | | 99 | | |
| 74 | | | 100 | | |
| 75 | | | 101 | | |
| 76 | | | 102 | | |

Ontario Provincial Standards Unit
301 St. Paul St., 2nd Floor North
St. Catharines, ON L2R 7R4

Telephone: 1-844-718-1605
Fax: 905-704-2051

# REVISION INFORMATION SHEET

## ONTARIO PROVINCIAL STANDARDS FOR ROADS AND PUBLIC WORKS

## VOLUME 3
## MUNICIPAL AND PROVINCIAL COMMON DRAWINGS FOR ROADS, BARRIERS, DRAINAGE, SANITARY SEWERS, WATERMAINS, AND STRUCTURES

**MANUAL REVISION #68** **November 2015**

### UPDATING ONTARIO PROVINCIAL STANDARDS FOR YOUR USE

Each roads and public works owner (Owner) is responsible for determining implementation dates and directions for use of Ontario Provincial Standards; therefore, manual holders are cautioned about immediately discarding superseded and cancelled standards.

### ACCESSING AND OBTAINING ONTARIO PROVINCIAL STANDARDS

The Ontario Provincial Standards for Roads and Public Works (OPS) manuals and the latest published updates for each of the eight OPS manuals are available as follows:

- Available electronically on the OPS/MTO website. Online access to the current, updated, and archived standards; indexes; OPS User Notes; and publication Revision Information Sheets are available free of charge at the site.
  (http://www.raqs.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage)

- Hard-copy format available from Publications Ontario by telephone at 1-800-668-9938 or online. Updates and OPS manuals are available for a cost-recovery fee.
  (www.publications.serviceontario.ca)

- The eight OPS manuals of standards are available on one CD in PDF format. The OPS drawings published in Volumes 3 and 4 are available in AutoCAD format on a separate CD. These CDs are available from Publications Ontario or by telephone at 1-800-668-9938 or online for a cost-recovery fee. The updates are not available on CDs as an update package.
  (www.publications.serviceontario.ca)

At the Publications Ontario web page, you can type “Ontario Provincial Standards,” “OPS,” “OPSS,” or “OPSD” in the search box, and all related products for the Ontario Provincial Standards will be listed, click on the item you wish to purchase, add the item to your cart, then follow the instructions to complete your order. If trying to order an OPS product online from Publications Ontario and it is shown as Out of Stock, you can backorder the product by telephone at 1-800-668-9938.

In order to receive the Municipal Engineers Association (MEA) purchase price, MEA members should visit the MEA website (www.municipalengineers.on.ca/) for the MEA Publications Ontario order form for hard-copy manuals and CDs.

MTO employees should contact Simon Leung, Account Representative at Publications Ontario, by email (simon.leung@ontario.ca) to set up an account in order to receive the MTO purchase price for technical publications, including the Ontario Provincial Standards.

Links to Publications Ontario and the Ontario Provincial Standards on the MTO Library website are available on the OPS website (www.ops.on.ca). Also on this site under News and Activities are notices for updates and changes in OPS.

Questions should be directed by email to Ontario.Prov.Standards@ontario.ca.

**YOU SHOULD REGISTER YOUR OPS MANUALS AND CDs**

Users of OPS do not receive notices of OPS updates as they had in the past. Methods of notification from Publications Ontario for the future are being investigated, and you will be informed of them as they become available. In the interim, an email will be sent to OPS users who have registered their OPS manuals and CDs with OPS.

Owners of OPS manuals, who have not yet done so, are requested to register their OPS hard-copy manuals and CDs with Ontario.Prov.Standards@ontario.ca. The registration form and submission instructions are available on the OPS website (www.ops.on.ca), Miscellaneous Info, OPS Forms.

**WAITING TO HEAR FROM YOU**

If you have a suggestion to revise a standard or you have a standard that works in your ministry, municipality, or area, send it to the Head, OPS Administration, for review and possible inclusion into the Ontario Provincial Standards.

**THIS MANUAL IS REVISED AS FOLLOWS:**

**Index Pages Volume 3**

Please remove the entire index and replace with the attached revised index.

**Standard Drawings Volume 3**

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 204.010 | 2 | 204.010 | 3 | **"BOULDER TREATMENT, CUT SECTIONS - SUBGRADE"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 219.100 | 1 | 219.100 | 2 | **"LIGHT-DUTY STRAW BALE BARRIER"**<br>See Summary of Revisions. |
| 219.110 | 1 | 219.110 | 2 | **"LIGHT-DUTY SILT FENCE BARRIER"**<br>See Summary of Revisions. |
| | | 219.120 | 0 | **"LIGHT-DUTY FIBRE ROLL BARRIER"**<br>This is a New Drawing. |
| 219.130 | 1 | 219.130 | 2 | **"HEAVY-DUTY SILT FENCE BARRIER"**<br>See Summary of Revisions. |
| | | 219.131 | 0 | **"HEAVY-DUTY WIRE-BACKED SILT FENCE BARRIER"**<br>This is a New Drawing. |
| 219.150 | 1 | 219.150 | 2 | **"SANDBAG BARRIER"**<br>See Summary of Revisions. |
| | | 219.160 | 0 | **"FIBRE ROLL GRADE BREAKS"**<br>This is a New Drawing. |
| 219.180 | 1 | 219.180 | 2 | **"STRAW BALE FLOW CHECK DAM"**<br>See Summary of Revisions. |
| 219.190 | 1 | | | **"SILT FENCE FLOW CHECK DAM"**<br>This drawing has been cancelled. |
| | | 219.191 | 0 | **"FIBRE ROLL FLOW CHECK DAM"**<br>This is a New Drawing. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 219.200 | 1 | 219.200 | 2 | **"SANDBAG FLOW CHECK DAM"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 219.210 | 1 | 219.210 | 2 | **"TEMPORARY ROCK FLOW CHECK DAM, V-DITCH"**<br>See Summary of Revisions. |
| 219.211 | 1 | 219.211 | 2 | **"TEMPORARY ROCK FLOW CHECK DAM, FLAT BOTTOM DITCH"**<br>See Summary of Revisions. |
| 219.220 | 1 | 219.220 | 2 | **"SEDIMENT TRAP IN DITCH"**<br>See Summary of Revisions. |
| 219.230 | 3 | 219.230 | 4 | **"TEMPORARY SLOPE DRAIN FOR SEDIMENT TRAP "**<br>See Summary of Revisions |
| 219.231 | 0 | 219.231 | 1 | **"TEMPORARY BERM BARRIER FOR SLOPE DRAIN"**<br>See Summary of Revisions. |
| 219.240 | 1 | 219.240 | 2 | **"SEDIMENT TRAP FOR DEWATERING"**<br>Title revised from Dewatering Trap to Sediment Trap for Dewatering. |
| 219.260 | 1 | 219.260 | 2 | **"TURBIDITY CURTAIN"**<br>Plan view, Inflection point label revised to Change in direction.<br>Section A-A view, Mooring line label revised with removal of "19mm nylon or polypropylene rope". |
| 219.261 | 1 | 219.261 | 2 | **"TURBIDITY CURTAIN, SEAM DETAIL"**<br>Oblique view, Ballast label revised with removal of "8mm steel chain". |
| 302.010 | 1 | 302.010 | 2 | **"MEDIAN CROSSOVERS FOR SERVICE AND EMERGENCY VEHICLES"**<br>This drawing has been reaffirmed with no changes to technical information. Title revised. |
| 310.010 | 1 | 310.010 | 2 | **"CONCRETE SIDEWALK"**<br>Notes 2, 3, A and B have been updated. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 310.020 | 1 | 310.020 | 2 | **"CONCRETE SIDEWALK ADJACENT TO CURB AND GUTTER"**<br>Notes 2, 3, A and B have been updated. |
| 310.030 | - | 310.030 | 1 | **"CONCRETE SIDEWALK RAMPS AT SIGNALIZED INTERSECTIONS"**<br>The entire standard has been updated based on MTOD 310.030, which is in compliance with AODA requirements. |
| | | 310.031 | 0 | **"CONCRETE SIDEWALK RAMPS AT SIGNALIZED INTERSECTIONS WITH INTERSECTING CROSSWALKS"**<br>This is a New Drawing.<br>The entire standard has been updated based on MTOD 310.031, which is in compliance with AODA requirements. |
| | | 310.033 | 0 | **"CONCRETE SIDEWALK RAMPS AT UNSIGNALIZED INTERSECTIONS"**<br>This is a New Drawing.<br>The entire standard has been updated based on MTOD 310.033, which is in compliance with AODA requirements. |
| | | 310.039 | 0 | **"CONCRETE SIDEWALK RAMPS TACTILE WALKING SURFACE INDICATORS COMPONENT"**<br>This is a New Drawing.<br>The entire standard has been updated based on MTOD 310.039, which is in compliance with AODA requirements. |
| 310.040 | 1 | 310.040 | 2 | **"UTILITY ISOLATION IN CONCRETE SIDEWALKS"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 310.050 | 1 | 310.050 | 2 | **"CONCRETE SIDEWALK DRIVEWAY ENTRANCE DETAILS"**<br>This drawing has been reaffirmed with no changes to technical information. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 310.060 | 1 | 310.060 | 2 | **"JOINT DETAIL FOR CONCRETE PEDESTRIAN CROSSWALK AT SIGNALIZED AND ALL-WAY STOP CONTROLLED INTERSECTIONS"**<br>This drawing has been reaffirmed with no changes to technical information however the title has been updated in order to better reflect the content of the drawing. |
| 401.081 | 0 | 401.081 | 1 | **"CAST IRON, SQUARE FRAME FISH TYPE COVER"**<br>See Summary of Revisions. |
| 508.010 | 1 | 508.010 | 2 | **"ROUTING AND SEALING CRACKS UP TO 20mm WIDTH IN ASPHALT PAVEMENT"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.020 | 2 | 802.020 | 3 | **"FLEXIBLE PIPE ARCH EMBEDMENT AND BACKFILL EARTH EXCAVATION"**<br>Note 1 rewritten to include reference to OPSD 805.020. |
| 802.023 | 2 | 802.023 | 3 | **"FLEXIBLE PIPE ARCH EMBEDMENT AND BACKFILL ROCK EXCAVATION"**<br>Note 1 rewritten to include reference to OPSD 805.020. |
| 802.024 | 2 | 802.024 | 3 | **"FLEXIBLE PIPE ARCH EMBEDMENT IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK"**<br>Note 1 rewritten to include reference to OPSD 805.020. |
| 802.030 | 2 | 802.030 | 3 | **"RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 1 OR 2 SOIL - EARTH EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.031 | 2 | 802.031 | 3 | **"RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL - EARTH EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.032 | 2 | 802.032 | 3 | **"RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 4 SOIL - EARTH EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 802.033 | 2 | 802.033 | 3 | **"RIGID PIPE BEDDING, COVER, AND BACKFILL ROCK EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.034 | 2 | 802.034 | 3 | **"RIGID PIPE BEDDING AND COVER IN EMBANKMENT, ORIGINAL GROUND: EARTH OR ROCK"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.050 | 2 | 802.050 | 3 | **"HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 1 OR 2 SOIL - EARTH EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.051 | 2 | 802.051 | 3 | **"HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL - EARTH EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.052 | 2 | 802.052 | 3 | **"HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 4 SOIL - EARTH EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.053 | 2 | 802.053 | 3 | **"HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL, ROCK EXCAVATION"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 802.054 | 2 | 802.054 | 3 | **"HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING AND COVER IN EMBANKMENT, ORIGINAL GROUND: EARTH OR ROCK"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 803.010 | 2 | 803.010 | 3 | **"BACKFILL AND COVER FOR CONCRETE CULVERTS WITH SPANS LESS THAN OR EQUAL TO 3.0M"**<br>This drawing has been reaffirmed with no changes to technical information. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 803.030 | 2 | 803.030 | 3 | **"FROST TREATMENT - PIPE CULVERTS FROST PENETRATION LINE BELOW BEDDING GRADE"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 803.031 | 3 | 803.031 | 4 | **"FROST TREATMENT - PIPE CULVERTS FROST PENETRATION LINE BETWEEN TOP OF PIPE AND BEDDING GRADE"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 806.040 | 2 | 806.040 | 3 | **"HEIGHT OF FILL TABLE, POLYVINYL CHLORIDE GRAVITY SEWER PIPE, 210, 320, AND 625kPa"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 807.010 | 2 | 807.010 | 3 | **"HEIGHT OF FILL TABLE, REINFORCED CONCRETE PIPE – CONFINED TRENCH, CLASS: 50-D, 65-D, 100-D, 140-D"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 807.030 | 2 | 807.030 | 3 | **"HEIGHT OF FILL TABLE, REINFORCED CONCRETE PIPE – EMBANKMENT, CLASS: 50-D, 65-D, 100-D, 140-D"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 807.040 | 1 | 807.040 | 2 | **"HEIGHT OF FILL TABLE, NON-REINFORCED CONCRETE PIPE – CLASS 3"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 807.050 | 2 | 807.050 | 3 | **"HEIGHT OF FILL TABLE, HORIZONTAL ELLIPTICAL CONCRETE PIPE, CLASS HE-A, HE-I, HE-II, HE-III AND HE-IV"**<br>This drawing has been reaffirmed with no changes to technical information. |
| 911.130 | 0 | 911.130 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, CAST-IN-PLACE, TYPE A, INSTALLATION"**<br>See Summary of Revisions. |
| 911.131 | 0 | 911.131 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, CAST-IN-PLACE, TYPE C, INSTALLATION"**<br>See Summary of Revisions. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 911.132 | 0 | 911.132 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, CAST-IN-PLACE, TALL WALL, INSTALLATION"**<br>See Summary of Revisions. |
| 911.133 | 0 | | | **"GUIDE RAIL SYSTEM, NON-REINFORCED CONCRETE BARRIER, INSTALLATION – BRIDGE MEDIAN"**<br>This drawing has been cancelled. |
| 911.134 | 0 | 911.134 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, INSTALLATION – MEDIAN CONCRETE BARRIER TO STRUCTURE"**<br>See Summary of Revisions. |
| | | 911.135 | 0 | **"GUIDE RAIL SYSTEM, CONCRETE ROADSIDE BARRIER, CAST-IN-PLACE OR SLIPFORMED, INSTALLATION"**<br>This is a New Drawing. |
| 911.173 | 0 | 911.173 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, TYPE M CONNECTION, INSTALLATION – TEMPORARY RESTRAINT SYSTEM, TRANSITION TO PERMANENT CONCRETE BARRIER"**<br>See Summary of Revisions. |
| 911.174 | 0 | 911.174 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, TYPE M CONNECTION, COMPONENT - THRIE BEAM TRANSITION"**<br>See Summary of Revisions. |
| 911.230 | 0 | 911.230 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, MEDIAN END TREATMENT, INSTALLATION"**<br>See Summary of Revisions. |
| 911.231 | 1 | | | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, SHOULDER END TREATMENT, INSTALLATION"**<br>This drawing has been cancelled. |
| 911.380 | 0 | 911.380 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, PERMANENT TRANSITION, INSTALLATION AT BRIDGE PIERS"**<br>See Summary of Revisions. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 911.381 | 1 | 911.381 | 2 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, PERMANENT TRANSITION INSTALLATION, ROADSIDE CONCRETE BARRIER TO STRUCTURE"**<br>This drawing has been reaffirmed with no changes to technical information. Title revised. |
| 911.382 | 0 | 911.382 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, DOWEL CONNECTION DETAIL"**<br>See Summary of Revisions. |
| | | 911.383 | 0 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, PERMANENT TRANSITION INSTALLATION AT LIGHTING POLE AND SIGN SUPPORT FOOTINGS"**<br>This is a New Drawing. |
| 911.430 | 0 | 911.430 | 1 | **"GUIDE RAIL SYSTEM, CONCRETE BARRIER, TEMPORARY - LEAVING END TREATMENT, INSTALLATION – DIVIDED HIGHWAY"**<br>See Summary of Revisions. |
| | | 923.006 | 0 | **"ENERGY ATTENUATOR, CRASH CUSHION, QUADGUARD SUPER WIDE SYSTEM, COMPONENT – REINFORCED CONCRETE PAD"**<br>This is a New Drawing. |
| | | 923.192 | 0 | **"ENERGY ATTENUATOR, CRASH CUSHION, QUADGUARD SUPER WIDE SYSTEM, INSTALLATION – TEMPORARY, UNDIRECTIONAL"**<br>This is a New Drawing. |
| | | 923.193 | 0 | **"ENERGY ATTENUATOR, CRASH CUSHION, QUADGUARD SUPER WIDE SYSTEM, INSTALLATION – TEMPORARY, BIDIRECTIONAL"**<br>This is a New Drawing. |
| | | 923.194 | 0 | **"ENERGY ATTENUATOR, CRASH CUSHION, QUADGUARD SUPER WIDE SYSTEM, INSTALLATION – PERMANENT UNDIRECTIONAL"**<br>This is a New Drawing. |
| | | 923.195 | 0 | **"ENERGY ATTENUATOR, CRASH CUSHION, QUADGUARD SUPER WIDE SYSTEM, INSTALLATION – PERMANENT BIDIRECTIONAL"**<br>This is a New Drawing. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| 924.135 | 0 | 924.135 | 1 | **"ENERGY ATTENUATOR, CRASH CUSHION, ACZ-350 SYSTEM, INSTALLATION – TEMPORARY CONCRETE BARRIER"**<br>Bays renumbered and Table A added. |
| 1101.010 | 3 | 1101.010 | 4 | **"PRECAST VALVE CHAMBER 1200mm AND 1500mm DIAMETER"**<br>This drawing has been reaffirmed. Reference to OPSD 110.011 was removed since that drawing is no longer active. No changes to technical information were made. |
| 1109.010 | 1 | 1109.010 | 2 | **"CATHODIC PROTECTION FOR METALLIC WATERMAIN SYSTEMS"**<br>This drawing has been reaffirmed. No changes to technical information were made. |
| 1109.011 | 1 | 1109.011 | 2 | **"CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS"**<br>This drawing has been reaffirmed. No changes to technical information were made. |
| 1109.012 | 0 | 1109.012 | 1 | **"CATHODIC PROTECTION OF EXISTING METALLIC WATERMAINS, EXPOSED SERVICE OR PIPE METHOD"**<br>This drawing has been reaffirmed. No changes to technical information were made. |
| 1109.013 | 0 | 1109.013 | 1 | **"ANODE INSTALLATION OVER PIPE METHOD FOR EXISTING METALLIC WATERMAINS"**<br>This drawing has been reaffirmed. No changes to technical information were made. |
| 1109.014 | 0 | 1109.014 | 1 | **"HORIZONTAL ANODE BANK AT SERVICE"**<br>This drawing has been reaffirmed. No changes to technical information were made. |
| 1109.015 | 0 | 1109.015 | 1 | **"VERTICAL ANODE BANK AT SERVICE"**<br>This drawing has been reaffirmed. No changes to technical information were made. |
| 1109.025 | 0 | 1109.025 | 1 | **"WATERPROOFING OF SPLICES"**<br>This drawing has been reaffirmed. No changes to technical information were made. |

| Superseded/Cancelled (Remove) | | Revised/New (Insert) | | Remarks |
|---|---|---|---|---|
| OPSD | Revision | OPSD | Revision | |
| | | 1109.030 | 0 | **"INSULATION FOR SEWERS AND WATERMAINS IN SHALLOW TRENCHES"**<br>This is a New Drawing. |
| 3311.900 | 1 | 3311.900 | 2 | **"DECK GIRDERS, STEEL BOX ACCESS HATCH"**<br>See Summary of Revisions. |
| | | 3920.100 | 0 | **"PRECAST REINFORCED CONCRETE BOX CULVERT WITH HEIGHT OF FILL ≥ 0.6M"**<br>This is a New Drawing. |
| | | 3920.110 | 0 | **"PRECAST REINFORCED CONCRETE BOX CULVERT WITH HEIGHT OF FILL < 0.6M"**<br>This is a New Drawing. |

## SUMMARY OF REVISIONS TO OPSD 219.100

### LIGHT-DUTY STRAW BALE BARRIER

- Section view, removed.
- Plan, end-run length revised 2m to 2.4m.
- Plan, Straw bale shape revised on corners to proper dimensions
- Plan, Note 2 added
- Section A-A, Earth surface revised to Original ground
- Section A-A, 600 label added.
- Isometric View, added.

## SUMMARY OF REVISIONS TO OPSD 219.110

### LIGHT-DUTY SILT FENCE BARRIER

- Perspective View, addition of end-run curve along barrier main run.
- Section view, removed.
- Plan view, modification of end-run angle to curve.
- Plan view, end-run length revised 2m to 3m.
- Plan view, 40m max added to main run label
- Plan view, addition of second fence and attachment joint.
- Joint Detail view added
- Section A-A, min added to 600mm label
- Section A-A, Earth surface revised to Original ground

## SUMMARY OF REVISIONS TO OPSD 219.130

### HEAVY-DUTY SILT FENCE BARRIER

- Perspective View, addition of end-run curve along barrier main run.
- Section view, removed.
- Plan view, modification of end-run angle to curve.
- Plan, end-run length revised 2m to 4m.
- Plan view, 40m max added to main run label
- Plan view, addition of second fence and attachment joint.
- Joint Detail view added.
- Section A-A, 200 label revised to 400; trench width.
- Section A-A, min added to 900mm label
- Section A-A, Earth surface revised to Original ground.

## SUMMARY OF REVISIONS TO OPSD 219.150

### SANDBAG BARRIER

- Perspective View, reduction in length of barrier main run.
- Plan View, addition of 350 Typ and 450 Typ bag dimensions.
- Section view, removed.
- Section A-A, Earth surface revised to Original ground.
- Section A-A, addition of 150 Typ bag dimension.

## SUMMARY OF REVISIONS TO OPSD 219.180

### STRAW BALE FLOW CHECK DAM

- Section C-C view, addition of Trench depth dimension
- Section C-C view, correction of width to 1275

## SUMMARY OF REVISIONS TO OPSD 219.210

**TEMPORARY ROCK FLOW CHECK DAM, V-DITCH**

- Plan Spillway view, Limits of geotextile added.
- Plan Spillway view, Anchor trench added.
- Title, Temporary added.

## SUMMARY OF REVISIONS TO OPSD 219.211

**TEMPORARY ROCK FLOW CHECK DAM, FLAT BOTTOM DITCH**

- Plan Spillway view, Limits of geotextile added.
- Plan Spillway view, Anchor trench added.
- Title, Temporary added.

## SUMMARY OF REVISIONS TO OPSD 219.220

**SEDIMENT TRAP IN DITCH**

- Plan view, realigned excavated basin to match width of ditch.
- Title, “Excavated” deleted.

## SUMMARY OF REVISIONS TO OPSD 219.230

**TEMPORARY SLOPE DRAIN FOR SEDIMENT TRAP**

- Perspective View, addition of rock under and around end pipe.
- Perspective View, deletion of rock flow check dam.
- Section view, addition of rock under end pipe.
- Section view, chute revised to slope drain.
- Section view, deletion of excavated from sediment trap OPSD 219.220 label.
- Notes 1, addition of per OPSD 810.010.
- Notes 2, deletion of “Inlet end section shall have a minimum grade of 3%”.
- Notes 2, addition of use OPSD 801.020 for corrugated steel.
- Title, Chute for Excavated Sediment Trap revised to Temporary Slope Drain for Sediment Trap.

## SUMMARY OF REVISIONS TO OPSD 219.231

**TEMPORARY BERM BARRIER FOR SLOPE DRAIN**

- Plan view, chute revised to slope drain.
- Plan view, addition of Geotextile or plastic sheeting
- Section A-A view, addition of Note 1 label.
- Section A-A view, chute revised to slope drain
- Section A-A view, addition of Geotextile or plastic sheeting label
- Section A-A view, addition of 3% grade label
- Notes, addition of note 1.
- Title, modified Temporary Berm Barrier For Slope Drain

## SUMMARY OF REVISIONS TO OPSD 401.081

**CAST IRON, SQUARE FRAME FISH TYPE COVER**

- Reference to stainless steel pins revised to 19 mm dia hinge pin.

## SUMMARY OF REVISIONS TO OPSD 911.130

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, CAST-IN-PLACE, TYPE A, INSTALLATION**

- Type A-3 view added.
- Existing Notes 1, A, and B deleted. Other Notes reordered.
- New Notes 2, 3, 4, and 5 added.

## SUMMARY OF REVISIONS TO OPSD 911.131

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, CAST-IN-PLACE, TYPE C, INSTALLATION**

- Existing Notes A, and C deleted. Other Notes reordered.
- New Notes 2 added.

**SUMMARY OF REVISIONS TO OPSD 911.132**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, CAST-IN-PLACE, TALL WALL, INSTALLATION**

- Type TW-3 view added
- Existing Notes 1, A, and B deleted. Other Notes reordered.
- New Notes 2, 3, 4 and 5 added.

**SUMMARY OF REVISIONS TO OPSD 911.134**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, INSTALLATION – MEDIAN CONCRETE BARRIER TO STRUCTURE**

- Title revised.
- Elevation view, steel reinforcement details deleted.
- Existing Cross Section On Bridge Deck view deleted.
- Existing Chase Detail deleted.
- Existing Dowel Detail view; renamed to Dowel Connection Detail, width of expansion joint added, and the hole diameter for the steel dowel revised from 300 to 30 mm.
- Note B, steel reinforcement deleted and dowel requirements added.

**SUMMARY OF REVISIONS TO OPSD 911.173**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, TYPE M CONNECTION, INSTALLATION – TEMPORARY RESTRAINT SYSTEM, TRANSITION TO PERMANENT CONCRETE BARRIER**

- Plan view, asphalt pavement label deleted.
- Elevation view; reference to OPSD 911.231 revised to 911.135,reference to OPSD 911.160 deleted, and steel pin label revised.
- New Note 1 added.

**SUMMARY OF REVISIONS TO OPSD 911.174**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, TYPE M CONNECTION, COMPONENT – THRIE BEAM TRANSITION**

- Reference to OPSD 911.231 revised to 911.135 throughout drawing.
- Elevation view was revised to reflect OPSD 911.172. Concrete pavement or bridge deck revised to concrete approach slab and extended, reference to OPSD 911.162 deleted, and bolt assemblies replaced with steel pins.

**SUMMARY OF REVISIONS TO OPSD 911.230**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, MEDIAN END TREATMENT, INSTALLATION**

- Shoulder width revised from 1.0 to 2.6 m min.
- Existing Table 1 deleted.
- New Note 2 added.

**SUMMARY OF REVISIONS TO OPSD 911.380**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, PERMANENT TRANSITION, INSTALLATION AT BRIDGE PIERS**

- OPSD 911.380 has been split into two drawings, OPSD 911.380 and new OPSD 911.383, for clarity. OPSD 911.380 for bridge piers and OPSD 911.383 for lighting pole and sign support footings.
- 40:1 flare rate replaced with a table for various posted speeds.
- Existing Note 1 deleted. Other note reordered.
- Existing Note 2 revised.
- New Notes 2 and 3 added.

**SUMMARY OF REVISIONS TO OPSD 911.382**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, DOWEL CONNECTION DETAIL**

- Dowel Connection Detail, Type I view; width of expansion joint added and filler type specified.
- Existing Note 1 deleted.
- New Notes 1 and B added. Other note reordered.

**SUMMARY OF REVISIONS TO OPSD 911.430**

**GUIDE RAIL SYSTEM, CONCRETE BARRIER, TEMPORARY – LEAVING END TREATMENT, INSTALLATION – DIVIDED HIGHWAY**

- Existing temporary connection of temporary concrete barriers to bridge abutments, retaining walls, permanent concrete barriers, etc. has been deleted. The temporary concrete barriers have been redesigned as a leaving end treatment at varies posted speeds.
- Title revised.

**SUMMARY OF REVISIONS TO OPSD 3311.900**

**DECK GIRDERS, STEEL BOX ACCESS HATCH**

- Outside Face – Elevation view, addition of B-B labels.
- Section A-A view, 50mm, Typ label added.
- Section A-A view, “Cope corner” label added.
- Section A-A view, three welding point labels added, two near the top and one near the bottom.
- Section A-A view, 75 and 25 labels added.
- Section A-A view, $45^{o}$ label added.
- Section A-A view, “Fitted condition” and “Connection PL 14x120” added.
- Section B-B view, added.
- Detail A view, 12mm changed to 14mm on “100x14mm min transverse stiffener label”.
- Notes: 1, addition of “hot-dip” and, removal of “according to CSA G164” and “according to ASTM A 325M, Type 3”.
- Notes: 2, moved “bolts shall be ASTM A325M, Type 3” to Notes: 3.
- Notes: 3, added.

ONTARIO PROVINCIAL STANDARD SPECIFICATION

# VOLUME 3 INDEX

## MUNICIPAL AND PROVINCIAL COMMON DRAWINGS FOR ROADS, BARRIERS, DRAINAGE, SANITARY SEWERS, WATERMAINS, AND STRUCTURES


| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| **DIVISION 100 - ABBREVIATIONS** | | | |
| 2010 11 | 100.010 | 4 | Abbreviations, General A-C |
| 2006 11 | 100.011 | 1 | Abbreviations, General D-J |
| 2009 11 | 100.012 | 2 | Abbreviations, General L-R |
| 2009 11 | 100.013 | 4 | Abbreviations, General S-W |
| 2006 11 | 100.050 | 1 | Abbreviations, Building Descriptions |
| 2006 11 | 100.060 | 1 | Abbreviations, Geotechnical |
| 2006 11 | 101.010 | 1 | Topography Plan Features, Monument Features |
| 2006 11 | 101.011 | 1 | Topography Plan Features, Ground Features |
| 2006 11 | 101.012 | 1 | Topography Plan Features, Road Features |
| 2006 11 | 101.013 | 1 | Topography Plan Features, Barrier and Vegetation Features |
| 2006 11 | 101.014 | 1 | Topography Plan Features, Utility Features |
| 2006 11 | 101.015 | 1 | Topography Plan Features, Drainage Features |
| 2006 11 | 101.016 | 1 | Topography Plan Features, Miscellaneous Features |
| 2008 11 | 101.017 | 3 | Topography Plan Features, Right-of-Way Features |
| 2006 11 | 102.010 | 1 | Removals, Legend |
| 2006 11 | 103.010 | 1 | New Construction, Legend 1 |
| 2008 04 | 103.011 | 2 | New Construction, Legend 2 |
| 2007 11 | 104.010 | 0 | Miscellaneous Symbols |
| **DIVISION 200 - GRADING** | | | |
| 2009 11 | 200.010 | 2 | Earth/Shale Grading, Undivided Rural |
| 2009 11 | 200.020 | 2 | Earth/Shale Grading, Divided Rural |
| 2009 11 | 201.010 | 2 | Rock Grading, Undivided Rural |
| 2009 11 | 201.020 | 2 | Rock Grading, Divided Rural |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2009 11 | 202.010 | 2 | Slope Flattening Using Surplus Excavated Material On Earth or Rock Embankment |
| 2013 11 | 202.020 | 3 | Drainage Gap for Slope Flattening on Rock or Granular Embankment |
| 2009 11 | 202.030 | 5 | Roadway Widening for Guide Rail End Treatments and Transitions |
| 2009 11 | 202.031 | 0 | Roadway Widening for Steel Beam Energy Attenuating Terminal Approach End |
| 2011 11 | 202.032 | 1 | Roadway Widening for Steel Beam Energy Attenuating Terminal Leaving End and Constrained Approach End |
| 2011 11 | 202.033 | 0 | Roadway Widening, Single Sided Energy Attenuating Terminals, Approach End |
| 2010 11 | 203.010 | 3 | Embankments Over Swamp, New Construction |
| 2010 11 | 203.020 | 3 | Embankments Over Swamp, Existing Slope Excavated to 1H:1V |
| 2010 11 | 203.030 | 3 | Embankments Over Swamp, Existing Slopes Maintained |
| 2010 11 | 203.040 | 3 | Embankments Over Swamp at Pipe Culvert $\leq$ 1500 mm |
| 2015 11 | 204.010 | 3 | Boulder Treatment, Cut Sections - Subgrade |
| 2009 11 | 205.010 | 2 | Transition Treatment, Earth Cut to Earth Fill |
| 2009 11 | 205.020 | 2 | Transition Treatment, Rock Cut to Rock Fill |
| 2009 11 | 205.030 | 2 | Transition Treatment, Rock Cut to Earth Fill |
| 2009 11 | 205.040 | 2 | Transition Treatment, Earth Fill to Rock Fill and Earth Fill to Granular Fill |
| 2009 11 | 205.050 | 2 | Transition Treatment, Rock Cut to Earth Cut |
| 2014 11 | 205.060 | 3 | Frost Heave Treatment |
| 2009 11 | 206.010 | 1 | Granular Courses, Undivided Rural |
| 2009 11 | 206.020 | 1 | Granular Courses, Divided Rural |
| 2008 11 | 206.050 | 1 | Subdrain Pipe, Connection and Outlet, Rural |
| 2007 11 | 207.010 | 2 | Concrete Pavement on Open Graded Drainage Layer, Divided Highway |
| 2007 11 | 207.020 | 2 | Composite Pavement on Open Graded Drainage Layer, Divided Highway |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2005 11 | 207.030 | 1 | Concrete and Composite Pavement on Open Graded Drainage Layer, Urban Section |
| 2008 11 | 207.041 | 3 | Subdrain Pipe, Open Graded Drainage Layer, Hot Mix Asphalt, Concrete, or Composite Pavement |
| 2008 11 | 207.044 | 4 | Subdrain Pipe, Connection and Outlet, Open Graded Drainage Layer |
| 2013 11 | 208.010 | 3 | Benching of Earth Slopes |
| 2009 11 | 209.010 | 1 | Rural Pavement Widening |
| 2009 11 | 209.011 | 2 | Rural Pavement Widening, Curb with Gutter |
| 2010 04 | 209.020 | 2 | Widening Existing Rock Cut with Grade Rise |
| 2010 11 | 210.010 | 1 | Tangent Shoulders, Rural |
| 2010 11 | 210.020 | 1 | Superelevated Shoulders, Rural |
| 2013 11 | 210.070 | 3 | Granular Sealing |
| 2010 11 | 211.010 | 2 | Partially Paved Shoulders, Existing Pavement Maintained |
| 2010 11 | 211.020 | 2 | Partially Paved Shoulders, Existing Pavement Resurfaced |
| 2009 11 | 212.010 | 1 | Resurfacing with Crossfall Correction with Hot Mix Asphalt, Tangent Section |
| 2009 11 | 212.020 | 1 | Resurfacing with Crossfall Correction with Hot Mix Asphalt, Superelevated Section |
| 2009 11 | 212.030 | 1 | Resurfacing, Existing Crossfall Maintained |
| 83 12 01 | 213.01 | 0 | Pavement Widening On Curves, Widening On Both Sides of Curve With or Without Spirals |
| 83 12 01 | 213.02 | 0 | Pavement Widening on Curves, Widening on Inside of Curves With or Without Spirals |
| 2007 11 | 214.010 | 1 | Single-Lane Ramp Grading for Asphalt Pavement with Granular Base and Shoulder |
| 2007 11 | 214.020 | 1 | Single-Lane Ramp Grading for Asphalt Pavement with Granular Base and Asphalt Shoulder |
| 2007 11 | 214.030 | 2 | Single-Lane Ramp Grading for Asphalt Pavement with Granular Base, Asphalt Shoulder, and Curb with Gutter |
| 2007 11 | 215.010 | 1 | Two-Lane Ramp Grading for Asphalt Pavement with Granular Base and Asphalt Shoulder |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2007 11 | 215.020 | 1 | Two-Lane Ramp Grading for Asphalt Pavement with Granular Base, Asphalt Shoulder, and Curb with Gutter for Tangent Section |
| 2007 11 | 215.030 | 2 | Two-Lane Ramp Grading for Asphalt Pavement with Granular Base, Asphalt Shoulder, and Curb with Gutter for Superelevated Section |
| 2006 11 | 216.010 | 1 | Boulevard Treatments, Urban Section |
| 2008 11 | 216.020 | 1 | Hot Mix, Concrete, and Composite Pavement On Granular Base, Urban Section |
| 2008 11 | 216.021 | 2 | Subdrain Pipe, Connection and Outlet, Urban |
| 2011 11 | 217.050 | 2 | Access to Hydrant Across Ditch |
| 2011 11 | 217.060 | 2 | Utility Pole Setting Depth at Ditch Locations |
| 2015 11 | 219.100 | 2 | Light-Duty Straw Bale Barrier |
| 2015 11 | 219.110 | 2 | Light-Duty Silt Fence Barrier |
| 2015 11 | 219.120 | 0 | Light-Duty Fibre Roll Barrier |
| 2015 11 | 219.130 | 2 | Heavy-Duty Silt Fence Barrier |
| 2015 11 | 219.131 | 0 | Heavy-Duty Wire-Backed Silt Fence Barrier |
| 2015 11 | 219.150 | 2 | Sandbag Barrier |
| 2015 11 | 219.160 | 0 | Fibre Roll Grade Breaks |
| 2015 11 | 219.180 | 2 | Straw Bale Flow Check Dam |
| 2015 11 | 219.191 | 0 | Fibre Roll Flow Check Dam |
| 2015 11 | 219.200 | 2 | Sandbag Flow Check Dam |
| 2015 11 | 219.210 | 2 | Temporary Rock Flow Check Dam, V-Ditch |
| 2015 11 | 219.211 | 2 | Temporary Rock Flow Check Dam, Flat Bottom Ditch |
| 2015 11 | 219.220 | 2 | Sediment Trap In Ditch |
| 2015 11 | 219.230 | 4 | Temporary Slope Drain for Sediment Trap |
| 2015 11 | 219.231 | 1 | Temporary Berm Barrier for Slope Drain |
| 2015 11 | 219.240 | 2 | Sediment Trap for Dewatering |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2015 11 | 219.260 | 2 | Turbidity Curtain |
| 2015 11 | 219.261 | 2 | Turbidity Curtain, Seam Detail |
| 2007 11 | 220.010 | 0 | Barrier for Tree Protection |
| 2000 11 | 221.010 | 0 | Temporary Water Passage System, Culvert in Watercourse |
| 2000 11 | 221.020 | 0 | Temporary Water Passage System, Pumping and Piping |
| 2000 11 | 221.030 | 0 | Temporary Water Passage System, Temporary Channel or Culvert Outside Watercourse |
| 2000 11 | 221.040 | 0 | Temporary Waterbody Crossing, Fill and Culvert |
| 2000 11 | 221.050 | 0 | Temporary Waterbody Crossing, Ford |
| 2014 11 | 222.010 | 1 | Rootwad Structures for Waterbody Banks |
| 2013 11 | 222.020 | 0 | Large Woody Debris for Waterbody Banks |
| 2013 11 | 222.030 | 0 | Stone Lunkers |
| 2013 11 | 222.040 | 0 | Wood Lunkers |
| 2014 11 | 222.050 | 0 | Riffles on Streambeds |
| 2014 11 | 222.060 | 0 | Pools in Streambeds |
| 2014 11 | 222.070 | 0 | Rocky Ramps on Streambeds |
| 2014 11 | 222.080 | 0 | Low Flow Channel |
| 2014 11 | 222.090 | 0 | Baffles in a Culvert |
| **DIVISION 300 - ENTRANCES** | | | |
| 2011 11 | 300.010 | 2 | Side Road Intersection, Fill |
| 2011 11 | 300.020 | 2 | Side Road Intersection, Cut |
| 2010 11 | 301.010 | 2 | Rural Entrances to Roads on Fill |
| 2010 11 | 301.020 | 2 | Rural Entrances to Roads in Earth Cut |
| 2010 11 | 301.030 | 2 | Rural Entrance, Rock Cut |
| 2015 11 | 302.010 | 2 | Median Crossovers for Service and Emergency Vehicles |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2009 11 | 304.010 | 1 | Shoulder Treatment, Sideroad Intersections |
| 2015 11 | 310.010 | 2 | Concrete Sidewalk |
| 2015 11 | 310.020 | 2 | Concrete Sidewalk Adjacent to Curb and Gutter |
| 2015 11 | 310.030 | 1 | Concrete Sidewalk Ramps at Signalized Intersections |
| 2015 11 | 310.031 | 0 | Concrete Sidewalk Ramps At Signalized Intersections With Intersecting Crosswalks |
| 2015 11 | 310.033 | 0 | Concrete Sidewalk Ramps At Unsignalized Intersections |
| 2015 11 | 310.039 | 0 | Concrete Sidewalk Ramps Tactile Walking Surface Indicators Component |
| 2015 11 | 310.040 | 2 | Utility Isolation in Concrete Sidewalks |
| 2015 11 | 310.050 | 2 | Concrete Sidewalk Driveway Entrance Details |
| 2015 11 | 310.060 | 2 | Joint Detail for Concrete Pedestrian Crosswalk at Signalized and All-Way Stop Controlled Intersections |
| 2009 11 | 350.010 | 1 | Urban Industrial, Commercial, and Apartment Entrances |
| 2009 11 | 351.010 | 1 | Urban Residential Entrance |
| **DIVISION 400 - FRAMES AND GRATES** | | | |
| 2013 11 | 400.001 | 1 | Hoisting Hook Rib for Cast Iron Frames for Catch Basins, Maintenance Holes, and Valve Chambers |
| 2013 11 | 400.010 | 2 | Cast Iron, Square Frame with Square Overflow Type Dished Grate for Catch Basins, Herring Bone Openings |
| 2013 11 | 400.020 | 2 | Cast Iron, Square Frame with Square Flat Grate for Catch Basins, Herring Bone Openings |
| 2013 11 | 400.021 | 0 | Cast Iron, Square Frame for Curb Inlet Overflow |
| 2013 11 | 400.030 | 2 | Cast Iron, Square Frame with Square V Grate for Catch Basins, Herring Bone Openings |
| 2013 11 | 400.040 | 2 | Cast Iron, One-Piece Frame and Flat Square Grate for Temporary Installation, Herring Bone Openings |
| 2014 11 | 400.070 | 5 | Cast Iron, Raised Square Frame with Circular Flat Grate for Catch Basins, Herring Bone Openings |
| 2013 11 | 400.080 | 2 | Cast Iron, Side Inlet for Catch Basins |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2013 11 | 400.081 | 2 | Cast Iron, Curb Inlet Frame with Two-Piece Raised Cover for Catch Basins Out of Roadway |
| 2014 11 | 400.082 | 4 | Cast Iron, Raised Curb Inlet Frame with Cover for Catch Basins Out of Roadway |
| 2013 11 | 400.090 | 2 | Cast Iron, Curb Inlet Overflow for Catch Basins |
| 2013 11 | 400.100 | 2 | Cast Iron, Square Frame with Square Flat Grate for Catch Basins, Perforated Openings |
| 2013 11 | 400.110 | 2 | Cast Iron, Square Frame with Square Overflow Type Flat Grate for Catch Basins, Perforated Openings |
| 2013 11 | 400.120 | 2 | Cast Iron, Square Frame with Birdcage Grate for Catch Basins |
| 2013 11 | 401.010 | 3 | Cast Iron, Square Frame with Circular Closed or Open Cover for Maintenance Holes |
| 2013 11 | 401.020 | 3 | Cast Iron, Circular Frame with Circular 745 mm Cover for Maintenance Holes |
| 2013 11 | 401.030 | 3 | Cast Iron, Square Frame with Circular Watertight Cover for Maintenance Holes |
| 2015 04 | 401.040 | 4 | Cast Iron, Raised Square Frame with Circular Closed or Open Cover for Maintenance Holes |
| 2015 04 | 401.050 | 4 | Cast Iron, Raised Square Frame with Circular Watertight Cover for Maintenance Holes |
| 2013 11 | 401.060 | 3 | Cast Iron, Circular Locking Cover for Maintenance Holes |
| 2014 11 | 401.080 | 0 | Cast Iron, Curb inlet Fish Type Cover for Catch Basins Out of Roadway |
| 2015 11 | 401.081 | 1 | Cast Iron, Square Frame Fish Type Cover |
| 2014 11 | 402.010 | 3 | Cast Iron, Square Frame with Circular Cover and Plug for Valve Chambers |
| 2014 11 | 402.011 | 3 | Cast Iron, Square Frame with Vented Circular Cover and Plug for Valve Chambers |
| 2015 04 | 402.020 | 4 | Cast Iron, Raised Square Frame with Circular Cover and Plug for Valve Chambers |
| 2015 04 | 402.021 | 3 | Cast Iron, Raised Square Frame with Vented Circular Cover and Plug for Valve Chambers |
| 2014 11 | 402.030 | 4 | Cast Iron, Rectangular Frame with Two-Piece Cover for Meter and Valve Chambers |
| 2013 11 | 403.010 | 2 | Galvanized Steel, Honey Comb Grating for Ditch Inlets |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2012 11 | 403.011 | 0 | Raised Bar Grate for Ditch Inlet, 600 x 600 mm |
| 2012 11 | 404.010 | 1 | Aluminum Safety Platform and Ladder for Rectangular Precast Concrete Valve Chambers |
| 2013 11 | 404.020 | 3 | Aluminum Safety Platform for Circular Maintenance Holes |
| 2013 11 | 404.021 | 2 | Aluminum Safety Platform for 1500 mm Diameter Circular Maintenance Holes with Drop Pipe |
| 2013 11 | 404.022 | 2 | Aluminum Safety Platform for 1800 mm Diameter Circular Maintenance Holes with Drop Pipe |
| 2013 11 | 405.010 | 3 | Maintenance Hole Steps, Hollow |
| 2013 11 | 405.020 | 3 | Maintenance Hole Steps, Solid |
| 2013 11 | 406.010 | 2 | Aluminum Ladder for Maintenance Holes |
| **DIVISION 500 - PAVING** | | | |
| 2009 11 | 500.010 | 0 | Turning Basins for Terminated Rural Roadways |
| 2009 11 | 500.020 | 0 | Turning Basins for Terminated Urban Roadways, Residential |
| 2009 11 | 500.030 | 0 | Turning Basins for Terminated Urban Roadways, Industrial and Commercial |
| 2010 11 | 501.010 | 1 | Bus Bays |
| 2009 11 | 502.010 | 1 | Access Lanes for Rear Lots |
| 2011 11 | 503.010 | 1 | Concrete Ripple Strip |
| 2012 11 | 504.010 | 1 | Raised Traffic Island |
| 2009 11 | 506.010 | 1 | Hot Mix Resurfacing Treatment at Structure Approaches |
| 2015 11 | 508.010 | 2 | Routing and Sealing Cracks Up to 20 mm Width in Asphalt Pavement |
| 2008 11 | 508.020 | 2 | Sealing or Resealing of Joints and Cracks in Concrete Pavement and Concrete Base |
| 2013 11 | 509.010 | 2 | Pavement Reinstatement for Utility Cuts |
| 2000 11 | 512.010 | 0 | Concrete Steps, Slab on Grade with Footings |
| 2000 11 | 512.011 | 0 | Concrete Steps, Slab on Grade |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2010 11 | 514.010 | 1 | Extruded Expanded Polystyrene Frost Heave Treatment, 25 mm Thickness |
| 2010 11 | 514.020 | 1 | Extruded Expanded Polystyrene Frost Heave Treatment, 40 mm Thickness |
| 2008 11 | 551.010 | 1 | Concrete and Composite Pavement Joint Spacing |
| 2008 11 | 551.020 | 1 | Concrete and Composite Pavement Joint Layout at Converging or Diverging Lanes |
| 2008 11 | 551.030 | 2 | Concrete and Composite Pavement Skewed Joint Layout at Intersections |
| 2008 11 | 551.031 | 2 | Concrete and Composite Pavement Right Angle Joint Layout at Intersections |
| 2008 11 | 551.032 | 2 | Concrete and Composite Pavement Utility Isolation |
| 2008 11 | 552.010 | 1 | Concrete Pavement Joint Details |
| 2008 11 | 552.020 | 1 | Composite Pavement Joint Details |
| 2008 11 | 552.050 | 2 | Load Transfer Device, Skewed Contraction Joint, Concrete or Composite Pavement |
| 2008 11 | 552.051 | 2 | Load Transfer Device, Right Angle Contraction Joint, Concrete or Composite Pavement |
| 2008 11 | 552.060 | 2 | Load Transfer Device, Skewed Expansion Joint, Concrete or Composite Pavement |
| 2008 11 | 552.061 | 2 | Load Transfer Device, Right Angle Expansion Joint, Concrete or Composite Pavement |
| 2008 11 | 553.010 | 1 | Concrete Pavement in Gore Areas |
| 2008 11 | 553.020 | 1 | Composite Pavement in Gore Areas |
| 2008 11 | 554.010 | 1 | Concrete Pavement Shoulder Terminal |
| 2008 11 | 554.020 | 1 | Composite Pavement Shoulder Terminal |
| 2008 11 | 555.010 | 1 | Concrete Pavement Approach Treatment to Hot Mix and Composite Pavements and Structure Approaches |
| 2008 11 | 555.020 | 1 | Composite Pavement Approach Treatment to Hot Mix and Concrete Pavements and Structure Approaches |
| 2010 11 | 560.010 | 5 | Composite or Exposed Concrete Pavements, Full Depth Concrete Slab Repair Layout |
| 2010 11 | 560.020 | 2 | Exposed Concrete Pavement, Full Depth Concrete Slab Repair, Joint Details |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2008 11 | 560.025 | 0 | Concrete Pavement and Concrete Base, Cross-Stitching Longitudinal Cracks |
| 2010 11 | 560.030 | 1 | Composite Pavement, Full Depth Concrete Slab Repair, Joint Details |
| 2010 11 | 560.040 | 1 | Partial Depth Repairs in Concrete Pavement |
| 2006 11 | 561.010 | 1 | Interlocking Concrete Pavers on Granular Base |
| 2006 11 | 561.020 | 1 | Interlocking Concrete Pavers on Concrete or Asphalt Base |
| 2006 11 | 561.030 | 1 | Interlocking Concrete Pavers for Retrofit Crosswalk Installation |
| **DIVISION 600 - CURBS AND GUTTERS** | | | |
| 2012 11 | 600.010 | 2 | Concrete Barrier Curb with Wide Gutter |
| 2012 11 | 600.020 | 2 | Concrete Semi-Mountable Curb with Wide Gutter |
| 2012 11 | 600.030 | 2 | Concrete Mountable Curb with Wide Gutter |
| 2012 11 | 600.040 | 2 | Concrete Barrier Curb with Standard Gutter |
| 2012 11 | 600.060 | 2 | Concrete Semi-Mountable Curb with Standard Gutter |
| 2012 11 | 600.070 | 2 | Concrete Barrier Curb with Standard Gutter, Two Stage Construction |
| 2012 11 | 600.080 | 2 | Concrete Barrier Curb with Narrow Gutter |
| 2012 11 | 600.090 | 2 | Concrete Semi-Mountable Curb with Narrow Gutter |
| 2012 11 | 600.100 | 2 | Concrete Mountable Curb with Narrow Gutter |
| 2012 11 | 600.110 | 2 | Concrete Barrier Curb |
| 2013 11 | 601.010 | 2 | Asphalt Curb and Asphalt Curb with Gutter |
| 2012 11 | 603.020 | 2 | Precast Concrete Curb |
| 2012 11 | 604.010 | 2 | 90° Concrete Outlet for Concrete Curb with Gutter |
| 2013 11 | 604.020 | 2 | 90° Asphalt Outlet for Asphalt Curb with Gutter |
| 2012 11 | 605.010 | 2 | 45° Concrete Outlet for Concrete Curb with Gutter |
| 2013 11 | 605.020 | 2 | 30° and 45° Asphalt Outlets for Asphalt Curb with Gutter |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2012 11 | 605.030 | 2 | 45° Concrete Outlet for Concrete Curb with Gutter at End of Run |
| 2013 11 | 605.040 | 2 | Asphalt Spillways |
| 2012 11 | 606.010 | 2 | 600 mm Radius Barrier Bullnose |
| 2012 11 | 606.020 | 2 | 600 mm Radius Mountable Bullnose |
| 2012 11 | 606.030 | 2 | 800 mm Radius Bullnose, Curb with Gutter Twin Inlet |
| 2012 11 | 607.010 | 2 | Over 600 mm Radius Mountable Bullnose |
| 2012 11 | 607.020 | 2 | Over 600 mm Radius Barrier Bullnose |
| 2012 11 | 608.010 | 2 | Method of Termination for Concrete Curb with Gutter |
| 2009 11 | 610.010 | 1 | Catch Basin Frame with Grate Installation at Curb with Gutter |
| 2006 11 | 610.020 | 2 | Catch Basin Frame with Grate Shoulder Installation at Concrete Barrier |
| 2009 11 | 610.030 | 1 | Frame with Grate Installation for Inlet Type Catch Basins |
| **DIVISION 700 - CATCH BASINS AND MANHOLES** | | | |
| 2014 11 | 701.010 | 5 | Precast Concrete Maintenance Hole, 1200 mm Diameter |
| 2014 11 | 701.011 | 5 | Precast Concrete Maintenance Hole, 1500 mm Diameter |
| 2014 11 | 701.012 | 5 | Precast Concrete Maintenance Hole, 1800 mm Diameter |
| 2014 11 | 701.013 | 5 | Precast Concrete Maintenance Hole, 2400 mm Diameter |
| 2014 11 | 701.014 | 4 | Precast Concrete Maintenance Hole, 3000 mm Diameter |
| 2014 11 | 701.015 | 4 | Precast Concrete Maintenance Hole, 3600 mm Diameter |
| 2014 11 | 701.021 | 4 | Maintenance Hole Benching and Pipe Opening Alternatives |
| 2014 11 | 701.030 | 4 | Precast Concrete Maintenance Hole Components, 1200 mm Diameter, Tapered Top and Flat Cap |
| 2014 11 | 701.031 | 2 | Precast Concrete Maintenance Hole Components, 1200 mm Diameter, Riser and Monolithic Base |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2014 11 | 701.032 | 2 | Precast Concrete Maintenance Hole Components, 1200 mm Diameter, Base Slab |
| 2014 11 | 701.040 | 4 | Precast Concrete Maintenance Hole Components, 1500 mm Diameter, Transition Cone and Slabs |
| 2014 11 | 701.041 | 2 | Precast Concrete Maintenance Hole Components, 1500 mm Diameter, Riser and Bases |
| 2014 11 | 701.050 | 4 | Precast Concrete Maintenance Hole Components, 1800 mm Diameter, Transition Slabs |
| 2014 11 | 701.051 | 2 | Precast Concrete Maintenance Hole Components, 1800 mm Diameter, Riser and Base Slab |
| 2014 11 | 701.060 | 4 | Precast Concrete Maintenance Hole Components, 2400 mm Diameter, Transition Slab |
| 2014 11 | 701.061 | 2 | Precast Concrete Maintenance Hole Components, 2400 mm Diameter, Riser and Base Slab |
| 2014 11 | 701.070 | 3 | Precast Concrete Maintenance Hole Components, 3000 mm Diameter, Transition Slab |
| 2014 11 | 701.071 | 2 | Precast Concrete Maintenance Hole Components, 3000 mm Diameter, Riser and Base Slab |
| 2014 11 | 701.080 | 3 | Precast Concrete Maintenance Hole Components, 3600 mm Diameter, Transition Slab |
| 2014 11 | 701.081 | 2 | Precast Concrete Maintenance Hole Components, 3600 mm Diameter, Riser and Base Slab |
| 2010 11 | 701.100 | 2 | Frost Strap Installation |
| 2014 11 | 702.040 | 3 | Precast Concrete Ditch Inlet Maintenance Hole - Type A, 1200 x 1200 mm |
| 2014 11 | 702.050 | 3 | Precast Concrete Ditch Inlet Maintenance Hole - Type B, 1200 x 1200 mm |
| 2014 11 | 703.011 | 2 | Precast Concrete Single Inlet Flat Cap, 1500 mm Diameter |
| 2014 11 | 703.012 | 2 | Precast Concrete Single Inlet Flat Cap, 1800 mm Diameter |
| 2014 11 | 703.013 | 2 | Precast Concrete Single Inlet Flat Cap, 2400 mm Diameter |
| 2014 11 | 703.014 | 2 | Precast Concrete Single Inlet Flat Cap, 3000 mm Diameter |
| 2014 11 | 703.015 | 2 | Precast Concrete Single Inlet Flat Cap, 3600 mm Diameter |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2014 11 | 703.021 | 2 | Precast Concrete Twin Inlet Flat Cap, 1500 mm Diameter |
| 2014 11 | 703.022 | 2 | Precast Concrete Twin Inlet Flat Cap, 1800 mm Diameter |
| 2014 11 | 703.023 | 2 | Precast Concrete Twin Inlet Flat Cap, 2400 mm Diameter |
| 2014 11 | 703.024 | 2 | Precast Concrete Twin Inlet Flat Cap, 3000 mm Diameter |
| 2014 11 | 704.010 | 3 | Precast Concrete Adjustment Units for Maintenance Holes, Catch Basins, and Valve Chambers |
| 2008 11 | 704.011 | 1 | High Density Polyethylene Adjustment Units for Maintenance Holes, Catch Basins, and Valve Chambers |
| 2013 04 | 704.012 | 0 | Expanded Polystyrene (EPS) Adjustment Units for maintenance Holes, Catch Basins, and Valve Chambers |
| 2014 11 | 705.001 | 0 | Concrete Catch Basin Apron, Mountable Curb with Wide Gutter |
| 2014 11 | 705.002 | 0 | Concrete Catch Basin Apron, Barrier Curb with Standard Gutter |
| 2014 11 | 705.010 | 3 | Precast Concrete Catch Basin, 600 x 600 mm |
| 2014 11 | 705.020 | 3 | Precast Concrete Twin Inlet Catch Basin, 600 x 1450 mm |
| 2014 11 | 705.030 | 3 | Precast Concrete Ditch Inlet, 600 x 600 mm |
| 2014 11 | 705.040 | 3 | Precast Concrete Ditch Inlets, 600 x 1200 mm |
| 2014 11 | 706.010 | 3 | Precast Concrete Ditch Inlets, 600 x 1200 mm with 1500 mm Diameter Flat Cap |
| 2014 11 | 706.020 | 3 | Precast Concrete Ditch Inlets, 600 x 1200 mm with 1800 mm Diameter Flat Cap |
| 2014 11 | 706.030 | 3 | Precast Concrete Ditch Inlet - Type A, 600 x 1200 mm with 2400 mm Diameter Flat Cap |
| 2014 11 | 706.031 | 2 | Precast Concrete Ditch Inlet - Type B, 600 x 1200 mm with 2400 mm Diameter Flat Cap |
| 2014 11 | 706.040 | 3 | Precast Concrete Ditch Inlet - Type A, 600 x 1200 mm with 3000 mm Diameter Flat Cap |
| 2014 11 | 706.041 | 2 | Precast Concrete Ditch Inlet - Type B, 600 x 1200 mm with 3000 mm Diameter Flat Cap |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2014 11 | 707.010 | 3 | Precast Concrete Maintenance Hole Manufactured Tee |
| 2011 11 | 708.010 | 2 | Catch Basin Connection for Rigid Main Pipe Sewer |
| 2011 11 | 708.020 | 3 | Support for Pipe at Catch Basin or Maintenance Hole |
| 2011 11 | 708.030 | 2 | Catch Basin Connection for Flexible Main Pipe Sewer |
| 2013 11 | 710.010 | 3 | Capping Existing Structures, Maximum 4.0 m Cover |
| **DIVISION 800 - CULVERTS AND DRAINS** | | | |
| 2012 11 | 800.010 | 2 | Concrete Pipe Culvert and Sewer Extensions Using Corrugated Steel Pipe, Temporary Conditions |
| 2012 11 | 800.011 | 2 | Concrete Rigid Frame Box and Open Culvert Extensions Using Corrugated Steel Pipe, Temporary Conditions |
| 2012 11 | 801.010 | 2 | Cut End Finish Circular Pipe and Pipe-Arch, Corrugated Steel Pipe |
| 2012 11 | 801.020 | 1 | End Section Details, Corrugated Steel Pipe |
| 2012 11 | 801.030 | 2 | Bevel Details, Circular and Pipe-Arch Structural Plate, Corrugated Steel Pipe |
| 2012 11 | 801.040 | 2 | Culvert and Sewer Safety Slope End Treatment Notes and Tables |
| 2012 11 | 801.041 | 2 | Culvert and Sewer Safety Slope End Treatment, Assembly Details |
| 2012 11 | 801.042 | 2 | Culvert and Sewer Safety Slope End Treatment, Connection Details |
| 2012 11 | 801.043 | 2 | Culvert and Sewer Safety Slope End Treatment, Installation Details |
| 2015 11 | 802.010 | 4 | Flexible Pipe Embedment and Backfill, Earth Excavation |
| 2014 11 | 802.013 | 3 | Flexible Pipe Embedment and Backfill, Rock Excavation |
| 2014 11 | 802.014 | 3 | Flexible Pipe Embedment in Embankment, Original Ground: Earth or Rock |
| 2015 11 | 802.020 | 3 | Flexible Pipe Arch Embedment and Backfill, Earth Excavation |
| 2015 11 | 802.023 | 3 | Flexible Pipe Arch Embedment and Backfill, Rock Excavation |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2015 11 | 802.024 | 3 | Flexible Pipe Arch Embedment in Embankment, Original Ground: Earth or Rock |
| 2015 11 | 802.030 | 3 | Rigid Pipe Bedding, Cover, and Backfill, Type 1 or 2 Soil - Earth Excavation |
| 2015 11 | 802.031 | 3 | Rigid Pipe Bedding, Cover, and Backfill, Type 3 Soil - Earth Excavation |
| 2015 11 | 802.032 | 3 | Rigid Pipe Bedding, Cover, and Backfill, Type 4 Soil - Earth Excavation |
| 2015 11 | 802.033 | 3 | Rigid Pipe Bedding, Cover, and Backfill, Rock Excavation |
| 2015 11 | 802.034 | 3 | Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock |
| 2015 11 | 802.050 | 3 | Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 1 or 2 Soil - Earth Excavation |
| 2015 11 | 802.051 | 3 | Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 3 Soil - Earth Excavation |
| 2015 11 | 802.052 | 3 | Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 4 Soil - Earth Excavation |
| 2015 11 | 802.053 | 3 | Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Rock Excavation |
| 2015 11 | 802.054 | 3 | Horizontal Elliptical Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock |
| 2011 11 | 802.095 | 1 | Clay Seal for Pipe Trenches |
| 2015 11 | 803.010 | 3 | Backfill and Cover for Concrete Culverts with Spans Less Than or Equal to 3.0 m |
| 2015 11 | 803.030 | 3 | Frost Treatment - Pipe Culverts, Frost Penetration Line Below Bedding Grade |
| 2015 11 | 803.031 | 4 | Frost Treatment - Pipe Culverts, Frost Penetration Line Between Top of Pipe and Bedding Grade |
| 2006 11 | 804.030 | 1 | Concrete Headwall for Pipe Less Than 900 mm Diameter |
| 2006 11 | 804.040 | 0 | Concrete Headwall for Sewer or Culvert Pipe Outlet |
| 2013 11 | 804.050 | 1 | Grating for Concrete Endwall |
| 2014 11 | 805.010 | 2 | Height of Fill Table, Round Corrugated Steel Pipe and Structural Plate Corrugated Steel Pipe |
| 2014 11 | 805.020 | 2 | Height of Fill Table, Corrugated Steel Pipe-Arch and Structural Plate Corrugated Steel Pipe-Arch |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2014 11 | 805.030 | 2 | Height of Fill Table, Spiral Rib Round Pipe |
| 2014 11 | 805.040 | 2 | Height of Fill Table, Spiral Rib Pipe-Arch |
| 2014 11 | 806.020 | 2 | Height of Fill Table, Dual Wall Corrugated Polyethylene Gravity Sewer Pipe, 320 kPa and RSC 160 |
| 2014 11 | 806.021 | 2 | Height of Fill Table, Closed Profile Wall Polyethylene Pipe, RSC 160 and RSC 250 |
| 2014 11 | 806.022 | 2 | Height of Fill Table, Dual Wall Corrugated Polyethylene Gravity Sewer Pipe, RSC 100 and RSC 160 |
| 2014 11 | 806.023 | 0 | Height of Fill Table, Solid Wall Polyethylene Pipe, SDR 32.5 |
| 2013 11 | 806.030 | 0 | Height of Fill Table, Dual and Triple Wall Corrugated Polypropylene Gravity Sewer Pipe, 320 kPa |
| 2015 11 | 806.040 | 3 | Height of Fill Table, Polyvinyl Chloride Gravity Sewer Pipe, 210, 320, and 625 kPa |
| 2014 11 | 806.060 | 1 | Height of Fill Table, Polyvinyl Chloride Pressure Pipe for Different Dimension Ratios |
| 2015 11 | 807.010 | 3 | Height of Fill Table, Reinforced Concrete Pipe - Confined Trench, Class 50-D, 65-D, 100-D, and 140-D |
| 2015 11 | 807.030 | 3 | Height of Fill Table, Reinforced Concrete Pipe - Embankment, Class 50-D, 65-D, 100-D, and 140-D |
| 2015 11 | 807.040 | 2 | Height of Fill Table, Non-Reinforced Concrete Pipe, Class 3 |
| 2015 11 | 807.050 | 3 | Height of Fill Table, Horizontal Elliptical Concrete Pipe, Class HE-A, HE-I, HE-II, HE-III, and HE-IV |
| 2013 11 | 809.010 | 3 | Perforated Pipe Subdrain in Granular Trench Main Storm Sewer Connection to Drainage Structure |
| 2013 11 | 810.010 | 2 | General Rip-Rap Layout for Sewer and Culvert Outlets |
| 2013 11 | 810.020 | 2 | General Rip-Rap Layout for Ditch Inlets |
| 2006 11 | 812.010 | 0 | Cut Off Wall for Structural Plate Pipe Arch and Circular CSP |
| **DIVISION 900 - FENCING, GUIDE RAILS** | | | |
| 2015 11 | 911.130 | 1 | Guide Rail System, Concrete Barrier, Cast-In-Place, Type A, Installation |
| 2015 11 | 911.131 | 1 | Guide Rail System, Concrete Barrier, Cast-In-Place, Type C, Installation |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2015 11 | 911.132 | 1 | Guide Rail System, Concrete Barrier, Cast-In-Place, Tall Wall, Installation |
| 2015 11 | 911.134 | 1 | Guide Rail System, Concrete Barrier, Installation - Median Concrete Barrier to Structure |
| 2015 11 | 911.135 | 0 | Guide Rail System, Concrete Roadside Barrier, Cast-In-Place Or Slipformed, Installation |
| 2013 11 | 911.140 | 1 | Guide Rail System, Concrete Barrier, Precast I-Lock Connection, Installation -Temporary and Permanent |
| 2013 11 | 911.143 | 1 | Guide Rail System, Concrete Barrier, Precast I-Lock Connection, Type TW, Installation - Permanent |
| 2013 11 | 911.150 | 0 | Guide Rail System, Concrete Barrier, Type J Connection, 4m Length, Installation - Temporary |
| 2013 11 | 911.151 | 0 | Guide Rail System, Concrete Barrier, Type J Connection, 6m Length, Installation - Temporary |
| 2013 11 | 911.160 | 0 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary 1 |
| 2013 11 | 911.161 | 0 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary 2 |
| 2013 11 | 911.162 | 0 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Pinned to Asphalt Pavement |
| 2013 11 | 911.163 | 0 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Strapped to Concrete |
| 2013 11 | 911.164 | 0 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Strapped to Concrete with Asphalt Surface |
| 2013 11 | 911.167 | 0 | Guide Rail System, Concrete Barrier, Type m Connection, Installation - Temporary Restraint System, Bolted Through Concrete |
| 2013 11 | 911.168 | 0 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Bolted Through Concrete with Asphalt Surface |
| 2014 11 | 911.170 | 1 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Transition to Pinned TCB |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2014 11 | 911.171 | 1 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Transition to Strapped TCB |
| 2014 11 | 911.172 | 1 | Guide Rail system, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Transition to Bolted TCB |
| 2015 11 | 911.173 | 1 | Guide Rail System, Concrete Barrier, Type M Connection, Installation - Temporary Restraint System, Transition to Permanent Concrete Barrier |
| 2015 11 | 911.174 | 1 | Guide Rail System, Concrete Barrier, Type M Connection, Component - Thrie Beam Transition |
| 2013 11 | 911.180 | 0 | Guide Rail System, Concrete Barrier, Type T Connection, 4.0m Length, Installation - Temporary |
| 2013 11 | 911.181 | 0 | Guide Rail System, concrete Barrier, Type T Connection, 6.0m Length, Installation - Temporary |
| 2015 11 | 911.230 | 1 | Guide Rail System, Concrete Barrier, Median End Treatment Installation |
| 2014 11 | 911.232 | 1 | Guide Rail System, Concrete Barrier, Energy Attenuator, Installation - Temporary |
| 2001 11 | 911.330 | 0 | Guide Rail System, Concrete Barrier, Temporary Transition Installation - Rail Method, Concrete Barrier to Temporary Concrete Barrier |
| 2013 11 | 911.340 | 0 | Guide Rail System, Concrete Barrier, Temporary Concrete Barrier Transition, Installation - Temporary |
| 2015 11 | 911.380 | 1 | Guide Rail System, Concrete Barrier, Permanent Transition, Installation at Piers and Poles |
| 2015 11 | 911.381 | 2 | Guide Rail System, Concrete Barrier, Permanent Transition Installation, Roadside Concrete Barrier to Structure |
| 2015 11 | 911.382 | 1 | Guide Rail System, Concrete Barrier, Dowel Connection Detail |
| 2015 11 | 911.383 | 0 | Guide Rail System, Concrete Barrier, Permanent Transition Installation At Lighting Pole And Sign Support Footings |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2015 11 | 911.430 | 1 | Guide Rail System, Concrete Barrier, Temporary - Leaving End Treatment, Installation – Divided Highway |
| 2010 11 | 912.101 | 2 | Guide Rail System, Steel Beam, Rail, Component |
| 2010 11 | 912.102 | 1 | Guide Rail System, Steel Beam, Channel, Component |
| 2010 11 | 912.103 | 1 | Guide Rail System, Steel Beam, Plastic Offset Blocks, Component |
| 2010 11 | 912.104 | 2 | Guide Rail System, Steel Beam, Steel Post with Wooden Offset Block, Component |
| 2010 11 | 912.105 | 1 | Guide Rail System, Steel Beam, Base Plate, Component |
| 2008 11 | 912.130 | 2 | Guide Rail System, Steel Beam, Steel Post with Wooden Offset Block Assembly, Installation - Single Rail |
| 2013 11 | 912.135 | 0 | Guide Rail System, Steel Beam, Steel Post with Steel Offset Block Assembly, Adjustment - Single Rail |
| 2010 11 | 912.140 | 2 | Guide Rail System, Steel Beam, Wooden Post Assembly, Installation - Single Rail |
| 2010 11 | 912.141 | 2 | Guide Rail System, Steel Beam, Wooden Post Assembly, Installation - Double Rail |
| 2013 11 | 912.145 | 0 | Guide Rail System, Steel Beam, Wooden Post Assembly, Adjustment - Single Rail |
| 2010 11 | 912.234 | 1 | Guide Rail System, Steel Beam, End Treatment, Installation - Leaving End Collector Median |
| 2010 11 | 912.235 | 1 | Guide Rail System, Steel Beam, Leaving End Treatment, Installation |
| 2010 11 | 912.240 | 0 | Guide Rail System, Steel Beam, Treatment at Culverts with Minimal Cover Installation - Single Rail |
| 2002 11 | 912.330 | 1 | Guide Rail System, Steel Beam, Temporary Transition Installation - Rail Method, Single Steel Beam to Temporary Concrete Barrier |
| 2002 11 | 912.331 | 1 | Guide Rail System, Steel Beam, Temporary Transition Installation, Single Steel Beam to Temporary Concrete Barrier |
| 2008 11 | 912.380 | 1 | Guide Rail System, Steel Beam, Permanent Transition Installation, Channel Termination, Median |
| 2002 11 | 912.381 | 1 | Guide Rail System, Steel Beam, Permanent Transition Installation, Single Steel Beam to 3 Cable, Divided Highway |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2009 11 | 912.382 | 3 | Guide Rail System, Steel Beam, Permanent Transition Installation, Steel Beam With Eccentric Loader to 3 Cable, Divided and Undivided Highway |
| 2010 11 | 912.401 | 1 | Guide Rail System, Steel Beam, Structure Connection, Component - Rail and Channel |
| 2010 11 | 912.430 | 3 | Guide Rail System, Steel Beam, Structure Connection |
| 2008 11 | 912.480 | 2 | Guide Rail System, Steel Beam, Permanent Connection Installation, Single Steel Beam to Concrete Barrier |
| 2008 11 | 912.481 | 2 | Guide Rail System, Steel Beam, Permanent Connection Installation, Double Steel Beam to Concrete Barrier |
| 2010 11 | 912.530 | 1 | Guide Rail System, Steel Beam, Structure Approach Treatment, Installation - Rural Highway |
| 2008 11 | 912.531 | 2 | Guide Rail System, Steel Beam, Installation - Entrances and Intersecting Roadways |
| 2008 11 | 912.532 | 1 | Guide Rail System, Steel Beam, Barricade, Installation |
| 2008 11 | 913.101 | 1 | Guide Rail System, Cable, Component - Cable Fittings |
| 2008 11 | 913.102 | 1 | Guide Rail System, Cable, Component - Concrete Anchor Blocks |
| 2008 11 | 913.103 | 1 | Guide Rail System, Cable, Component - Wooden Post Base Plate |
| 2008 11 | 913.130 | 1 | Guide Rail System, Cable, Installation - Shoulder |
| 2014 11 | 913.131 | 0 | Guide Rail System, Cable, Installation - Entrances and Intersecting Roads |
| 2013 11 | 913.135 | 0 | Guide Rail System, Cable, Adjustment - Shoulder |
| 2013 11 | 921.101 | 1 | Energy Attenuator, General, Installation - Granular Approach Pad, Median |
| 2011 11 | 922.131 | 2 | Energy Attenuator, Crash Cushion, QuadTrend System, Installation - Concrete Barrier |
| 2011 11 | 922.133 | 2 | Energy Attenuator, Crash Cushion, QuadTrend System, Installation - Concrete Pad and Rear Cable Anchor Block |
| 2010 11 | 922.180 | 2 | Energy Attenuator, End Treatment, Steel Beam Energy Attenuating Terminal, Sequential Kinking Terminal System with Wooden Posts, Installation |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2010 11 | 922.181 | 2 | Energy Attenuator, End Treatment, Steel Beam Energy Attenuating Terminal, Sequential Kinking Terminal System with Steel Posts, Installation |
| 2013 11 | 922.330 | 3 | Energy Attenuator, End Treatment, Crash-Cushion Attenuating Terminal (CAT-350) System, Assembly |
| 2013 11 | 922.401 | 2 | Energy Attenuator, End Treatment, Eccentric Loader Terminal System, Component - Loader Assembly |
| 2013 11 | 922.402 | 2 | Energy Attenuator, End Treatment, Eccentric Loader Terminal System, Component - Rail and Cable Attachment |
| 2013 11 | 922.410 | 2 | Energy Attenuator, End Treatment, Eccentric Loader Terminal System, Assembly - Loader Detail |
| 2013 11 | 922.430 | 7 | Energy Attenuator, End Treatment, Eccentric Loader Terminal System, Installation - Layout and Post |
| 2010 11 | 922.530 | 5 | Energy Attenuator, End Treatment, Steel Beam Energy Attenuating Terminal, Extruder Terminal System with Wooden Posts, Installation |
| 2010 11 | 922.532 | 2 | Energy Attenuator, End Treatment, Steel Beam Energy Attenuating Terminal, Extruder Terminal System with Steel Posts, Installation |
| 2011 11 | 923.001 | 3 | Energy Attenuator, Crash Cushion, Narrow Systems, Component - Reinforced Concrete Pad |
| 2005 11 | 923.002 | 0 | Energy Attenuator, Crash Cushion, Component - Anchor Assembly |
| 2011 11 | 923.004 | 0 | Energy Attenuator, Crash Cushion, Wide Systems, Component - Reinforced Concrete Pad |
| 2011 11 | 923.005 | 0 | Energy Attenuator, Crash Cushion, Extra Wide Systems, Component - Reinforced Concrete Pad |
| 2015 11 | 923.006 | 0 | Energy Attenuator, Crash Cushion, Quadguard Super Wide System, Component – Reinforced Concrete Pad |
| 2011 11 | 923.180 | 1 | Energy Attenuator, Crash Cushion, QuadGuard System, Installation - Temporary, Unidirectional |
| 2011 11 | 923.181 | 1 | Energy Attenuator, Crash Cushion, QuadGuard System, Installation - Temporary, Bidirectional |
| 2011 11 | 923.182 | 1 | Energy Attenuator, Crash Cushion, QuadGuard System, Installation - Permanent, Unidirectional |
| 2011 11 | 923.183 | 1 | Energy Attenuator, Crash Cushion, QuadGuard System, Installation - Permanent, Bidirectional |
| 2011 11 | 923.184 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Wide System, Installation - Temporary, Unidirectional |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2011 11 | 923.185 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Wide System, Installation - Temporary, Bidirectional |
| 2011 11 | 923.186 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Wide System, Installation - Permanent, Unidirectional |
| 2011 11 | 923.187 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Wide System, Installation - Permanent, Bidirectional |
| 2011 11 | 923.188 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Extra Wide System, Installation - Temporary, Unidirectional |
| 2011 11 | 923.189 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Extra Wide System, Installation - Temporary, Bidirectional |
| 2011 11 | 923.190 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Extra Wide System, Installation - Permanent, Unidirectional |
| 2011 11 | 923.191 | 0 | Energy Attenuator, Crash Cushion, QuadGuard Extra Wide System, Installation - Permanent, Bidirectional |
| 2015 11 | 923.192 | 0 | Energy Attenuator, Crash Cushion, Quadguard Super Wide System, Installation – Temporary, Undirectional |
| 2015 11 | 923.193 | 0 | Energy Attenuator, Crash Cushion, Quadguard Super Wide System, Installation – Temporary, Bidirectional |
| 2015 11 | 923.194 | 0 | Energy Attenuator, Crash Cushion, Quadguard Super Wide System, Installation – Permanent Undirectional |
| 2015 11 | 923.195 | 0 | Energy Attenuator, Crash Cushion, Quadguard Super Wide System, Installation – Permanent Bidirectional |
| 2013 11 | 923.201 | 2 | Energy Attenuator, Crash Cushion, Connecticut Impact Attenuation System, Component - Steel Cylinder |
| 2013 11 | 923.202 | 2 | Energy Attenuator, Crash Cushion, Connecticut Impact Attenuation System, Component - Polyethylene Lid |
| 2013 11 | 923.204 | 2 | Energy Attenuator, Crash Cushion, Connecticut Impact Attenuation System, Component - Concrete Backwall |
| 2013 11 | 923.242 | 2 | Energy Attenuator, Crash Cushion, Connecticut Impact Attenuation System, Installation |
| 2013 11 | 923.244 | 1 | Energy Attenuator, Crash Cushion, Connecticut Impact Attenuation System, Installation - Long Median Hazard |
| 2013 11 | 923.245 | 2 | Energy Attenuator, Crash Cushion, Connecticut Impact Attenuation System, Installation - Short Median Hazard |
| 2011 11 | 923.280 | 1 | Energy Attenuator, Crash Cushion, TRACC System, Installation - Temporary, Unidirectional |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2011 11 | 923.281 | 1 | Energy Attenuator, Crash Cushion, TRACC System, Installation - Temporary, Bidirectional |
| 2011 11 | 923.282 | 1 | Energy Attenuator, Crash Cushion, TRACC System, Installation - Permanent, Unidirectional |
| 2011 11 | 923.283 | 1 | Energy Attenuator, Crash Cushion, TRACC System, Installation - Permanent, Bidirectional |
| 2011 11 | 923.380 | 1 | Energy Attenuator, Crash Cushion, TAU II System, Installation - Temporary, Unidirectional |
| 2011 11 | 923.381 | 1 | Energy Attenuator, Crash Cushion, TAU II System, Installation - Temporary, Bidirectional |
| 2011 11 | 923.382 | 1 | Energy Attenuator, Crash Cushion, TAU II System, Installation - Permanent, Unidirectional |
| 2011 11 | 923.383 | 1 | Energy Attenuator, Crash Cushion, TAU II System, Installation - Permanent, Bidirectional |
| 2011 11 | 923.384 | 0 | Energy Attenuator, Crash Cushion, TAU II Wide System, Installation - Temporary, Unidirectional |
| 2011 11 | 923.385 | 0 | Energy Attenuator, Crash Cushion, TAU II Wide System, Installation - Temporary, Bidirectional |
| 2011 11 | 923.386 | 0 | Energy Attenuator, Crash Cushion, TAU II Wide System, Installation - Permanent, Unidirectional |
| 2011 11 | 923.387 | 0 | Energy Attenuator, Crash Cushion, TAU II Wide System, Installation - Permanent, Bidirectional |
| 2011 11 | 923.388 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-2, Installation - Temporary, Unidirectional |
| 2011 11 | 923.389 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-2, Installation - Temporary, Bidirectional |
| 2011 11 | 923.390 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-3, Installation - Temporary, Unidirectional |
| 2011 11 | 923.391 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-3, Installation - Temporary, Bidirectional |
| 2011 11 | 923.392 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-2, Installation - Permanent, Unidirectional |
| 2011 11 | 923.393 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-2, Installation - Permanent, Bidirectional |
| 2011 11 | 923.394 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-3, Installation - Permanent, Unidirectional |
| 2011 11 | 923.395 | 0 | Energy Attenuator, Crash Cushion, TAU II Extra Wide System - TL-3, Installation - Permanent, Bidirectional |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2010 11 | 923.480 | 0 | Energy Attenuator, Crash Cushion, Smart System, Installation - Temporary, Unidirectional |
| 2010 11 | 923.481 | 0 | Energy Attenuator, Crash Cushion, Smart System, Installation - Temporary, Bidirectional |
| 2010 11 | 923.482 | 0 | Energy Attenuator, Crash Cushion, Smart System, Installation - Permanent, Unidirectional |
| 2010 11 | 923.483 | 0 | Energy Attenuator, Crash Cushion, Smart System, Installation - Permanent, Bidirectional |
| 2011 11 | 923.530 | 1 | Energy Attenuator, Crash Cushion, Box Beam Bursting Energy Absorbing Terminal, Installation - Layout |
| 2011 11 | 923.531 | 1 | Energy Attenuator, Crash Cushion, Box Beam Bursting Energy Absorbing Terminal, Installation - Impact Head and Post |
| 2011 11 | 924.131 | 0 | Energy Attenuator, Crash Cushion, ABSORB 350 System, Installation - Temporary Concrete Barrier |
| 2015 11 | 924.135 | 1 | Energy Attenuator, Crash Cushion, ACZ-350 System, Installation - Temporary Concrete Barrier |
| 2013 11 | 925.010 | 0 | Guide Rail System, Thrie Beam, Component - Rail |
| 2013 11 | 925.030 | 0 | Guide Rail System, Thrie Beam, Component - Terminal Connector |
| 2012 11 | 971.101 | 3 | Fence, Highway, In Earth, Shale, Loose Rock, Or Friable Rock, Installation |
| 2012 11 | 971.102 | 1 | Fence, Highway, In Solid Rock, Installation |
| 2012 11 | 972.101 | 2 | Fence, Chain-Link, Component - Barbed Wire |
| 2012 11 | 972.102 | 2 | Fence, Chain-Link, Component - Gate |
| 2012 11 | 972.130 | 2 | Fence, Chain-Link, Installation - Roadway |
| 2012 11 | 972.131 | 2 | Fence, Chain-Link, Installation - Concrete Barrier |
| 2012 11 | 972.132 | 0 | Fence, Chain-Link, Details and Table |
| 2009 11 | 980.101 | 2 | Pedestrian Barricade, Installation |
| 2009 11 | 982.101 | 1 | Splash Guard, Pedestrian, Installation |
| 2014 11 | 984.101 | 1 | Post Mounted Delineator, Installation |
| 2010 11 | 984.201 | 0 | Energy Attenuator, End Treatment, Delineation, Installation - Approach End |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2010 11 | 984.202 | 0 | Energy Attenuator, End Treatment, Delineation, Installation - Leaving End |
| 2010 11 | 984.203 | 0 | Energy Attenuator, Crash Cushion, Delineation, Installation - Temporary |
| 2010 11 | 984.204 | 0 | Energy Attenuator, Crash Cushion, Delineation, Installation - Permanent |
| 2013 11 | 984.205 | 0 | Energy Attenuator, Crash Cushion, Connecticut Impact Attenuation System, Delineation, Installation - Permanent |
| 2013 11 | 985.110 | 0 | Small Sign Support System, Single Breakaway Wooden Post, 89x89mm, 89x140mm, 140x140mm, and 140x148mm, Installation - Single Post Assembly |
| 2013 11 | 985.210 | 0 | Small Sign Support System, Double Breakaway Wooden Post, 89x89mm and 89x140mm, Installation - Double Post Assembly |
| 2013 11 | 985.220 | 0 | Small Sign Support System, Double Breakaway Wooden Post, 140x140mm and 140x184mm, Installation - Double Post Assembly |
| 2013 11 | 987.101 | 0 | Small Sign Support System, Lap Splice Rib-Bak Breakaway System, Components |
| 2013 11 | 987.110 | 0 | Small Sign Support, Lap Splice Rib-Bak Breakaway System, Installation - Single Post Assembly |
| 2013 11 | 987.210 | 0 | Small Sign Support System, Lap Splice Rib-Bak Breakaway System, Installation - Double Post Assembly |
| 2013 11 | 987.310 | 0 | Small Sign Support System, Lap Splice Rib-Bak Breakaway System, Installation - Triple Post Assembly |
| 2013 11 | 989.110 | 0 | Small Sign Support System, Sqr-Loc Perforated Steel Square Sign Post System, Installation - Single Post Assembly |
| 2013 11 | 989.210 | 0 | Small Sign Support System, Sqr-Loc Perforated Steel Square Post System, Installation - Double Post |
| 2014 11 | 990.110 | 1 | Small Sign Support System, Non-Breakaway U-Flange Post, Installation - Single Post Assembly |
| 2014 11 | 991.130 | 3 | Expanded Metal Anti-Glare Screen, Installation - Concrete Barrier |
| 2014 11 | 991.131 | 3 | Expanded Metal Anti-Glare Screen, Installation - Steel Beam Guide Rail with Wooden Post |
| 2012 11 | 991.132 | 2 | Expanded Metal Anti-Glare Screen, Installation - Chain-Link Fence |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| **DIVISION 1000 - SANITARY SEWERS** | | | |
| 2011 11 | 1003.010 | 2 | Cast-in-Place Maintenance Hole Drop Structure Tee |
| 2011 11 | 1003.020 | 2 | Cast-in-Place Maintenance Hole Drop Structure Wye |
| 2013 11 | 1003.030 | 3 | Internal Drop Structure for Existing Maintenance Hole |
| 2013 11 | 1003.031 | 2 | Internal Drop Structure for New Maintenance Hole |
| 2011 11 | 1006.010 | 2 | Sewer Service Connections for Rigid Main Pipe Sewer |
| 2011 11 | 1006.020 | 2 | Sewer Service Connections for Flexible Main Pipe Sewer |
| **DIVISION 1100 - WATERMAINS** | | | |
| 2014 11 | 1100.010 | 3 | Cast-in-Place Chamber for Valves Up to 350 mm Diameter |
| 2014 11 | 1100.011 | 2 | Piping Layout for Butterfly and Gate Valves Up to 350 mm Diameter in Cast-in-Place Chambers |
| 2015 11 | 1101.010 | 4 | Precast Valve Chamber, 1200 mm and 1500 mm Diameter |
| 2013 11 | 1101.012 | 2 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm Components |
| 2013 11 | 1101.013 | 2 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm, Riser and Base |
| 2013 11 | 1101.014 | 2 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm, Thrust Blocks |
| 2013 11 | 1101.015 | 2 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 1800 x 2400 mm, Chimney and Cap |
| 2013 11 | 1101.016 | 2 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Components |
| 2013 11 | 1101.017 | 2 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Riser and Base |
| 2013 11 | 1101.018 | 3 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Thrust Blocks |
| 2013 11 | 1101.019 | 2 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 2400 x 3000 mm Chimney and Cap |
| 2013 11 | 1101.020 | 3 | Valve Operator |
| 2013 11 | 1101.030 | 0 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3000 x 3000 mm Components |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2013 11 | 1101.031 | 0 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3000 x 3000 mm Riser and Base |
| 2013 11 | 1101.032 | 0 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3000 x 3000 mm Thrust Blocks |
| 2013 11 | 1101.033 | 0 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3000 x 3000 mm Chimney and Cap |
| 2013 11 | 1101.040 | 0 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3600 x 3000 mm Components |
| 2013 11 | 1101.041 | 1 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3600 x 3000 mm Riser and Base |
| 2013 11 | 1101.042 | 0 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3600 x 3000 mm Thrust Blocks |
| 2013 11 | 1101.043 | 0 | Precast Concrete Valve Chamber with Poured-in-Place Thrust Blocks, 3600 x 3000 mm Chimney and Cap |
| 2013 11 | 1103.010 | 2 | Concrete Thrust Blocks for Tees, Plugs, and Horizontal Bends |
| 2013 11 | 1103.020 | 3 | Concrete Thrust Blocks for Vertical Bends |
| 2013 11 | 1103.021 | 0 | Dimension Tables for Concrete Thrust Blocks for Vertical ends |
| 2013 11 | 1104.010 | 3 | Water Service Connection, 19 and 25 mm Diameter Sizes |
| 2013 11 | 1104.020 | 2 | Water Service Connection, 32, 38, and 50 mm Diameter Sizes |
| 2013 11 | 1104.030 | 2 | Blow Off Installation |
| 2013 11 | 1105.010 | 2 | Hydrant Installation |
| 2014 11 | 1107.010 | 2 | Piping Layout for Water Meters 50 mm and Smaller in Chambers |
| 2014 11 | 1107.020 | 2 | Piping Layout for Water Meters 75 to 250 mm in Chambers with By-Pass |
| 2014 11 | 1107.030 | 2 | Piping Layout for Water Meters in Building with By-Pass |
| 2013 11 | 1108.010 | 2 | Cast-in-Place Water Meter Chamber for 75 to 250 mm Meters |
| 2015 11 | 1109.010 | 2 | Cathodic Protection for Metallic Watermain Systems |
| 2015 11 | 1109.011 | 2 | Cathodic Protection for PVC Watermain Systems |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2015 11 | 1109.012 | 1 | Cathodic Protection of Existing Metallic Watermains, Exposed Service or Pipe Method |
| 2015 11 | 1109.013 | 1 | Anode Installation Over Pipe Method for Existing Metallic Watermains |
| 2015 11 | 1109.014 | 1 | Horizontal Anode Bank at Service |
| 2015 11 | 1109.015 | 1 | Vertical Anode Bank at Service |
| 2015 11 | 1109.025 | 1 | Waterproofing of Splices |
| 2015 11 | 1109.030 | 0 | Insulation For Sewers And Watermains In Shallow Trenches |
| **DIVISION 3000 - STRUCTURES** | | | |
| 2010 11 | 3000.100 | 2 | Foundation, Piles, Steel H-Pile Driving Shoe |
| 2010 11 | 3000.150 | 1 | Foundation, Piles, Steel H-Pile Splice |
| 2010 11 | 3000.201 | 1 | Foundation, Piles, Steel HP 310 Oslo Point |
| 2010 11 | 3001.100 | 1 | Foundation, Piles, Steel Tube Pile Driving Shoe |
| 2010 11 | 3001.150 | 1 | Foundation, Piles, Steel Tube Pile Splice |
| 2010 11 | 3002.200 | 1 | Foundation, Piles, Steel Sheet Pile Anchorage |
| 2010 11 | 3003.100 | 1 | Foundation, Piles, Wooden Pile Driving Shoe |
| 2010 11 | 3003.150 | 1 | Foundation, Piles, Wooden Pile Head Protection |
| 2010 11 | 3090.100 | 1 | Foundation, Frost Penetration Depths for Northern Ontario |
| 2010 11 | 3090.101 | 1 | Foundation, Frost Penetration Depths for Southern Ontario |
| 2010 11 | 3101.150 | 1 | Walls, Abutment, Backfill, Minimum Granular Requirement |
| 2010 11 | 3101.200 | 1 | Walls, Abutment, Backfill, Rock |
| 2010 11 | 3102.100 | 1 | Walls, Abutment, Backfill Drain |
| 2010 11 | 3120.100 | 2 | Walls, Retaining, Concrete Toe Wall |
| 2010 11 | 3121.150 | 1 | Walls, Retaining, Backfill, Minimum Granular Requirement |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2011 04 | 3190.100 | 2 | Walls, Retaining and Abutment, Wall Drain |
| 2011 11 | 3290.100 | 1 | Piers, Cutwater Assembly |
| 2010 11 | 3310.100 | 1 | Deck, Girders, Concrete, Method of Obtaining Screed Elevations |
| 2011 11 | 3310.150 | 1 | Deck, Girders, Concrete, Positive Moment Connection at Piers |
| 2010 11 | 3311.100 | 1 | Deck, Girders, Steel, Method of Obtaining Screed Elevations |
| 2015 11 | 3311.900 | 2 | Deck, Girders, Steel Box, Access Hatch |
| 2011 11 | 3329.100 | 1 | Deck, Reinforcement, Supports for Reinforcing Steel for Slab Depths 300 mm or Less |
| 2011 11 | 3329.101 | 1 | Deck, Reinforcement, Supports for Reinforcing Steel for Slab Depths Greater Than 300 mm |
| 2011 11 | 3332.100 | 1 | Deck, Round Voids, Form Supports and Tie-Downs |
| 2010 11 | 3333.100 | 1 | Deck, Round Voids, Drains |
| 2010 11 | 3333.101 | 1 | Deck, Trapezoid Void, Drains |
| 2011 11 | 3339.100 | 1 | Deck, Voids, Access Hatch for Concrete Bridges, Assembly |
| 2011 11 | 3339.101 | 1 | Deck, Voids, Access Hatch for Concrete Bridges, Installation |
| 2014 11 | 3340.100 | 2 | Deck, Drains with Downspout |
| 2014 11 | 3340.102 | 2 | Deck, Drains with Sloped Downspout |
| 2012 11 | 3340.150 | 2 | Deck, Drains with Transverse Bar Openings |
| 2012 11 | 3340.153 | 2 | Deck, Drains, Median with Transverse Bar Openings |
| 2012 11 | 3340.200 | 2 | Deck, Drains with Downspout Modification for Addition of Asphalt to Existing Structure |
| 2012 11 | 3340.201 | 2 | Deck, Drains, with Sloped Downspout Modification for Addition of Asphalt to Existing Structure |
| 2012 11 | 3340.250 | 2 | Deck, Drains, with Transverse or Longitudinal Bar Openings, Modification for Addition of Asphalt to Existing Structure |
| 2012 11 | 3349.100 | 2 | Deck, Drains, Drainage of New Deck Below Asphalt Wearing Surface |

| DATE | OPSD NO. | REV. | TITLE |
|---|---|---|---|
| 2012 11 | 3349.101 | 2 | Deck, Drains, Drainage of Existing Deck Below Asphalt Wearing Surface |
| 2011 11 | 3360.100 | 1 | Deck, Light Pole Bases, Structures with Barrier Walls |
| 2011 11 | 3360.200 | 1 | Deck, Light Pole Bases, Structures with Parapet Walls |
| 2008 11 | 3370.100 | 2 | Deck, Waterproofing Hot Applied Asphalt Membrane with Protection Board |
| 2008 11 | 3370.101 | 2 | Deck, Waterproofing Hot Applied Asphalt Membrane at Active Cracks Greater Than 2 mm Wide and Construction Joints |
| 2012 11 | 3390.100 | 2 | Deck, Drip Channel |
| 2005 11 | 3390.150 | 0 | Falsework Clearance to Traffic Lanes |
| 2010 11 | 3419.100 | 1 | Barriers and Railings, Steel Beam, Guide Rail and Channel Anchorage |
| 2010 11 | 3419.150 | 1 | Barriers and Railings, Steel, Single Railing Anchorage |
| 2010 11 | 3419.155 | 1 | Barriers and Railings, Steel, Double Railing Anchorage |
| 2012 11 | 3900.100 | 1 | Utilities, Duct Location |
| 2011 11 | 3900.150 | 1 | Utilities, Duct Termination at Bridge Approaches |
| 2015 11 | 3920.100 | 0 | Precast Reinforced Concrete Box Culvert With Height Of Fill ≥ 0.6m |
| 2015 11 | 3920.110 | 0 | Precast Reinforced Concrete Box Culvert With Height Of Fill < 0.6m |
| 2010 11 | 3940.150 | 2 | Figures in Concrete, Warning Message, Layout |
| 2010 11 | 3940.151 | 2 | Figures in Concrete, Warning Message, Letters |
| 2013 11 | 3941.200 | 2 | Figures in Concrete, Site Number and Date, Layout |
| 2011 11 | 3950.100 | 1 | Joints, Concrete Expansion and Construction on Structure |

| | |
|---|---|
| Aban (ed) | abandon (ed) |
| Abut or A | abutment |
| AC | asphalt coated, asphalt curb, or asphalt cement |
| AC&G | asphalt curb with gutter |
| AC PI | asphalt coated and paved invert |
| Add'l | additional |
| AG | asphalt gutter |
| AISC | American Institute of Steel Construction |
| ALT | alternate |
| Allce | allowance |
| Asph | asphalt |
| ASTM | ASTM International (formerly American Society for Testing and Materials) |
| A S/W | asphalt sidewalk |
| Ave | avenue |
| B or Bot | bottom |
| BB–BEAT | box beam bursting energy absorbing terminal |
| BBGR | box beam guide rail |
| BC | beginning of curve |
| BCA | Bell cable aerial |
| BCU | Bell cable underground |
| BCUM | Bell cable underground marker |
| BF | back face |
| Bfl | backfill |
| BFS | beginning of full superelevation |
| BH | button head bolt |
| B/L | base line |
| Bld (y) | boulder (y) |
| Bldg | building |
| Blk | block |
| Blvd | boulevard |
| BM | bench mark |
| Br | brick |
| B/R | bottom of rail |
| Brg | bearing |
| BS | beginning of superelevation |
| BVC | beginning of vertical curve |
| BWF | barbed wire fence |
| C | coated |
| CaB | carriage bolt |
| CAH | controlled access highway |
| Can | Canadian |
| CB | catch basin |
| CBMH | catch basin–maintenance hole |
| CC | concrete curb |
| C/C | centre to centre |
| CC&G | concrete curb with gutter |
| CG | concrete gutter |
| CGR | cable guide rail |
| Chkd | checked |
| CI | cast iron |
| CIP | clay pipe |
| Circ | circular |
| CJ | construction joint |
| C/L or ℄ | centreline |
| CLF | chain link fence |
| Co | county |
| Con | concession |
| Conc or C | concrete |
| Const or C | construction |
| Cont | contract |
| CP | concrete pipe |
| CPCI | Canadian Precast/Prestressed Concrete Institute |
| Cr | creek or crushed |
| CS | circular curve to spiral |
| CSA | CSA Standards (formerly Canadian Standards Association) |
| CSP | corrugated steel pipe |
| CSPA | corrugated steel pipe arch |
| C S/W | concrete sidewalk |
| Culv | culvert |
| C/W | come with |
| CWB | Canadian Welding Bureau |

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 4 |
|---|---|---|---|
| **ABBREVIATIONS**<br>GENERAL A–C | | | |

OPSD 100.010

| | |
|---|---|
| D | ditch |
| Def | deflection |
| Deg | degree |
| DI | ditch inlet or ductile iron |
| Dia | diameter |
| DICB | ditch inlet catch basin |
| Dist | district |
| Div | division |
| D/W | driveway |
| Dwg | drawing |
| | |
| EB | eastbound |
| EBL | eastbound line |
| EC | end of curve |
| ED | earth ditching |
| EF | each face |
| EFS | end of full superelevation |
| Elev or El | elevation |
| EMH | electrical maintenance hole |
| Ent | entrance |
| EP | edge of pavement |
| Eq | equally |
| ES | edge of shoulder or end of superelevation |
| EVC | end of vertical curve |
| EW | each way |
| Exc | excavation |
| Exist | existing |
| Exp | expansion |
| Expy | expressway |
| Extn | extension |
| $E_T$ | external distance of a spiralled curve |
| | |
| Fdn | foundation |
| FF | front face |
| FL | fence line |
| Ftg | footing |
| Fr | frame |

| | |
|---|---|
| G | grading |
| Ga | gauge |
| Galv | galvanized |
| GB | granual base |
| GBC | granual base course |
| GBfl | granular backfill |
| GC | grading and culverts |
| GD | grading and drainage |
| GL | ground level |
| GP | grade point |
| Gran | granular |
| GSB | granular sub base |
| | |
| HL | hot laid |
| HM | hot mix |
| HOC | hub on curve |
| HOST | hub on subtangent |
| HOT | hub on tangent |
| Hor | horizontal |
| HP | high point |
| HPC | high performance concrete |
| Ht | height |
| HT | high tension |
| HTL | high tension line |
| Hw | headwall |
| HWL | high water level |
| HWM | high water mark |
| Hwy | highway |
| Hyd | hydrant |
| | |
| IB | iron bar |
| ID | inside diameter |
| IF | iron fence or inside face |
| Incl (ing) (sive) | include (ing)(sive) |
| Inst | instrument |
| Inv Elev | invert elevation |
| IP | iron pipe |
| | |
| Jt or J | joint |

| | |
|---|---|
| L | length or length of curve |
| La | length of spiral between circular curve |
| LG | long |
| LH | left hand |
| Ls | length of spiral curve |
| LT | long tangent |
| LVC | length of vertical curve |
| LWL | low water level |
| M | middle |
| Max | maximum |
| Med | median |
| MH | maintenance hole |
| Min | minimum |
| Mon | monument |
| MTO | Ontario Ministry of Transportation |
| Mun | municipal |
| N (ing) | north (ing) |
| NB | northbound |
| NBL | northbound lane |
| NC | normal crown |
| NCHRP | National Cooperative Highway Research Program |
| NIC | not in contract |
| NTS | not to scale |
| OC | on centre |
| OD | outside diameter |
| OF | outside face |
| OG | original ground |
| Opass | overpass |
| OPSD | Ontario Provincial Standard Drawing |
| OPSS | Ontario Provincial Standard Specification |
| Org M | organic matter |
| Orig or O | original |
| Pavt | pavement |
| Perf | perforated |
| PF | picket fence |
| PG | plain galvanized or profile grade |
| PC | profile control |
| PCC | point of compound curve |
| PE | polyethylene |
| PI | point of intersection |
| PL | property line |
| POC | point on curve |
| PRC | point of reverse curve |
| Prof | profile |
| Prop | proposed |
| PVC | point on vertical curve or polyvinyl chloride |
| PVT | point of vertical tangent |
| R | radius |
| RC | rock cut |
| REF | reference |
| Reg (al) | region (al) |
| Reinf | reinforced |
| Reqd | required |
| Resurf | resurfacing |
| Rev | revision |
| R Exc | rock excavation |
| RF | rail fence or rock fill |
| RH | right hand |
| Rk | rock |
| Rnd | rounding |
| ROW | right–of–way |
| RP | reference point or registered plan |
| RR | rip–rap |
| RS | ripple strip |
| RSIC | Reinforced Steel Institute of Canada |
| RSS | retained soil system |
| RW | retaining wall |
| Rwy | railway |

| | |
|---|---|
| $S$ | rate of superelevation |
| San | sanitary |
| SB | southbound |
| SBEAT | steel beam energy attenuating terminal |
| SBGR | steel beam guide rail |
| SBL | southbound lane |
| SC | spiral to circular curve |
| SD | side ditch |
| Sec (ary) | second (ary) |
| Serv Rd | service road |
| SF | stone fence |
| Sh Rk | shot rock |
| SHLG, Sh or SH | shoulder |
| SP | special provision |
| Spec | specification |
| SQ | square |
| SR | side road |
| ST | spiral to tangent or short tangent or storm sewer |
| St | stripping |
| Sta | station |
| Std | standard |
| Stm | storm |
| Str (al) | structure (al) |
| Sty | storey |
| SPCSA | structural plate corrugated steel arch (with footings) |
| SPCSP | structural plate corrugated steel pipe |
| SPCSPA | structural plate corrugated steel pipe arch |
| Surf | surface |
| S/W | sidewalk |
| T | top |
| TB | top of bank or turning basin |
| T&B | top and bottom |
| TCH | Trans Canada Highway |
| TG or T/G | top of grate |
| TP | top of pavement |
| TR or T/R | top of rail |
| Trans | transverse or transferred |
| TS | tangent to spiral or tensile strength |
| Twp | township |
| Typ | typical |
| UNO | unless noted otherwise |
| Upass | underpass |
| U/S | underside |
| Var | varies, variable |
| VC | vertical curve |
| VCP | vitrified clay pipe |
| Vert | vertical |
| Vol | volume |
| W | water main |
| WB | westbound |
| WBL | westbound lane |
| WF | wire fence |
| WIF | wrought iron fence |
| WL | water level |
| WMF | wire mesh fence |
| W/O | water out |
| WP | work project |
| WT | water table |
| WW | wing wall |
| WWF | welded wire fabric |
| WWR | welded wire reinforcement |

| NUMBER OF UNITS | NUMBER OF STOREYS OF THE BUILDING | MATERIAL USED IN SUPERSTRUCTURE OF BUILDING | NAME–OF–BUILDING | BASEMENT | REMARKS |
|---|---|---|---|---|---|
| A number followed by a hyphen for the number of units. | A number of designating the number of storeys of the building. | Letter preceding the name–of–building group. | Letter that designates the name of the building. | The letter B after name–of–building group denotes basement. | All descriptions shall contain a name–of–building group. |
| | | Br brick<br>C concrete<br>CB concrete block<br>F insulbrick<br>F metal clad<br>Fr frame<br>M metal<br>S stone<br>St stucco | A apartment<br>B barn<br>C cabin<br>F factory<br>G garage<br>Gr greenhouse<br>H house<br>O office<br>PO post office<br>R restaurant<br>S shed<br>SS service station<br>ST store<br>W warehouse | If no letter appears after the name, the building has no basement. | As a general rule, if there is ambiguity in the description, then the full abbreviated or long form description shall be written out. |
| 2– | 1 1/2<br>2 | | | | Examples:<br>Arena<br>Building<br>Church<br>Fire Hall<br>Hotel<br>Library<br>Motel<br>Rec Hall<br>School |
| If description involves only one building, this group is omitted. | If description of building involves only one storey,this group is omitted. | Or combination of letters as a group, e.g., Br&St Brick & Stucco Br&S Brick & Stone.<br><br>All descriptions shall contain this group. | Or combination of letters as a group, e.g., SS&R Service Station and Restaurant.<br><br>All descriptions shall contain this group. | | |

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006 | Rev 1

# ABBREVIATIONS

## BUILDING DESCRIPTIONS

OPSD 100.050

| | |
|---|---|
| Accep | acceptable |
| Agg | aggregate |
| Amor | amorphous |
| Asph | asphalt |
| BH | borehole |
| Bl | blue |
| Bld (y) | boulder (y) |
| Blds | boulders |
| Blk | black |
| Br | brown |
| BR | bedrock |
| BU | break up |
| CF | channel face |
| Cl (y) | clay (ey) |
| Co | coarse |
| Cob | cobbles |
| Comp | compact |
| Conc | concrete |
| Contam | contaminated |
| Cord | corduroy |
| Cr | crushed |
| D | dense |
| Decomp | decomposed |
| Dk | dark |
| $D_R$ | relative density |
| E | earth |
| F | fine |
| FB | frost boil |
| FH | frost heave |
| Fib | fibrous |
| Fr Wat | free water |
| Gr (y) | gravel (ly) |
| Gran | granular |
| Grn | green |
| Gry | grey |
| H | heavy |
| Hi | highly |
| HM | hot mix |
| HP | high plasticity |
| Ip | plasticity index |
| L | loose |
| Liq | liquid |
| Lo | loam |
| Lt | light |
| Matl | material |
| Max | maximum |
| MDD | maximum dry density |
| Med | medium |
| Mod | moderate |
| Mott | mottled |
| MP | medium plasticity |
| Mrl | marl |
| Mul | mulch |
| MWD | maximum wet density |
| NFP | no further progress |
| NFP (blds) | no further progress (boulders) |
| Num | numerous |
| Ob | overburden |
| Occ | occasional |
| Ora | orange |
| Org | organic |
| Org M | organic matter |
| Pavt | pavement |
| Pedo | pedological |
| Pen Mac | penetration macadam |
| Poss | possible |
| PST | prime and surface treated |
| Psty | polystyrene |
| Quant | quantity |
| Reinf | reinforced |
| RF | rock fill |
| RSS | remoulded shear strength |
| Sa (y) | sand (y) |
| Sat | saturated |
| SH | shale |
| Sh Rk | shot rock |
| Si (y) | silt (y) |
| Sl (y) | slight (ly) |
| SP | slight plasticity |
| SSM | select subgrade material |
| St | sensitivity |
| Stn (y) | stone (y) |
| Stks | streaks |
| Surf | surface |
| Temp | temperature |
| TH | test hole |
| TP | test pit |
| Tps | topsoil |
| Tr | trace |
| Unreinf | unreinforced |
| USS | undisturbed shear strength |
| Varv | varved |
| VF | very fine |
| w | field moisture content |
| W | with |
| $W_L$ | liquid limit |
| Wd (y) | wood (y) |
| Weath | weathered |
| Wopt | optimum moisture content |
| Wp | plastic limit |
| WT | water table |
| Yel | yellow |

**SUSCEPTIBILITY TO FROST HEAVING**

HSFH – High
MSFH – Medium
LSFH – Low

ONTARIO PROVINCIAL STANDARD DRAWING

# ABBREVIATIONS

GEOTECHNICAL

Nov 2006 | Rev 1

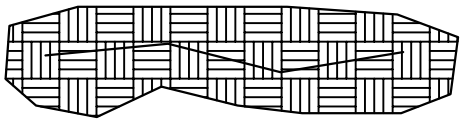
OPSD 100.060

| | |
|---|---|
| CM | concrete monument |
| SIB | standard iron bar |
| SSIB | short standard iron bar |
| RB | rock bar |
| RP | rock post |
| RPL | rock plug |
| RIB | round iron bar |
| CC | cut cross |
| CP | concrete pin |
| IB | iron bar |
| PK | spike, nail, rock rivet, etc. |
| GBM 819768123 | geodetic bench mark (primary vertical control point) |
| BM | Ministry of Transportation bench mark (vertical project control point) |
| HCP | horizontal project control point |
| HCM plus number | primary horizontal control monument |
| PI 9+916.211 | point of intersection |
| | hub on tangent |
| NAIL | nail |

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **TOPOGRAPHY PLAN FEATURES**<br>MONUMENT FEATURES | | | |
| | **OPSD 101.010** | | |



top of rock cut
hachure for rock/earth cut/fill
bottom of rock cut



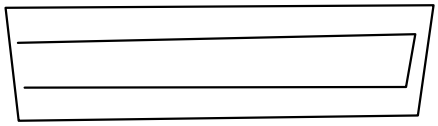
rock outline & string
of rock outcrop, Note 1



asphalt outline &
asphalt string, Note 1



bank of river, Note 1



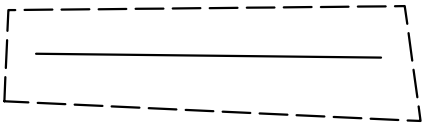
concrete outline &
concrete string, Note 1




door sill, Note 1



entrance centreline, Note 1



gravel outline &
gravel string, Note 1



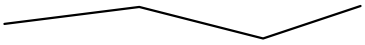
railway ballast edge, Note 1



railway ballast top, Note 1



original ground string, Note 1



stream bed, Note 1



stock pile or pit

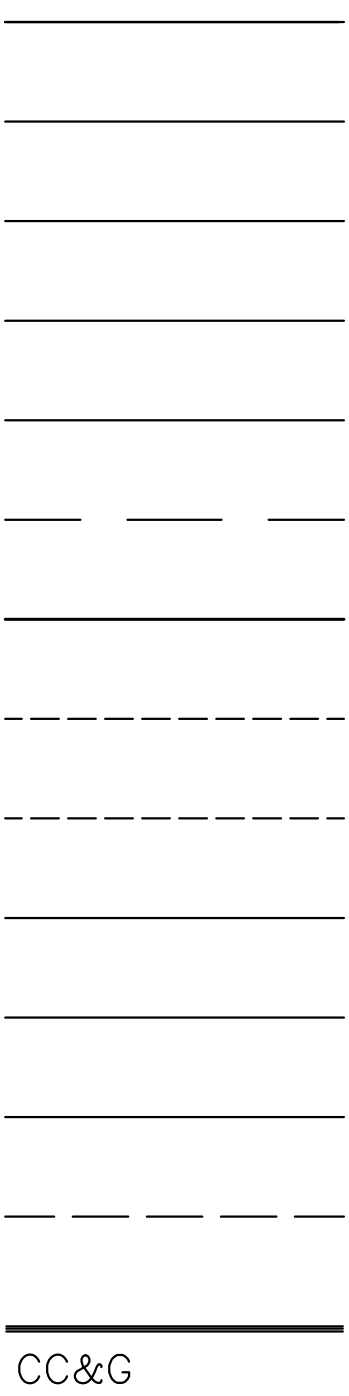


toe of fill sideslope, Note 1

NOTE:

1 These items are not normally plotted.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **TOPOGRAPHY PLAN FEATURES**<br>GROUND FEATURES | | | |
| | **OPSD 101.011** | | |




NOTE:

1 These items are not normally plotted.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **TOPOGRAPHY PLAN FEATURES**<br>ROAD FEATURES | | | |
| | **OPSD 101.012** | | |

## BARRIER FEATURES


gate

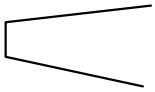

guide rail


fence line at grade



barrier top, Note 1


barrier bottom


inertial barrier outline


fence line – not for terrain model



guide rail post elevation, Note 1



guide rail wire elevation, Note 1

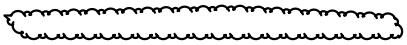

noise barrier at grade

## VEGETATION FEATURES



bush outline


tree


hedge


woods trunkline, Note 1

NOTE:

1 These items are not normally plotted.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **TOPOGRAPHY PLAN FEATURES**<br>BARRIER AND VEGETATION FEATURES | | | |

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

**OPSD 101.013**

| | | | |
|---|---|---|---|
| AN | anchor for pole | | |
| | hydro tower outline | | |
| GM | gas meter | H | hydro pole |
| GV | gas valve | LS | light standard |
| WM | water meter | PO | pole other |
| WV | water valve | PW | pole well (crib) |
| B | Bell pole | TB | terminal box |
| B&H | Bell & hydro pole | TS | traffic signal pole |
| FH | fire hydrant | V | vent |

| | |
|---|---|
| BCUM GUM PCUM | underground bell, gas, or power cable markers |
| W | well |
| HC | hydro crossing ground elevation, Note 1 |
| HW | hydro crossing wire elevation, Note 1 |
| G | gas main |
| W | water main |
| TVU | TV cable |
| HCU | hydro cable underground |
| Description | pipeline |
| BCU | Bell cable underground |
| UT | Utility, other underground |

NOTE:

1 These items are not normally plotted.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev 1

# TOPOGRAPHY PLAN FEATURES

## UTILITY FEATURES

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 101.014

| | |
|---|---|
| □ CB | catch basin, center |
| □ DI | ditch inlet, centre of grate |
| ○ MH | maintenance hole |
| + CV | culvert invert elevation, Note 1 |
| + DB | ditch inlet bottom of opening, Note 1 |
| + DT | ditch inlet top of opening, Note 1 |
| + FR | frustum elevation, Note 1 |
| + SU | sump elevation, Note 1 |
| ——— | high water mark |
| ═══ | culvert |
| ——— ◄ | bottom of ditch with flow |
| ——— | drainage centerline |
| Lake | edge of water |
| RR | rip–rap outline |
| Swamp | swamp or muskeg |
| ——— ST ——— | storm sewer |
| ——— SAN ——— | sanitary sewer |

NOTE:

1 These items are not normally plotted.

ONTARIO PROVINCIAL STANDARD DRAWING

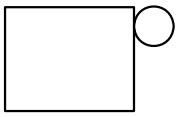
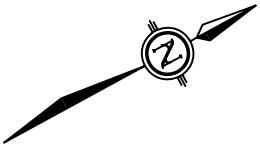
Nov 2006 | Rev 1

# TOPOGRAPHY PLAN FEATURES

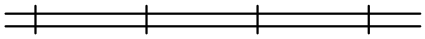
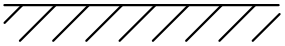
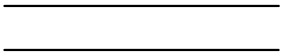
## DRAINAGE FEATURES

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 101.015

| | |
|---|---|
| CBP | concrete bridge pillar |
|  | building, silo |
|  | grid north orientation |
| DD | deck drain |
| Com S | commercial sign |

| | |
|---|---|
| BN | bullnose, Note 1 |
| BO | borehole |
| EV | miscellaneous elevation, Note 1 |
| GFL | gate with flashing light |
| RLS | railway sign/signal |
| RCS | railway crossing sign |

| | |
|---|---|
|  | railway track |
|  | cemetery outline |
|  | wooden deck/dock outline |
|  | expansion joint |
|  | gabion baskets |
|  | hand rail |
|  | overhead sign |
|  | retaining wall |
|  | sidewalk |
|  | walkway/trail/path |
|   | co–ordinate grid |
|  | existing alignment/reference line |
|  | existing entrance alignment |
|  | existing sideroad alignment |

NOTE:

1 These items are not normally plotted.

| | | | |
|---|---|---|---|
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
| TOPOGRAPHY PLAN FEATURES<br>MISCELLANEOUS FEATURES | | | OPSD 101.016 |

property limit



city, town or village boundary



general boundary/property line



subdivision lot line



original concession/lot line



fence on highway right–of–way or property limit



highway right–of–way, highway property limit, no fence



right–of–way, except highway ROW, no fence



fences excluding those outlinings ROW limits



limited interest, permanent



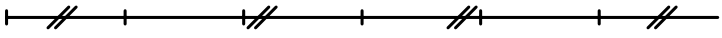
limited interest, temporary

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 3 |
|---|---|---|---|
| **TOPOGRAPHY PLAN FEATURES**<br>RIGHT–OF–WAY FEATURES | | | |

**OPSD 101.017**

To indicate removal of a feature, use the appropriate topography plan feature with cross out lines.

Examples:



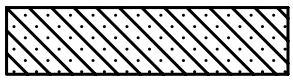
guide rail removal



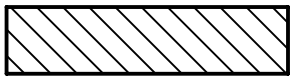
culvert removal



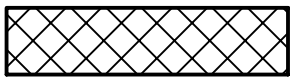
maintenance hole and sewer removal



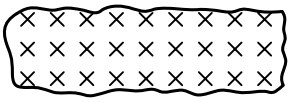
concrete pavement with bituminous surface to be removed



bituminous pavement to be removed



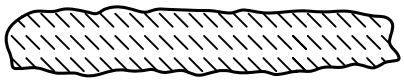
concrete pavement to be removed



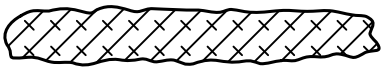
area to be close cut cleared



area to be cleared



area to be grubbed



area to be cleared and grubbed

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **REMOVALS**<br>LEGEND | | | |
| | OPSD 102.010 | | |

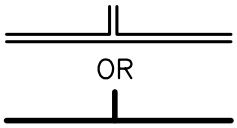
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ○ NUMBER | MH | existing | maintenance hole | ● NUMBER | MH | new | |
| □ NUMBER | CB | existing | catch basin | ■ NUMBER | CB | new | |

□□ TICB, TIMH, TDICB, TDIMH — twin inlet catch basin or maintenance hole, twin ditch, inlet catch basin or maintenance hole

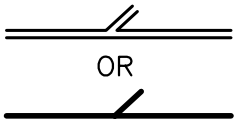
 sub–drain, flow indicated

 curb, gutter, or curb with gutter transition

 drop curb



gutter outlet 90 °



gutter outlet 45 °

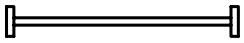


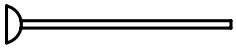
storm sewer



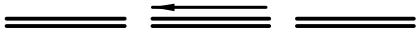
sanitary sewer

 culvert

 culvert with headwall

 culvert with steel end apron

 ditches, V type

 ditches, flat bottom

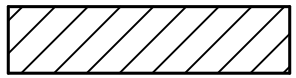
 watercourse, 3m wide and over

 flow arrow

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **NEW CONSTRUCTION**<br>LEGEND 1 | | | |
| | **OPSD 103.010** | | |



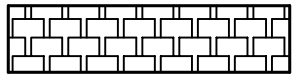
backfill



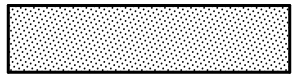
gore area



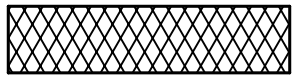
rip rap



gabions



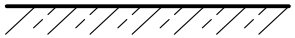
pavement



miscellaneous paving



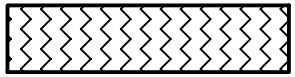
concrete section



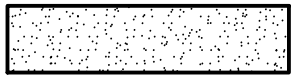
earth section



rock section



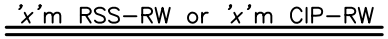
rock shatter



paved shoulder



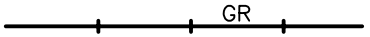
pier




retaining wall with height
RSS–retained soil system
CIP–cast–in–place



sidewalk



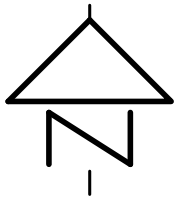

guide rail (cable, steel beam or box beam) or guide post



sod (nursery or field)



Inertial barrier modules



plan orientation

Traffic flow 

direction of traffic

ONTARIO PROVINCIAL STANDARD DRAWING

April 2008 | Rev 2

# NEW CONSTRUCTION

LEGEND 2

OPSD 103.011



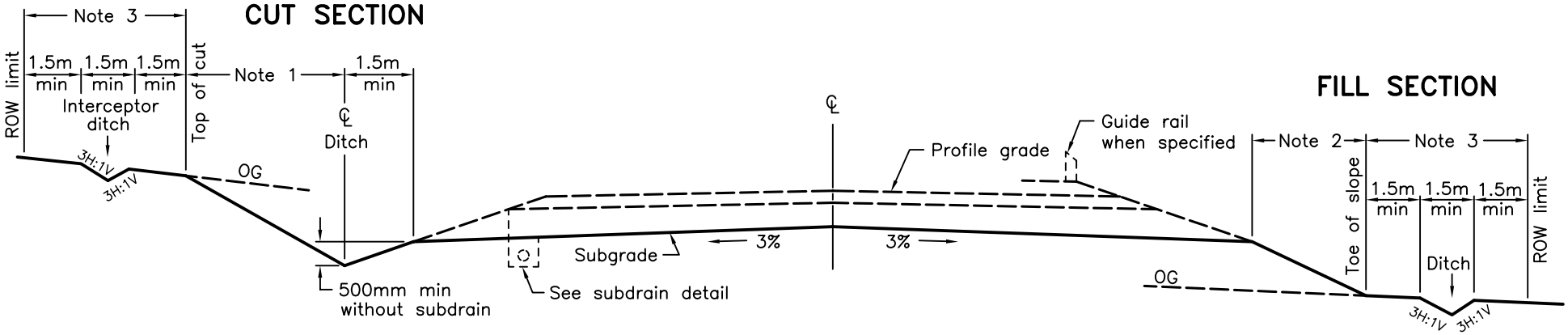
machined surface

ONTARIO PROVINCIAL STANDARD DRAWING

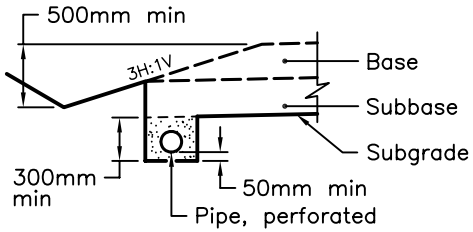
Nov 2007 | Rev | 0

# MISCELLANEOUS SYMBOLS

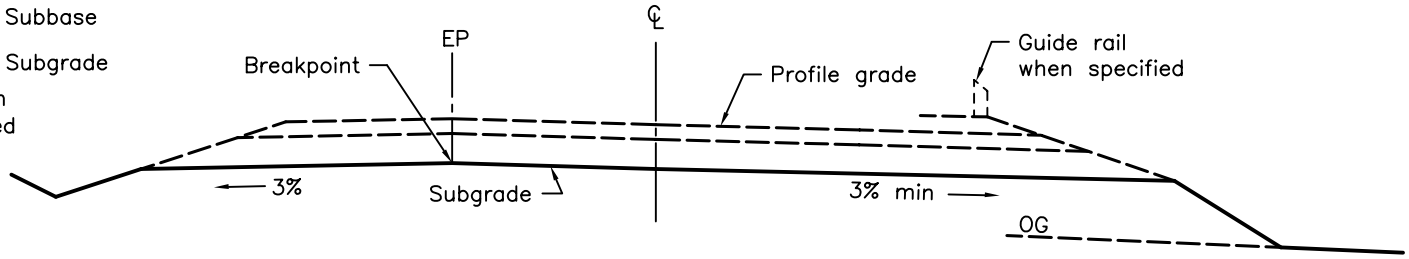
OPSD 104.010




TANGENT SECTION




SUBDRAIN DETAIL
WHERE APPLICABLE



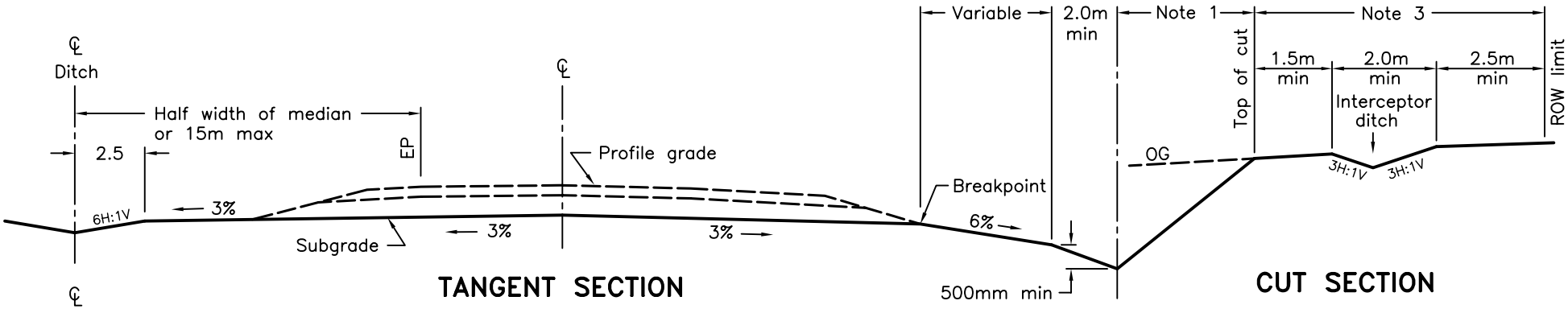

SUPERELEVATED SECTION

NOTES:

1 Cut slope shall be 3H:1V or steeper when specified.
2 Fill slope shall be 3H:1V or flatter when specified.
3 Distance shall be 1.5m minimum when ditch is not required.

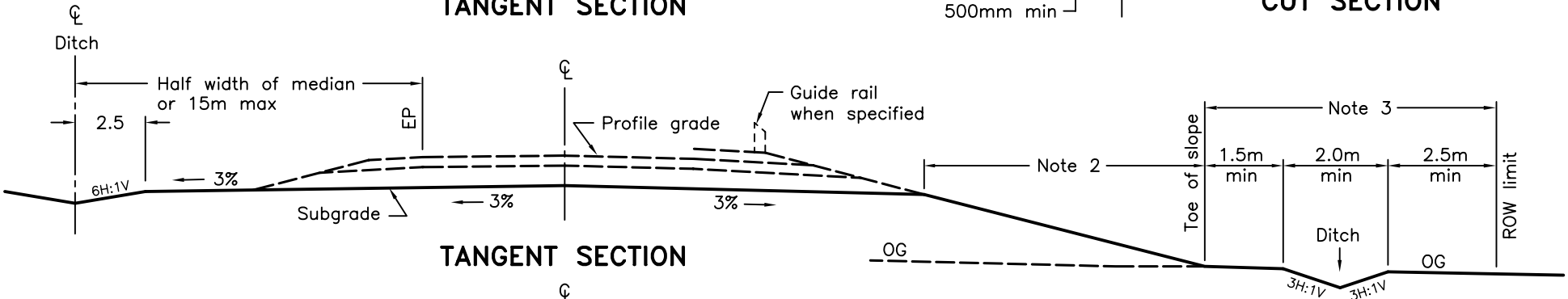
A This OPSD to be read in conjunction with OPSD 202.010 and OPSD 202.020.
B All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 2 |
|---|---|---|---|
| **EARTH/SHALE GRADING** | | | |
| UNDIVIDED RURAL | | | |
| | **OPSD 200.010** | | |



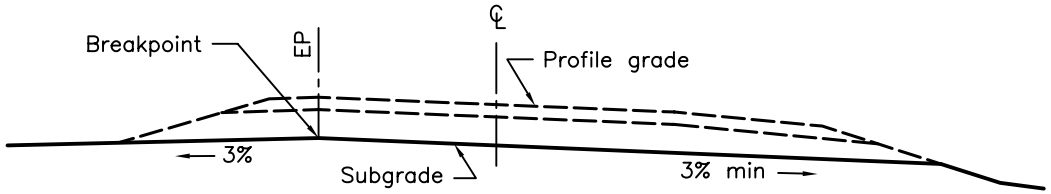

TANGENT SECTION

CUT SECTION




TANGENT SECTION

FILL SECTION




SUPERELEVATED SECTION

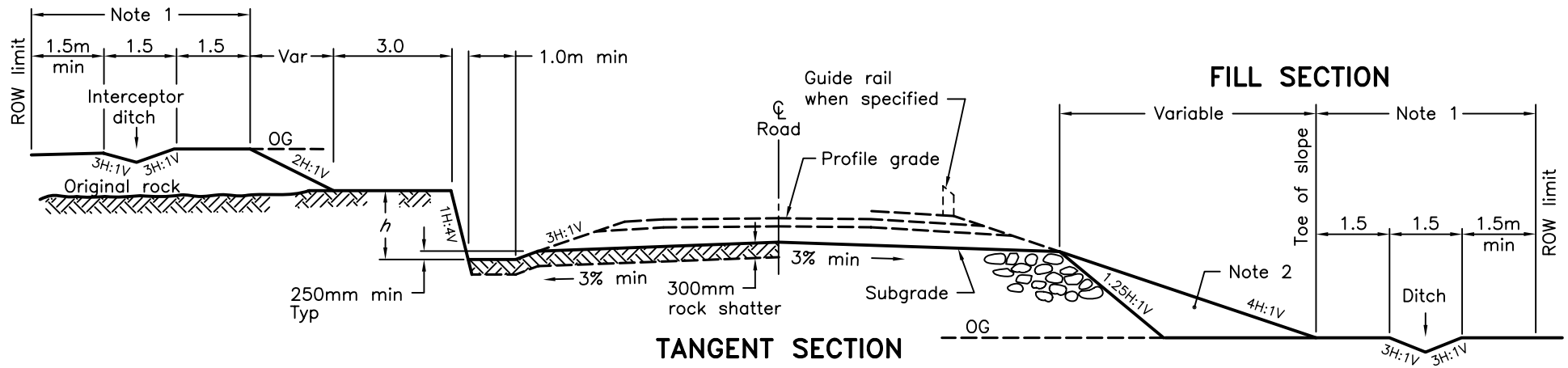
NOTES:

1 Cut slope shall be 3H:1V or steeper when specified.
2 Fill slope shall be 4H:1V or flatter when specified.
3 Distance shall be 2.5m minimum when ditch is not required.

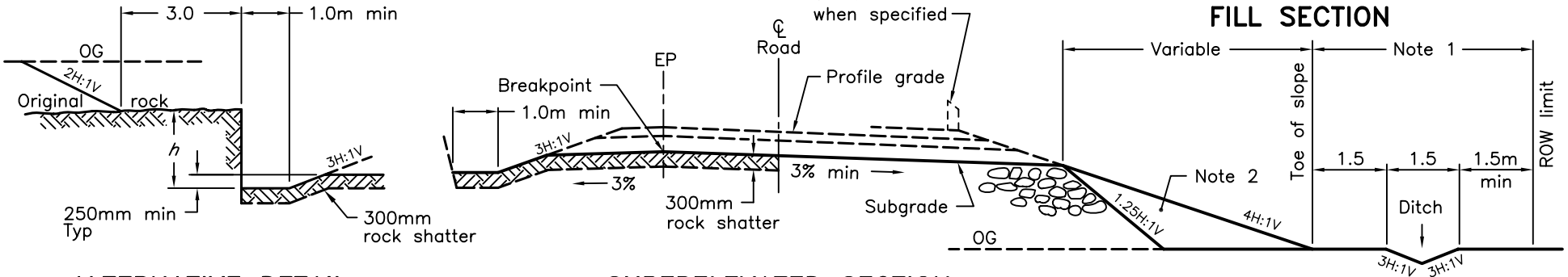
A This OPSD to be read in conjunction with OPSD 202.010 and OPSD 202.020.
B All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 2 |
|---|---|---|---|
| **EARTH/SHALE GRADING**<br>DIVIDED RURAL | | | |
| | **OPSD 200.020** | | |

## CUT SECTION




## TANGENT SECTION




## ALTERNATIVE DETAIL
WHERE SPECIFIED

## SUPERELEVATED SECTION

NOTES:

1 Distance shall be 1.5m minimum when ditch is not required.

2 Where top of rock fill embankment is less than 2.0m above original ground, flatten slope with surplus excavated material.

A Shale shall be treated according to earth grading standards.

B This OPSD to be read in conjunction with OPSD 202.010 and OPSD 202.020.

C All dimensions are in metres unless otherwise shown.

LEGEND:

*h* – Height of rock face

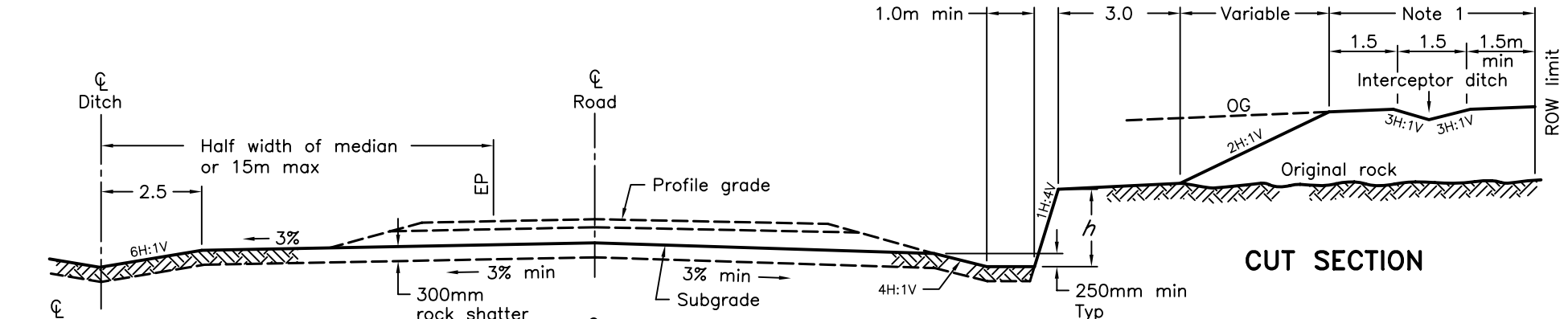
ONTARIO PROVINCIAL STANDARD DRAWING

# ROCK GRADING

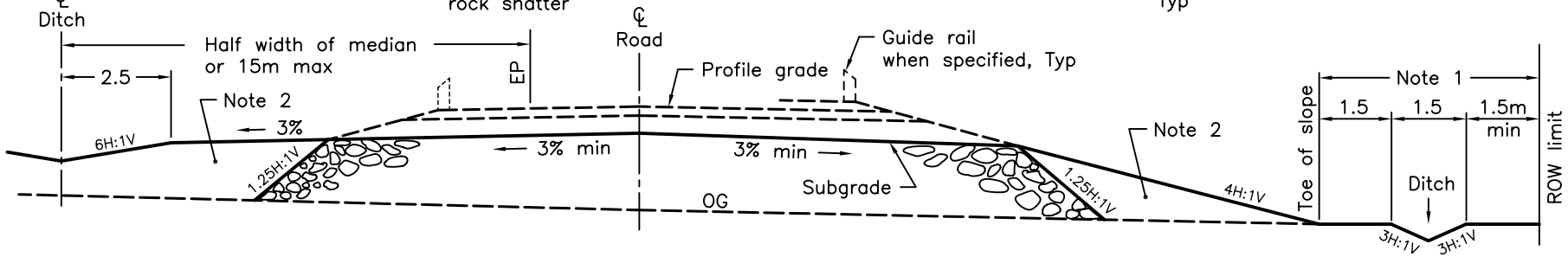
UNDIVIDED RURAL

Nov 2009 | Rev 2

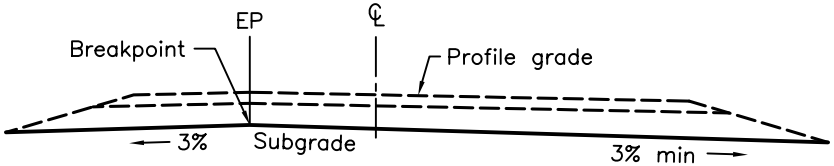
OPSD 201.010




## CUT SECTION

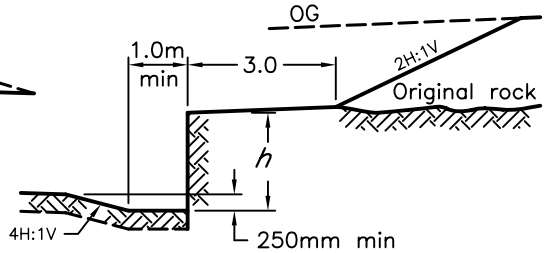



## TANGENT SECTIONS




## SUPERELEVATED SECTION

## FILL SECTION




## ALTERNATIVE DETAIL
WHERE SPECIFIED

NOTES:

1 Distance shall be 1.5m minimum when ditch is not required.

2 Where the top of rock fill embankment is less than 2.0m above original ground, flatten slope with surplus excavated material.

A Shale shall be treated according to earth grading standards.

B This OPSD to be read in conjunction with OPSD 202.010 and OPSD 202.020.

C All dimensions are in metres unless otherwise shown.

LEGEND:

*h* – Height of rock face

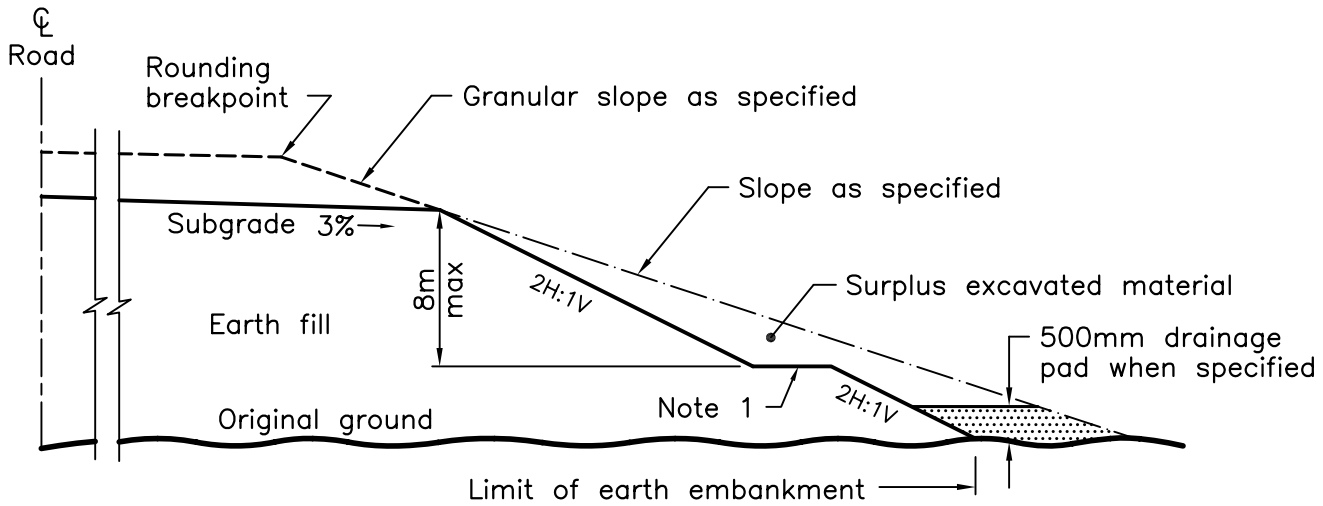
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev 2

# ROCK GRADING

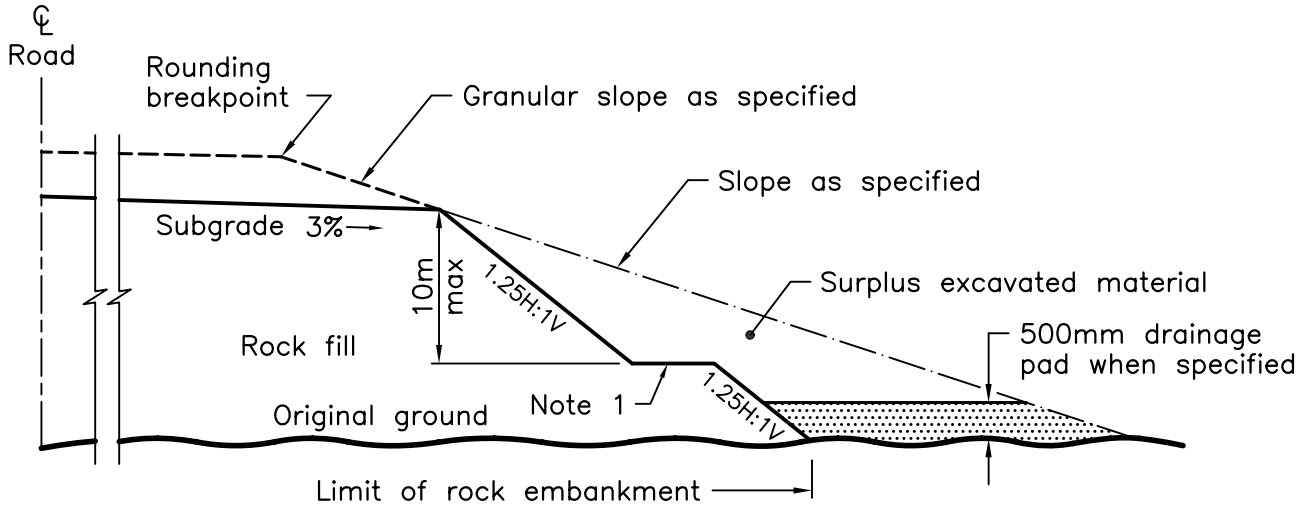
DIVIDED RURAL

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

**OPSD 201.020**




**EARTH EMBANKMENT**




**ROCK EMBANKMENT**

NOTES:

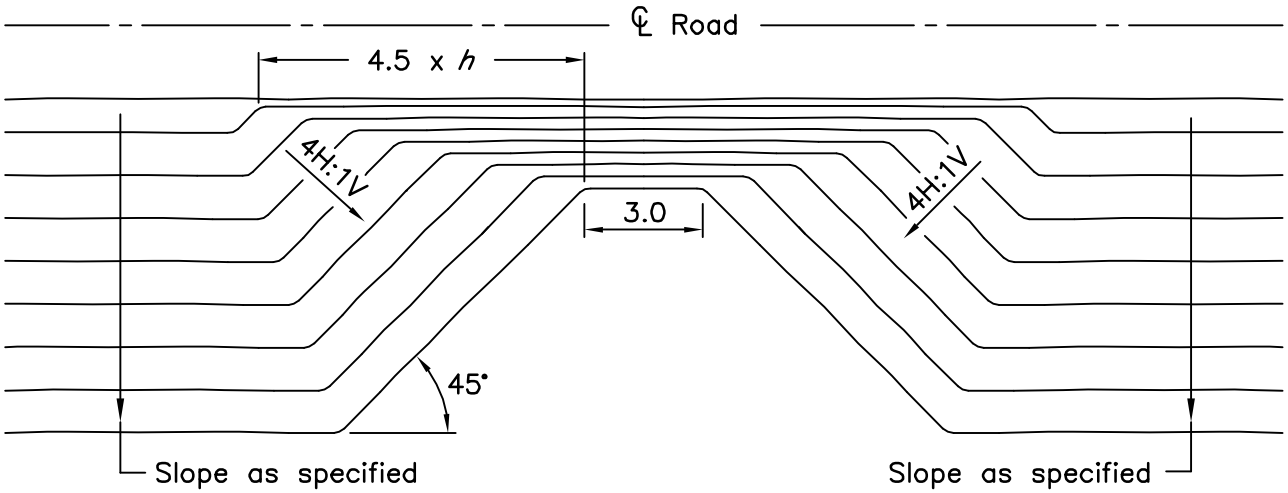
1 Benches 2m minimum in width are required along slopes at maximum vertical intervals as shown.

A Height of fill is the vertical difference between top of subgrade and top of original ground measured at new road centreline.

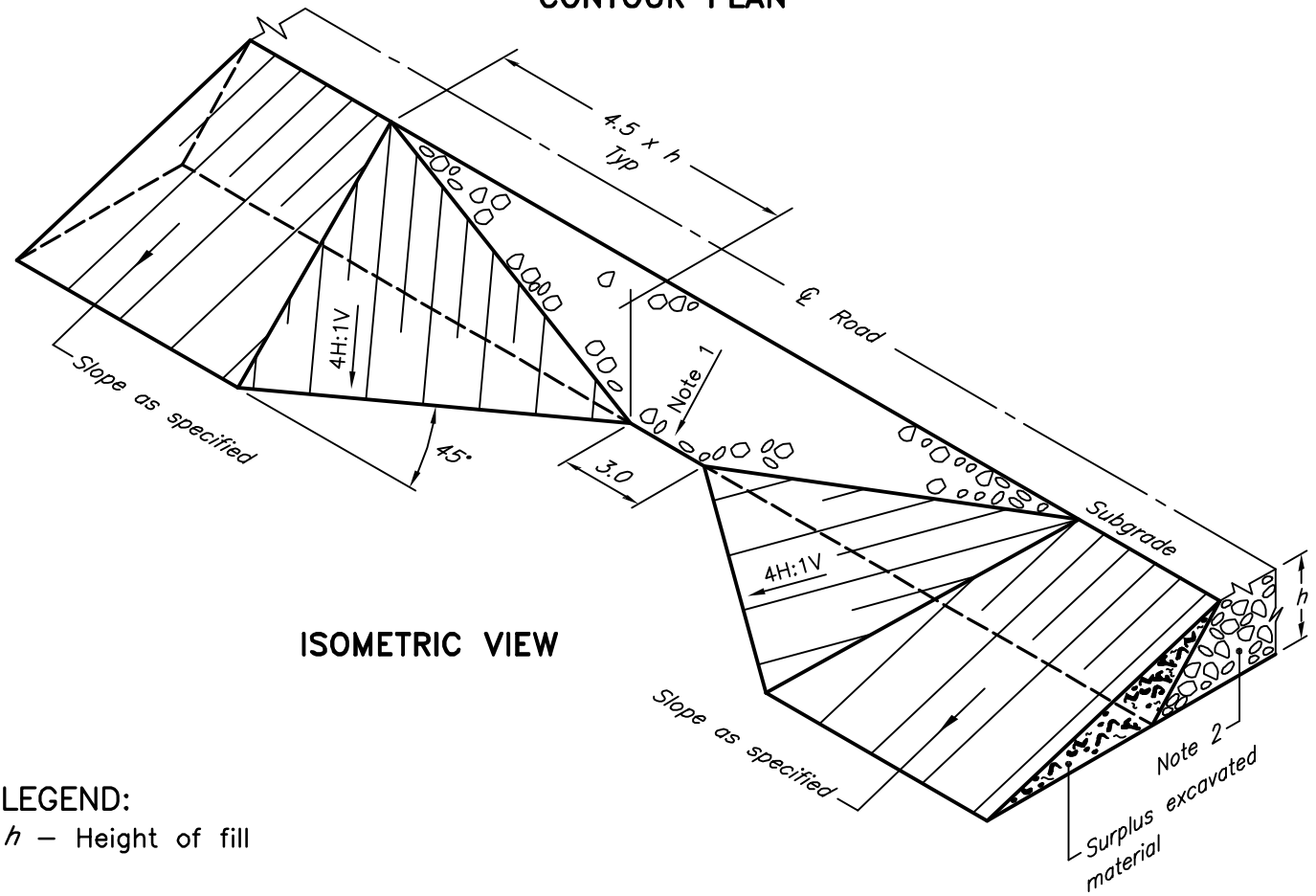
B Surplus excavated material placed shall not extend beyond the right–of–way.

C All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 2 |
|---|---|---|---|
| SLOPE FLATTENING<br>USING SURPLUS EXCAVATED MATERIAL<br>ON EARTH OR ROCK EMBANKMENT | | | |
| | OPSD 202.010 | | |




**CONTOUR PLAN**




**ISOMETRIC VIEW**

LEGEND:

*h* – Height of fill

NOTES:

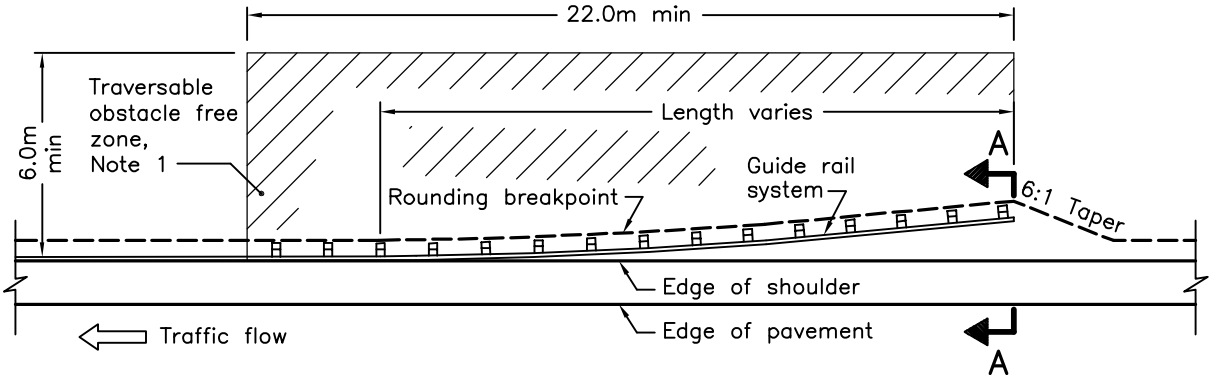
1 Slope shall be as specified.

2 Embankment material shall be rock fill or other granular material.

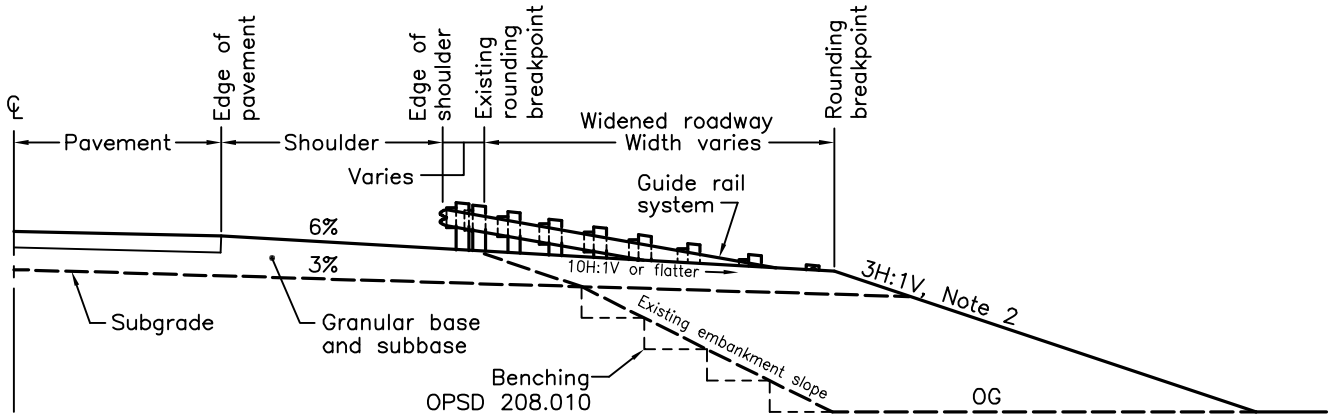
A Height of fill shall be the vertical difference between top of subgrade and top of original ground measured at new road centreline.

B All dimensions are in metres unless otherwise shown.

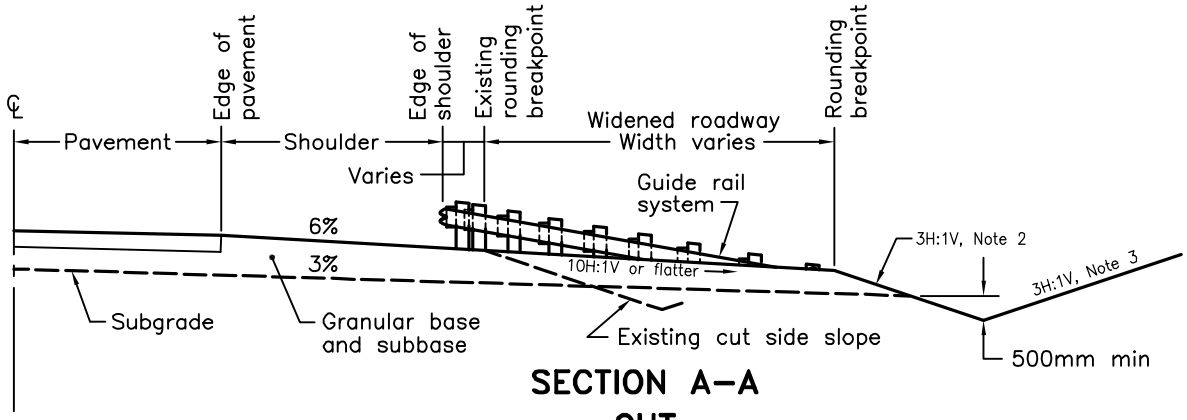
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| **DRAINAGE GAP FOR SLOPE FLATTENING ON ROCK OR GRANULAR EMBANKMENT** | | | |
| | **OPSD 202.020** | | |




## PLAN VIEW OF WIDENED ROADWAY




## SECTION A–A FILL



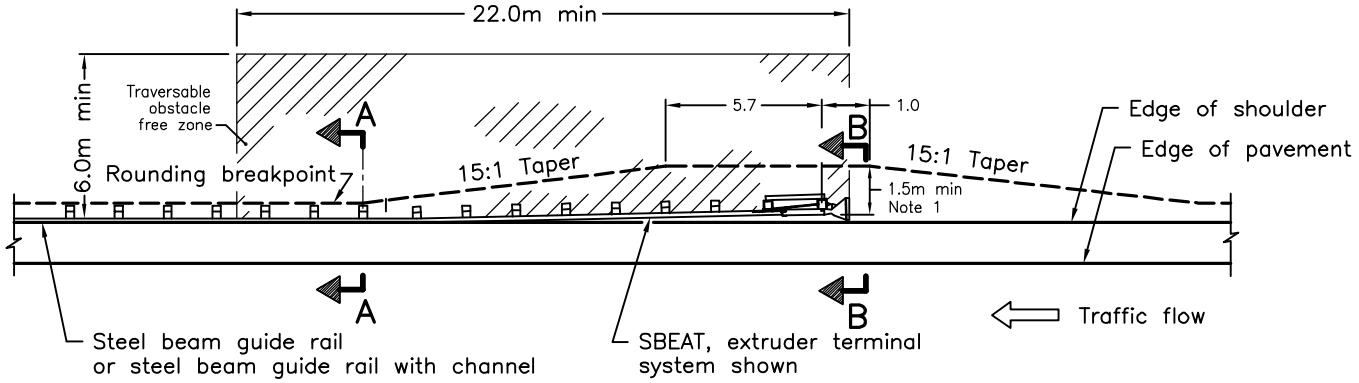

## SECTION A–A CUT

NOTES:

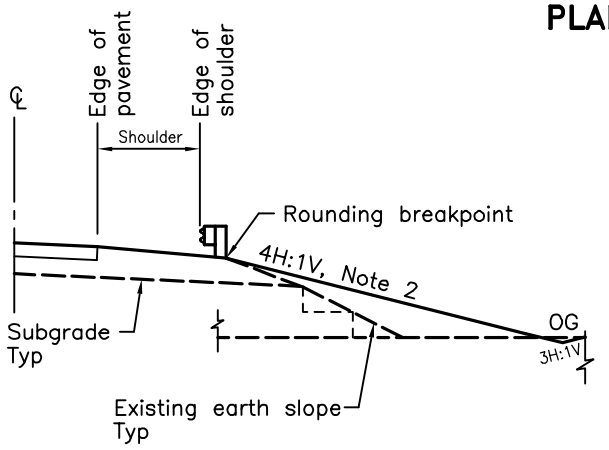
1 Required for steel beam guide rail with eccentric loader.
2 Slope shall be flatter when specified.
3 Slope shall be steeper when specified.

A This OPSD to be read in conjunction with guide rail end treatment and transition 900 series OPSDs.
B All dimensions are in metres unless otherwise shown.

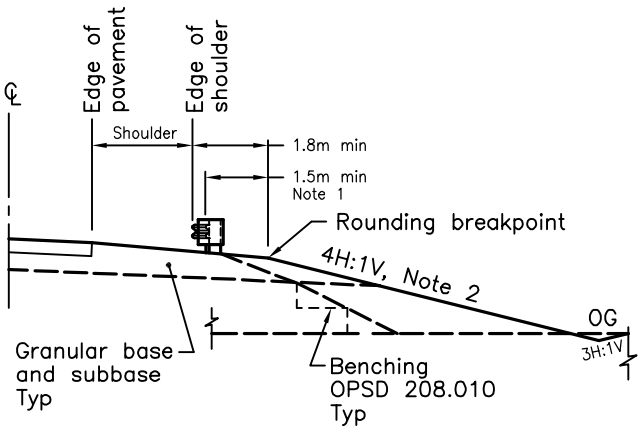
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 5 |
|---|---|---|---|
| ROADWAY WIDENING FOR GUIDE RAIL END TREATMENTS AND TRANSITIONS | | | |
| | OPSD 202.030 | | |




## PLAN

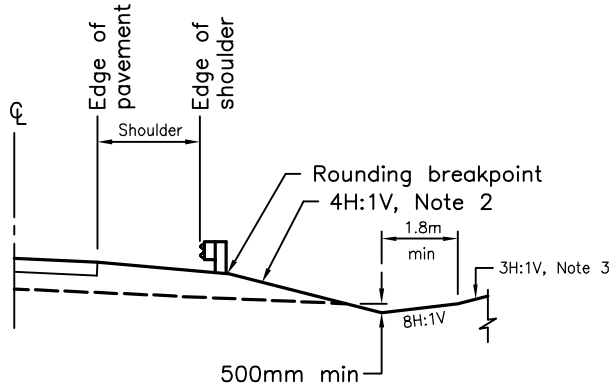



SECTION A–A

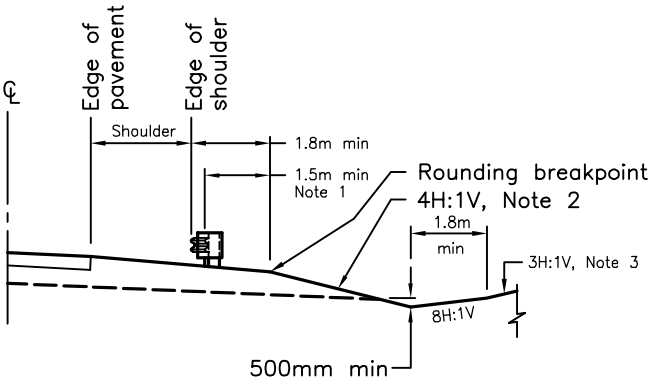



SECTION B–B

## FILL SECTION




SECTION A–A




SECTION B–B

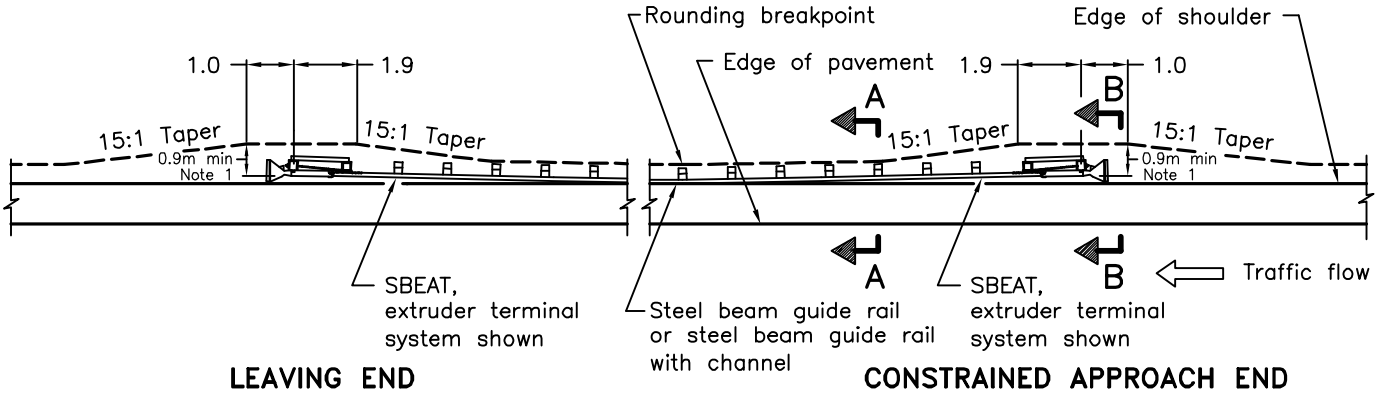
## CUT SECTION

NOTES:

1 Measured from traffic side face of steel beam at the first post.
2 Slope shall be flatter when specified.
3 Slope shall be steeper when specified.

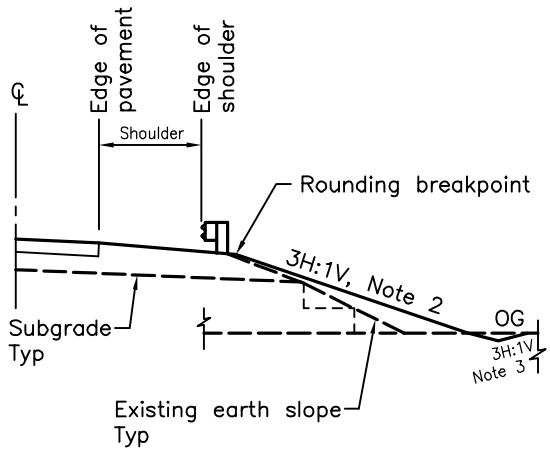
A For leaving end and constrained approach end applications, see OPSD 202.032.
B This OPSD to be read in conjunction with the OPSD 922 series SBEAT drawings.
C All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 0 |
|---|---|---|---|
| ROADWAY WIDENING FOR STEEL BEAM ENERGY ATTENUATING TERMINAL APPROACH END | | | |
| | | | OPSD 202.031 |

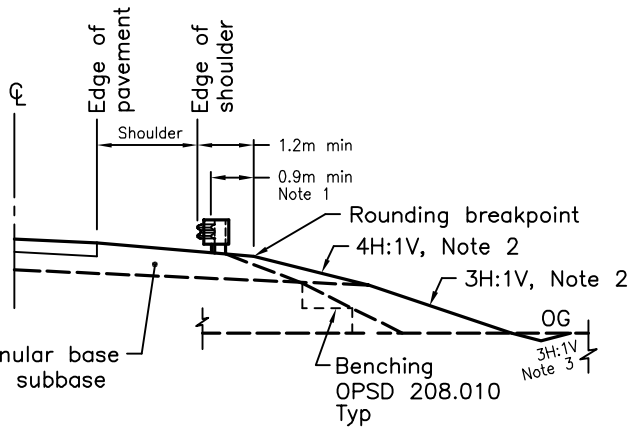



**LEAVING END** **CONSTRAINED APPROACH END**

## PLAN

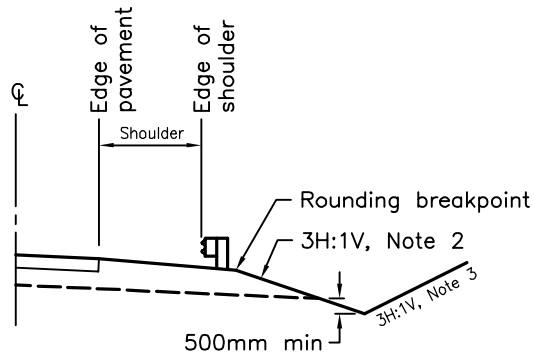



**SECTION A–A**

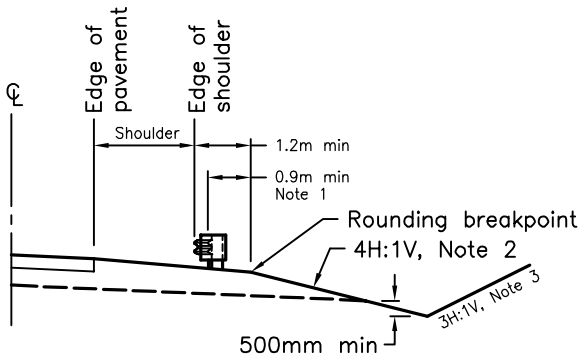



**SECTION B–B**

## FILL SECTION




**SECTION A–A**




**SECTION B–B**

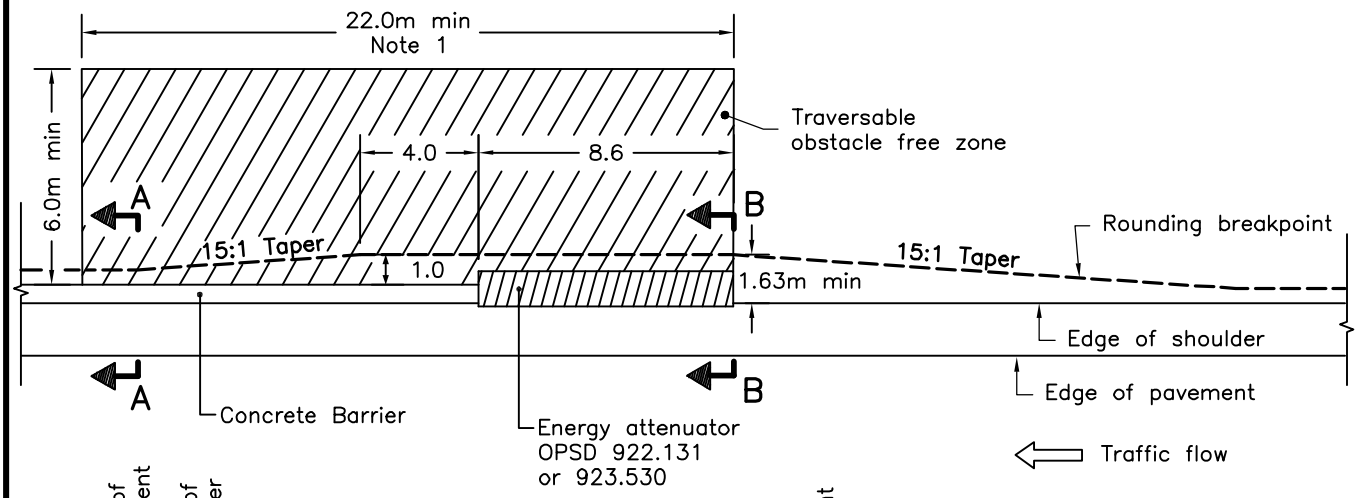
## CUT SECTION

NOTES:

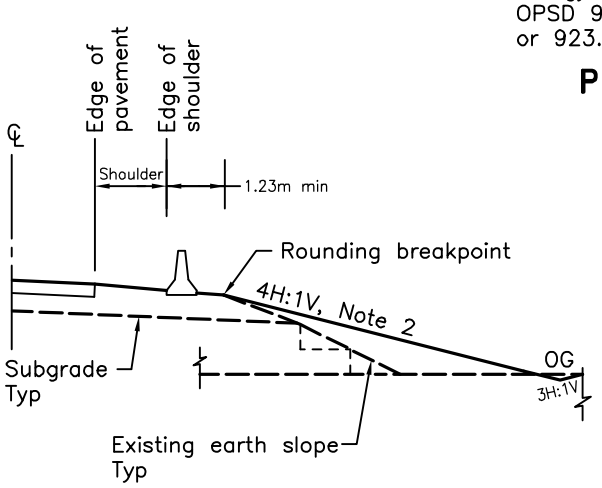
1 Measured from traffic side face of steel beam at the first post.
2 Slope shall be flatter when specified.
3 Slope shall be steeper when specified.

A For approach end application see OPSD 202.031.
B This OPSD to be read in conjunction with the OPSD 922 series SBEAT drawings.
C All dimensions are in metres unless otherwise shown.

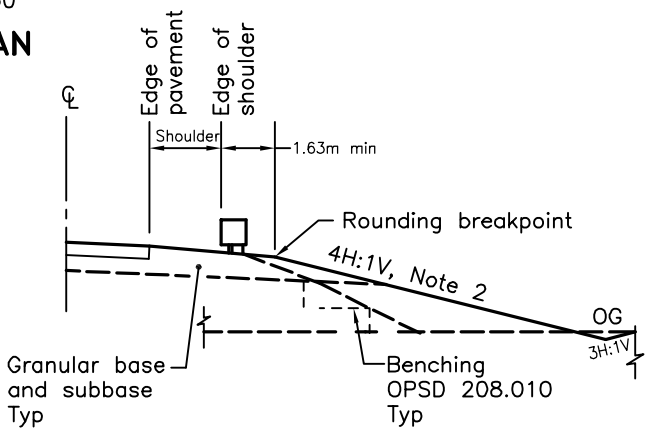
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| ROADWAY WIDENING FOR STEEL BEAM ENERGY ATTENUATING TERMINAL LEAVING END AND CONSTRAINED APPROACH END | | | |
| | OPSD 202.032 | | |




## PLAN

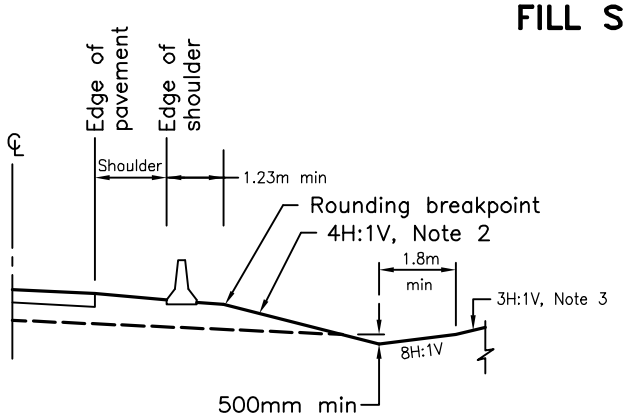



SECTION A–A

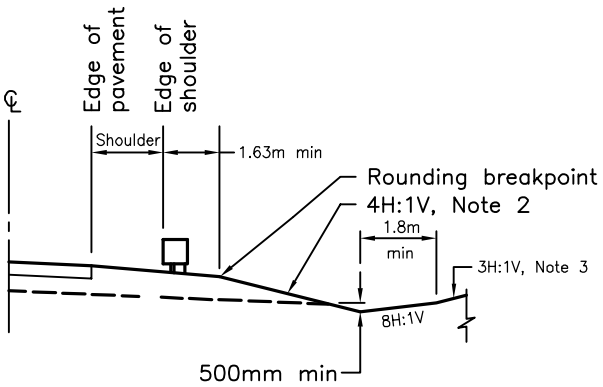



SECTION B–B

## FILL SECTION




SECTION A–A




SECTION B–B

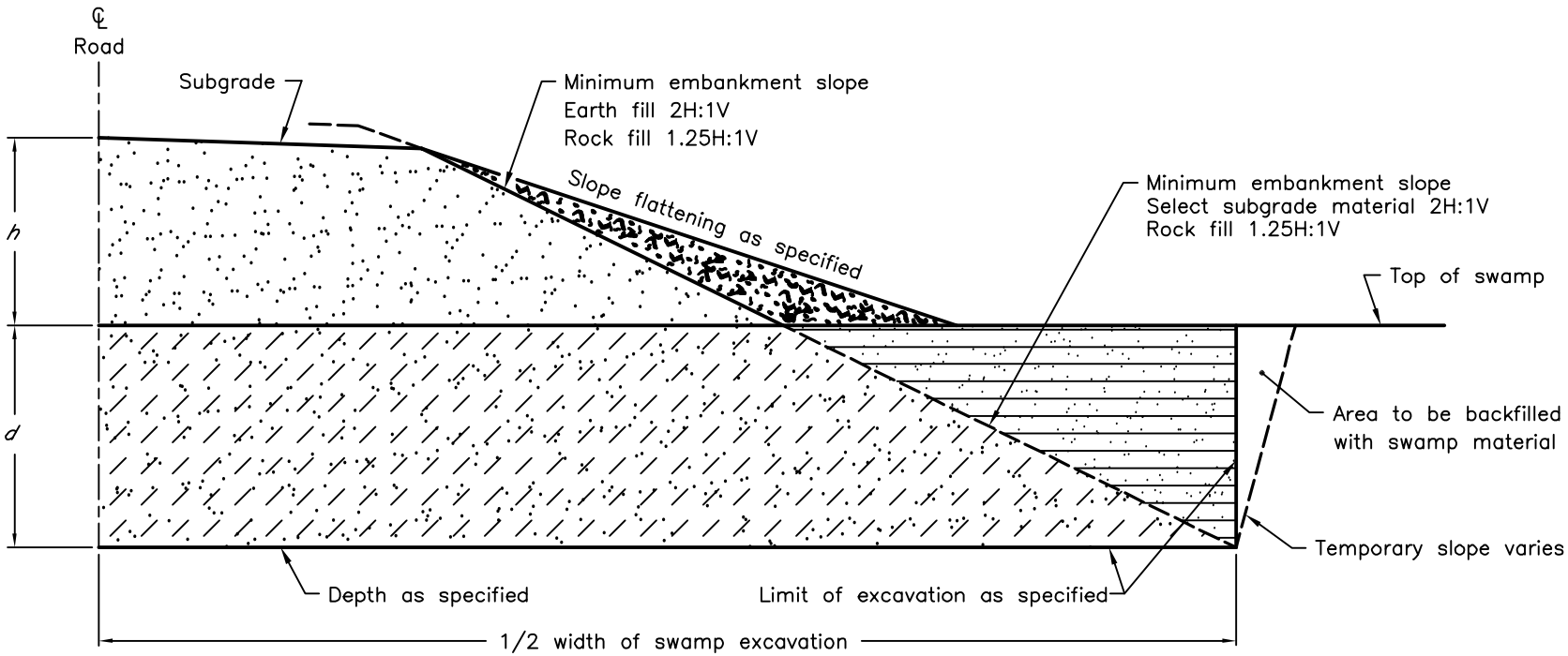
## CUT SECTION

NOTES:

1 Measured from impact head or nose assembly of terminal.
2 Slope shall be flatter when specified.
3 Slope shall be steeper when specified.

A All dimensions are in meters unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 0 |
|---|---|---|---|
| ROADWAY WIDENING<br>SINGLE SIDED ENERGY ATTENUATING TERMINALS<br>APPROACH END | | | |
| | OPSD 202.033 | | |




## NOTES:

A For this OPSD, $h \leq 4.5$m and $d \leq 6.0$m.

B Height of fill is the vertical difference between subgrade and top of swamp measured at new road centreline.

C For divided roads with median <10m, excavate swamp material full width.

D For divided roads with median ≥10m, excavate swamp material to limits as specified.

## LEGEND:

- Embankment materials as specified
- Excavated swamp material
- Excavate and backfill as specified
- Excavate and backfill with swamp material

$h$ – Height of fill

$d$ – Depth of sub–excavation

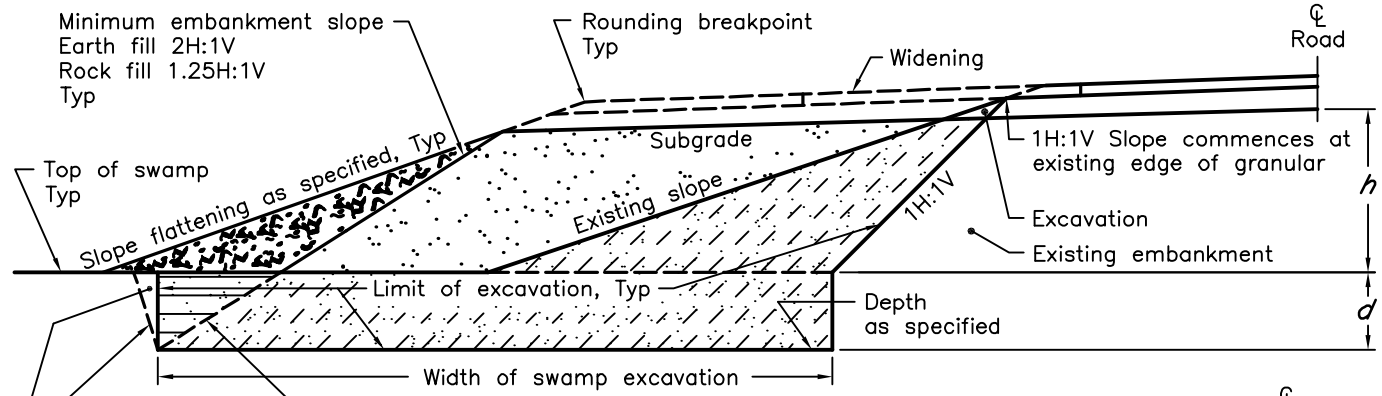
ONTARIO PROVINCIAL STANDARD DRAWING

# EMBANKMENTS OVER SWAMP

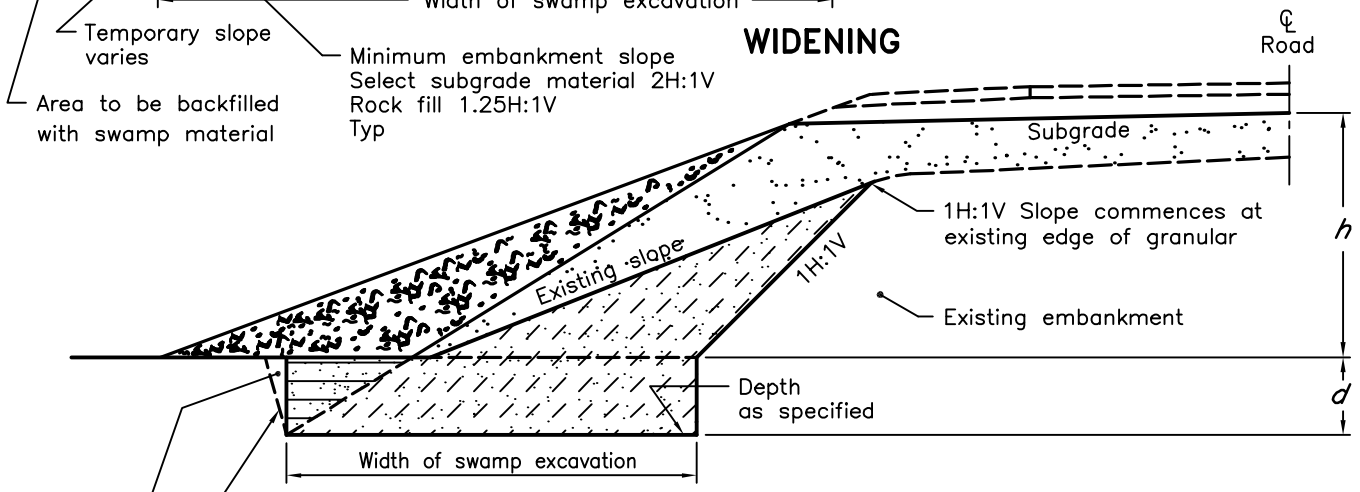
NEW CONSTRUCTION

Nov 2010 | Rev 3

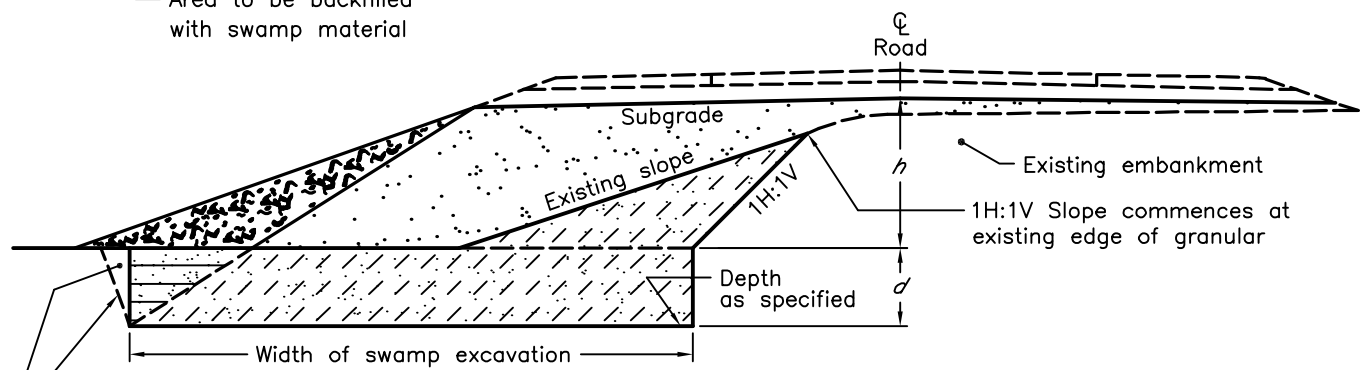
OPSD 203.010




## WIDENING




## GRADE CHANGE




## RE–ALIGNMENT AND GRADE CHANGE

### LEGEND:

*h* – Height of fill

*d* – Depth of sub–excavation

- Embankment materials as specified
- Excavated swamp material
- Excavate and backfill as specified
- Excavate and backfill with swamp material

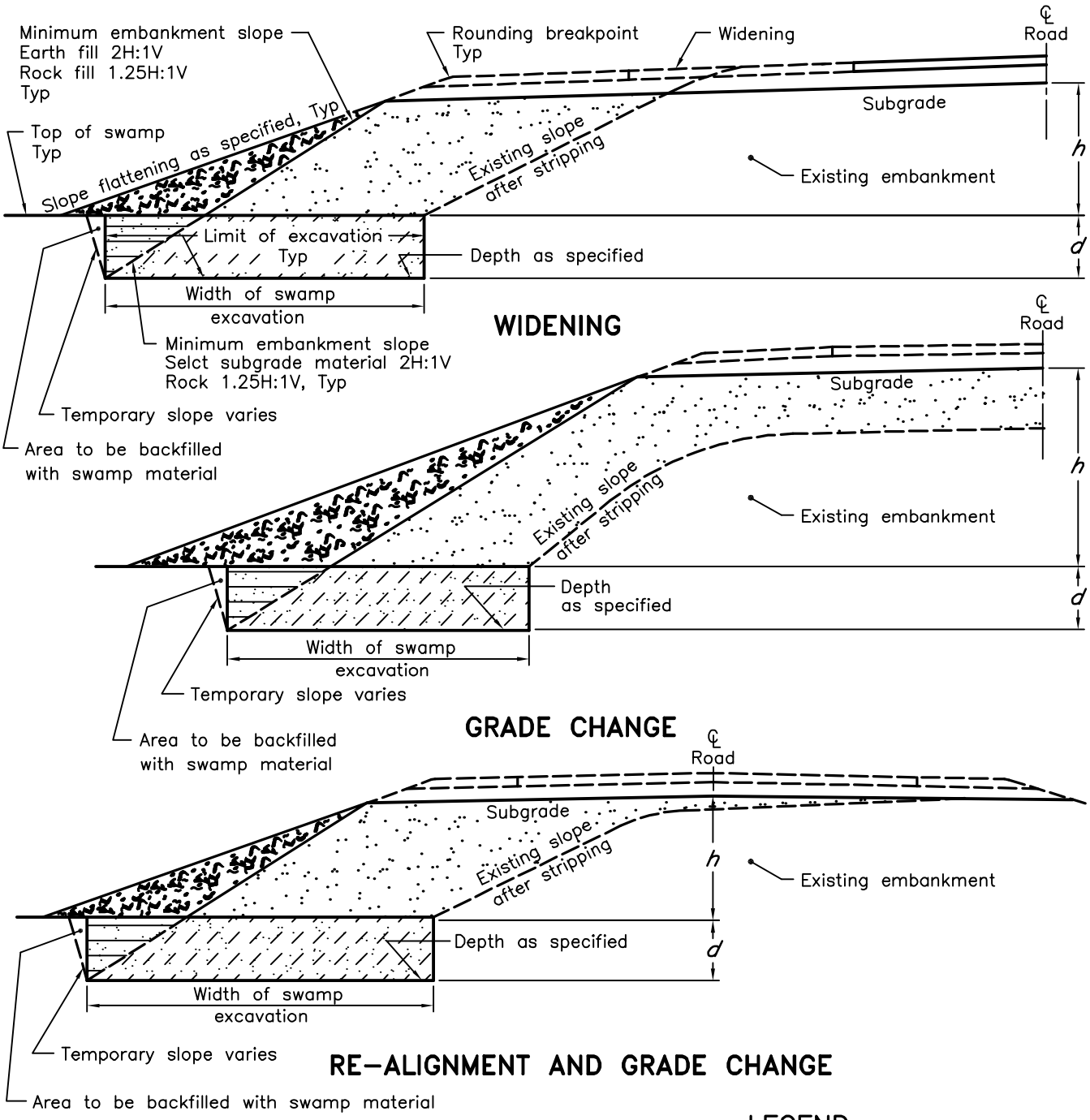
### NOTES:

A For this OPSD, $h \leq 4.5m$ and $d \leq 6.0m$.

B Height of fill is the vertical difference between subgrade and top of swamp measured at new road centreline.

C Widening of existing earth embankments shall be benched according to OPSD 208.010.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 3 |
|---|---|---|---|
| **EMBANKMENTS OVER SWAMP**<br>EXISTING SLOPE EXCAVATED TO 1H:1V | | | |
| | | | **OPSD 203.020** |




## NOTES:

A For this OPSD, $h \leq 4.5$m and $d \leq 6.0$m.

B Topsoil shall be stripped from existing slopes.

C Height of fill is the vertical difference between subgrade and top of swamp measured at new road centreline.

D Widening of existing earth embankments shall be benched according to OPSD 208.010.

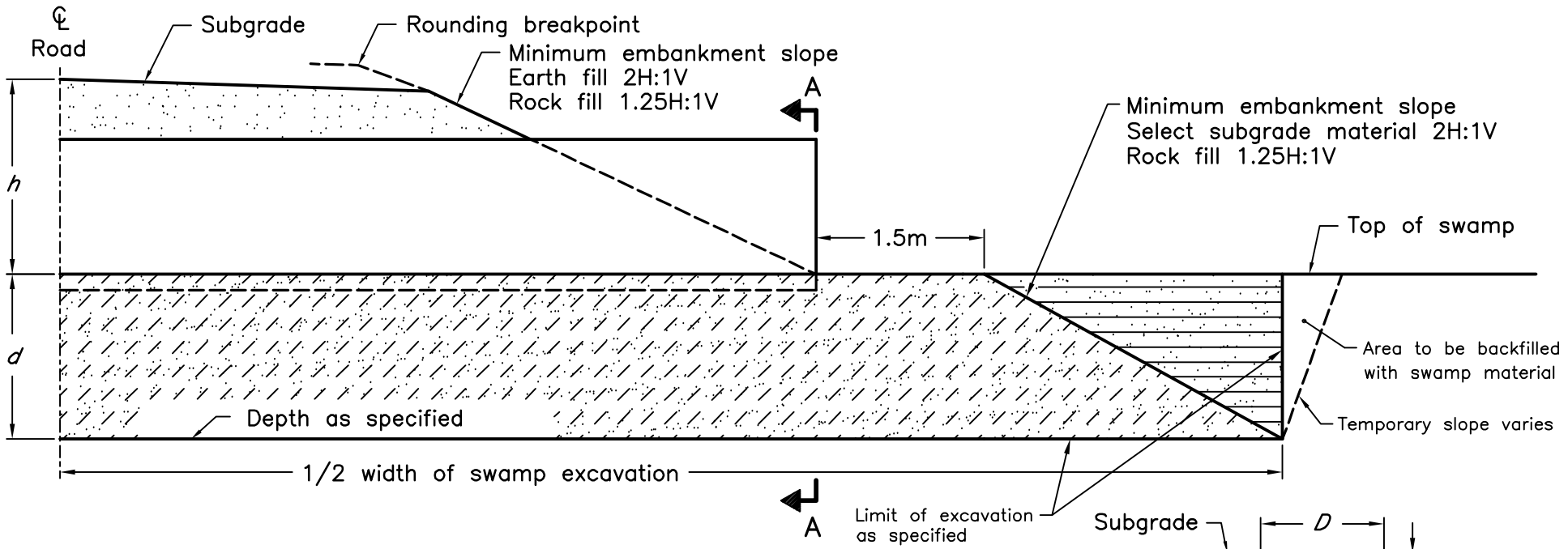
## LEGEND:

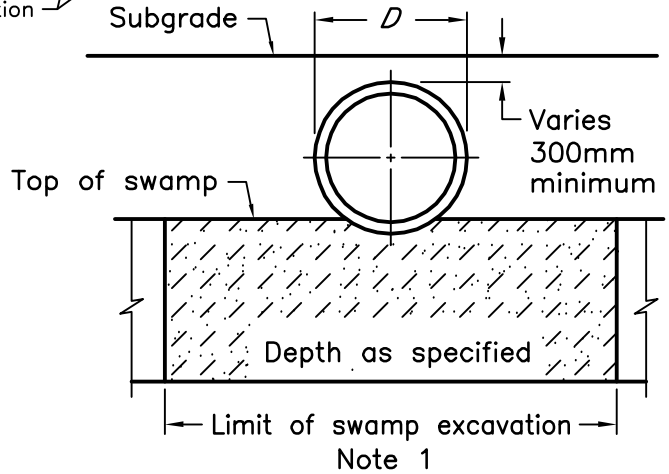
$h$ – Height of fill

$d$ – Depth of sub–excavation

- Embankment materials as specified
- Excavated swamp material
- Excavate and backfill as specified
- Excavate and backfill with swamp material

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 3 |
|---|---|---|---|
| **EMBANKMENTS OVER SWAMP**<br>EXISTING SLOPES MAINTAINED | | | |
| | | | **OPSD 203.030** |




**SECTION A–A**

## NOTES:

1 Width of excavation shall be $D$ +1.0m for pipes ≤1000mm in diameter and $2D$ for pipes >1000mm in diameter.

A For this OPSD, $h$ ≤4.5m and $d$ ≤6.0m.

B Height of fill is the vertical difference between subgrade and top of swamp measured at new road centreline.

C All dimensions are in millimetres unless otherwise shown.

## LEGEND:

$h$ – Height of fill
$d$ – Depth of sub–excavation
$D$ – Nominal pipe diameter

Embankment materials as specified

Excavate and backfill as specified

Excavate and backfill with swamp material

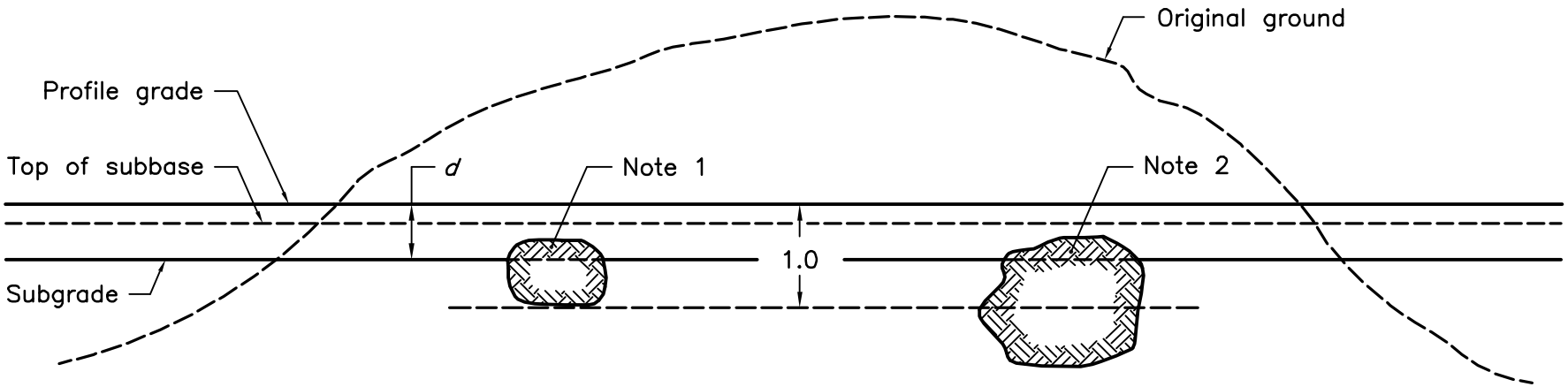
ONTARIO PROVINCIAL STANDARD DRAWING

# EMBANKMENTS OVER SWAMP AT PIPE CULVERTS ≤ 1500mm

Nov 2010 | Rev 3

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 203.040




LEGEND:

$d$ = Depth of roadbed granular

NOTES:

1 Boulders partially within depth $d$ but not deeper than 1.0m below profile grade shall be removed completely.

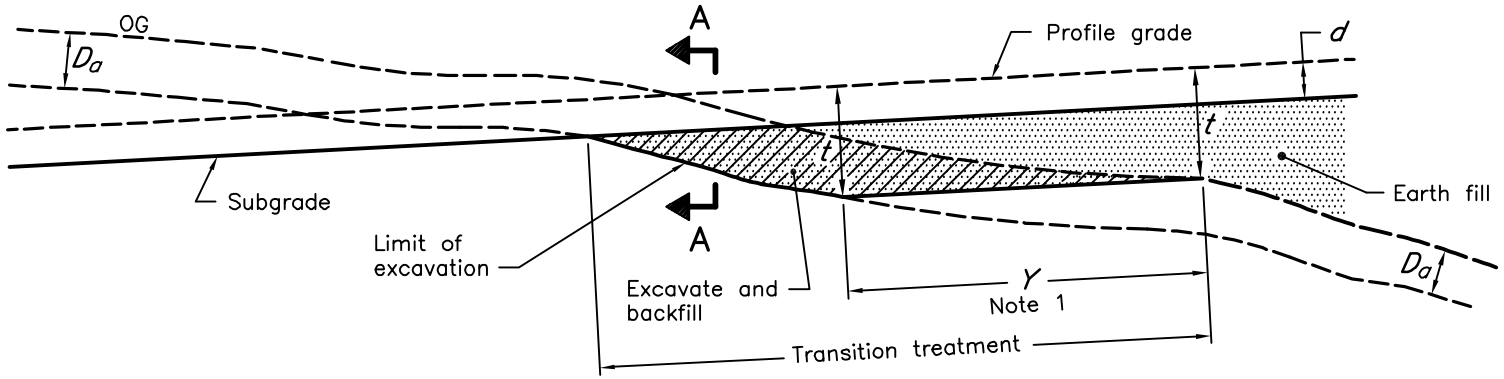
2 Boulders partially within depth $d$ but deeper than 1.0m below profile grade shall be shattered to 0.6m below subgrade and then excavated to a minimum of 0.3m below subgrade.

A Excavation below subgrade shall be backfilled with approved material.

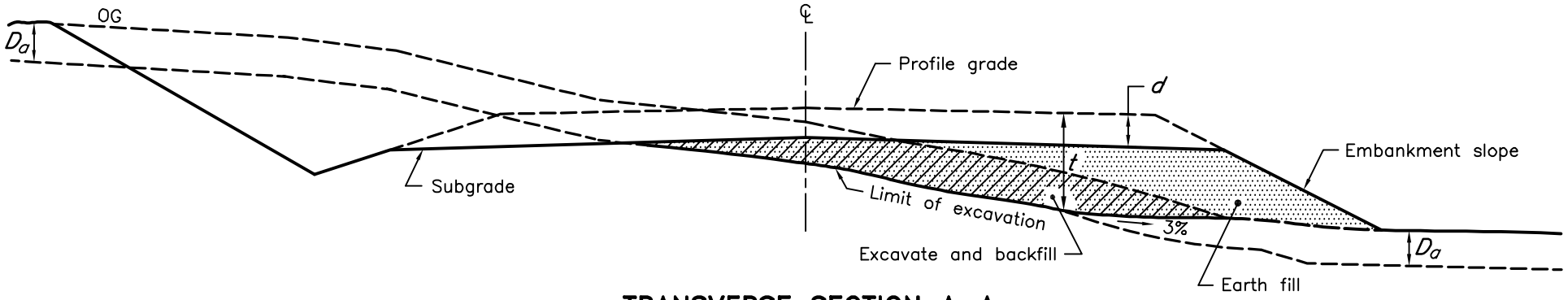
B Profile grade and subgrade lines apply across the transverse section.

C All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 3 |
|---|---|---|---|
| **BOULDER TREATMENT**<br>CUT SECTIONS–SUBGRADE | | | |
| | **OPSD 204.010** | | |




## LONGITUDINAL SECTION




## TRANSVERSE SECTION A–A

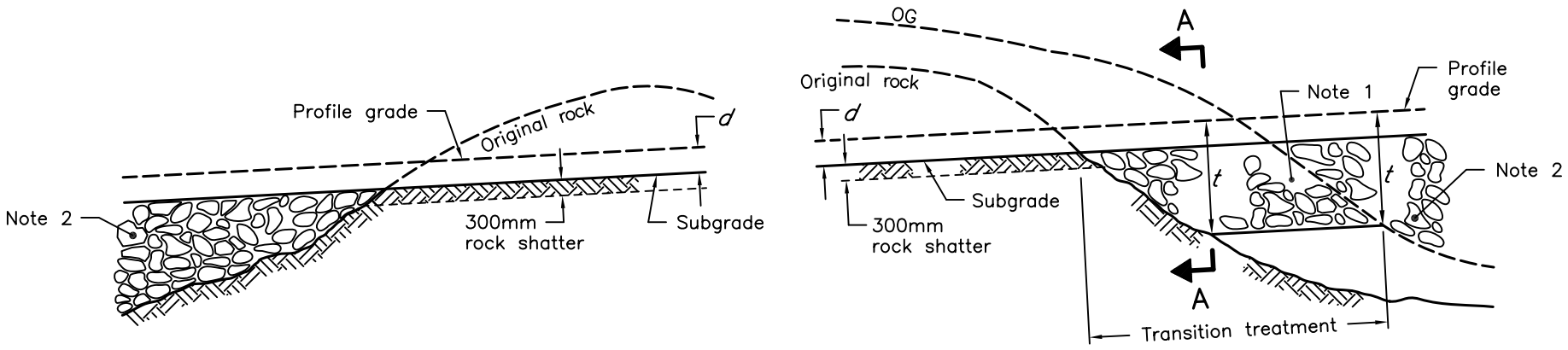
NOTES:

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 $D_o$

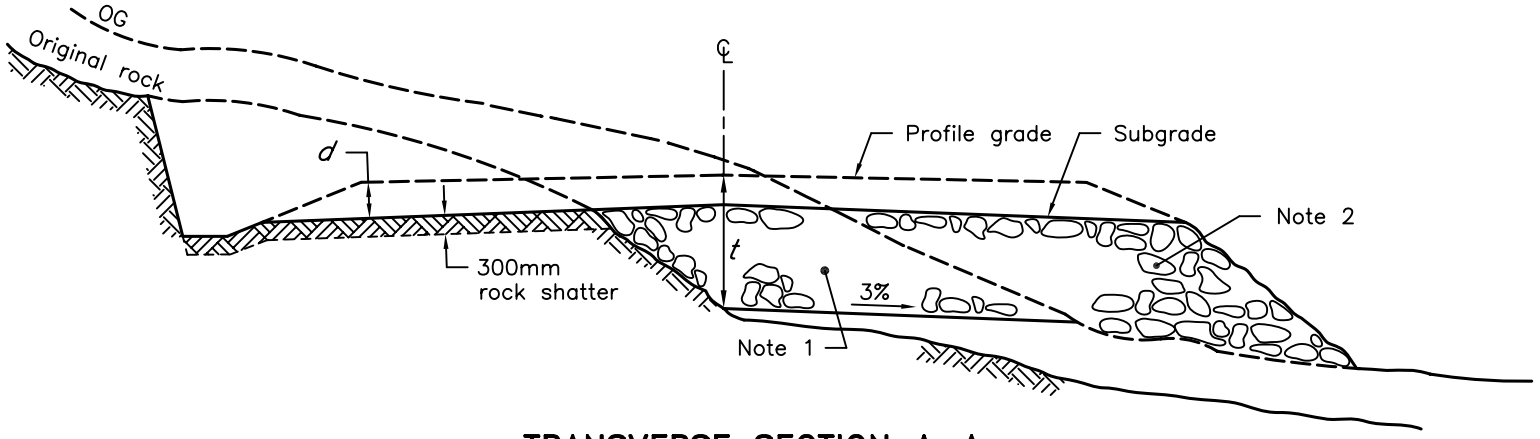
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 2 |
|---|---|---|---|
| **TRANSITION TREATMENT**<br>EARTH CUT TO EARTH FILL | | | |
| | **OPSD 205.010** | | |




WITHOUT OVERBURDEN

WITH OVERBURDEN

## LONGITUDINAL SECTIONS




## TRANSVERSE SECTION A–A

NOTES:

1 Excavate overburden for transition where applicable.

2 Rock or granular fill.

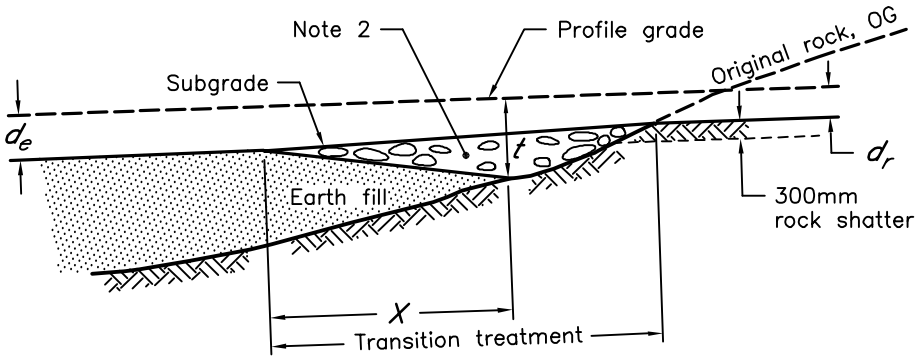
A All dimensions are in millimetres unless otherwise shown.

LEGEND:

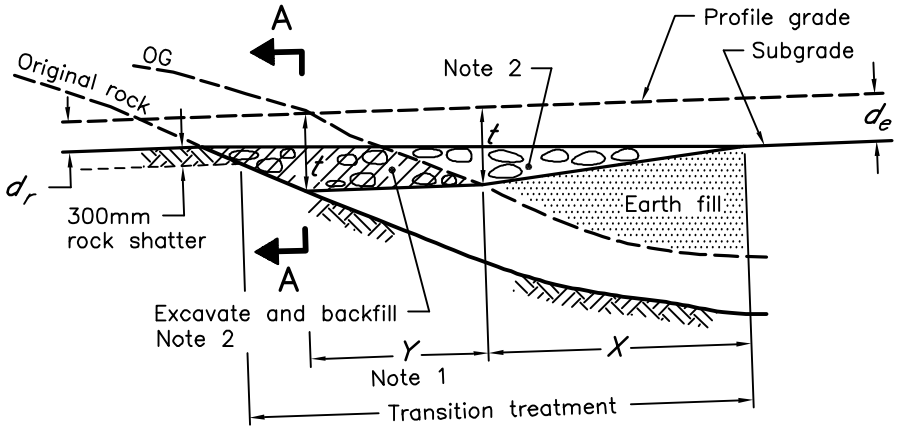
$t$ – Transition treatment depth, as specified

$d$ – Depth of granular base and subbase, as specified

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 2 |
|---|---|---|---|
| **TRANSITION TREATMENT**<br>ROCK CUT TO ROCK FILL | | | |
| | **OPSD 205.020** | | |

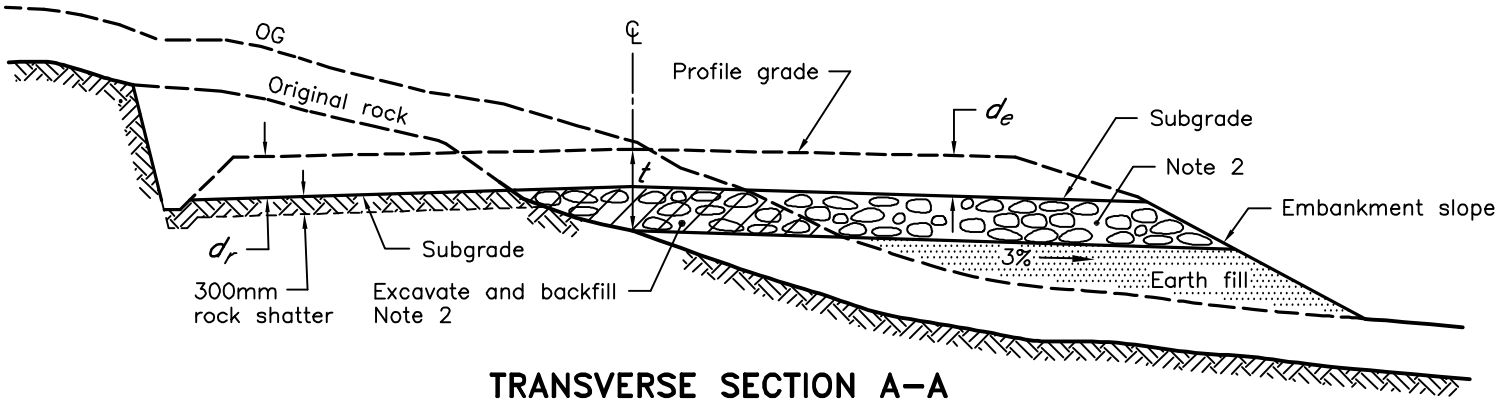



WITHOUT OVERBURDEN




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

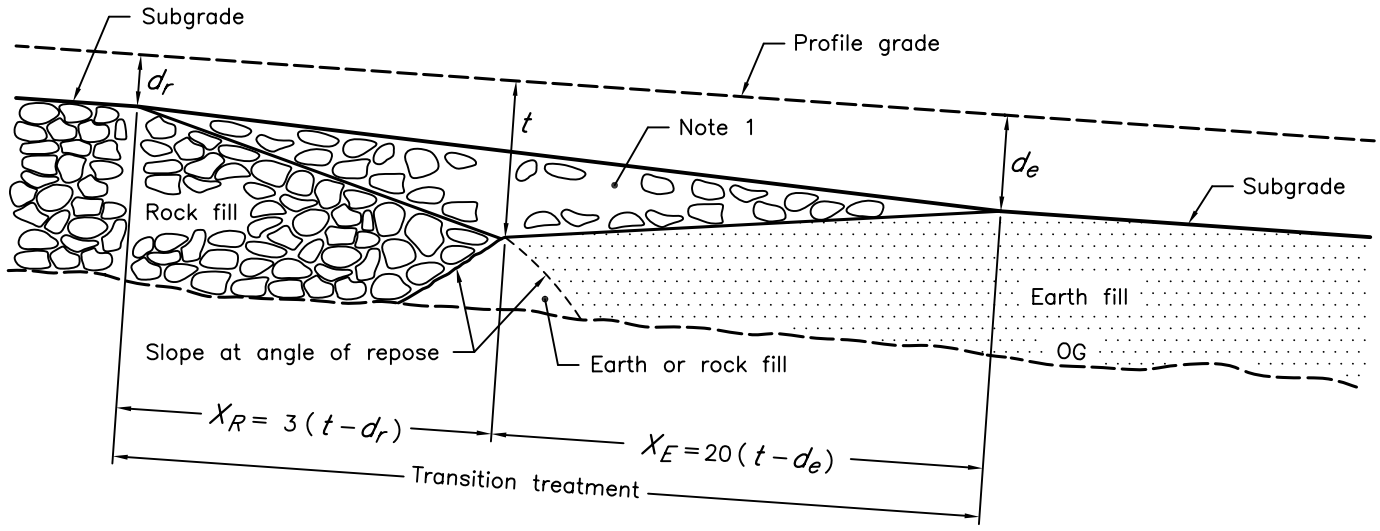
# TRANSITION TREATMENT

ROCK CUT TO EARTH FILL

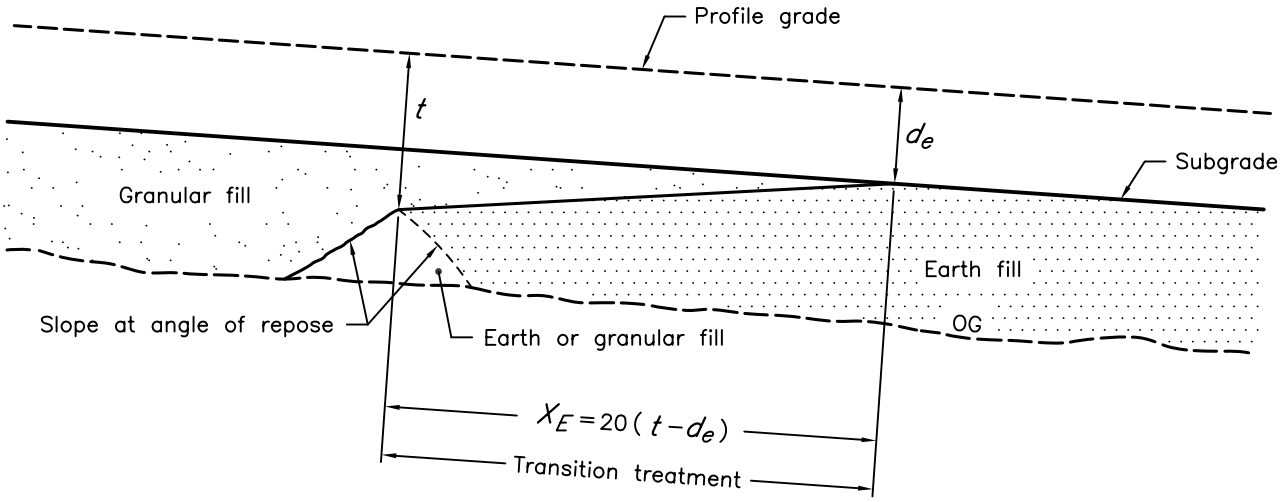
Nov 2009 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

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

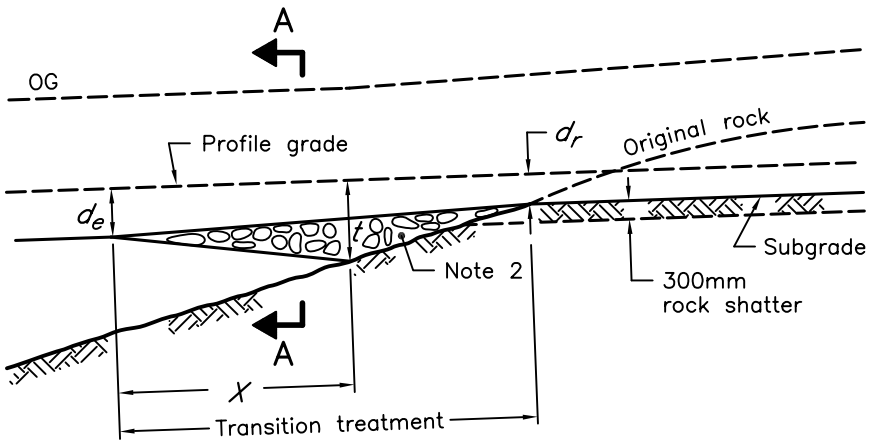
$d_r$ – Depth of granular base and subbase over rock fill

$t$ – Transition treatment depth, as specified

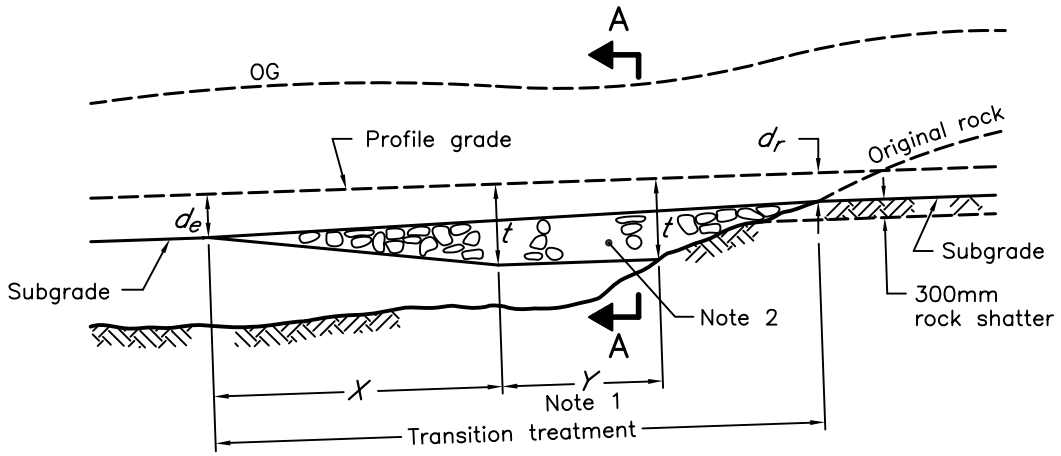
$X_E$ – Length of transition for earth fill, 15m maximum

$X_R$ – Length of transition in rock fill

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 2 |
|---|---|---|---|
| **TRANSITION TREATMENT**<br>EARTH FILL TO ROCK FILL AND<br>EARTH FILL TO GRANULAR FILL | | | |
| | **OPSD 205.040** | | |

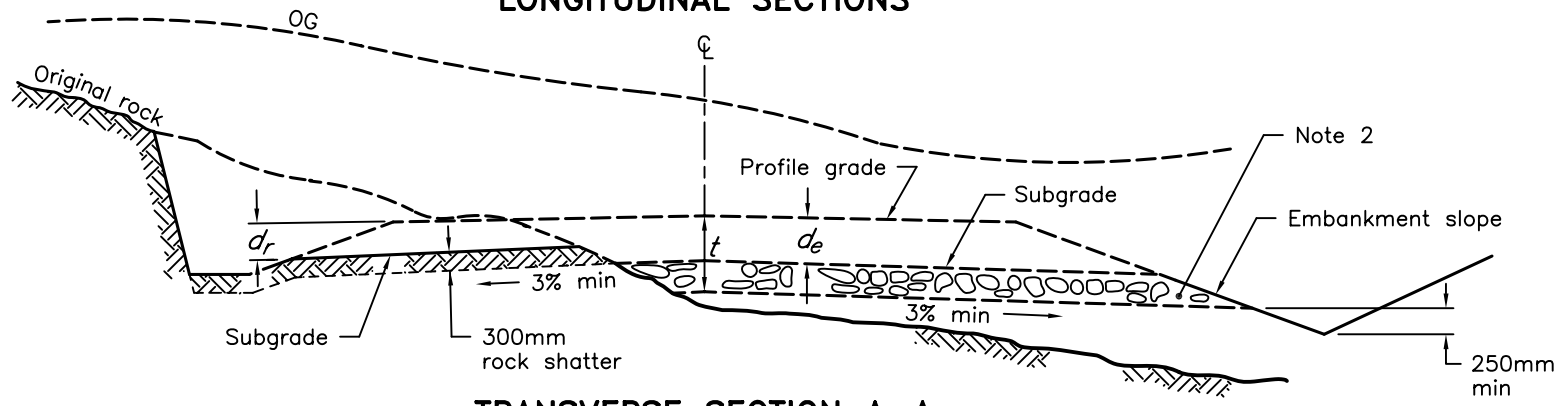



NON–FROST SUSCEPTIBLE SOILS




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

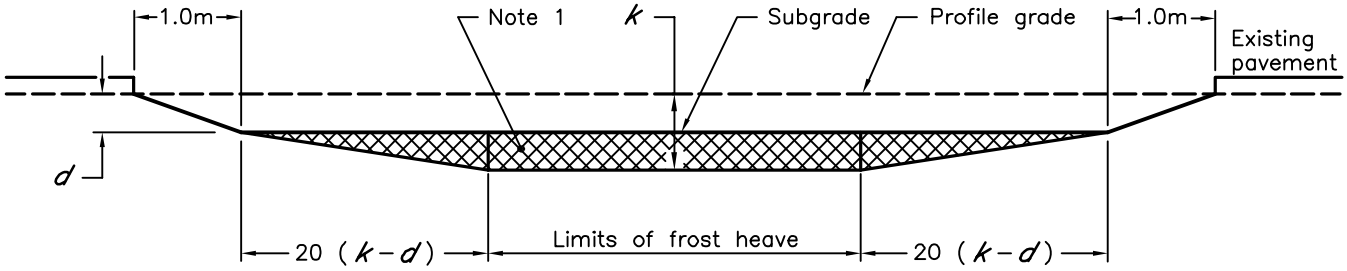
# TRANSITION TREATMENT

ROCK CUT TO EARTH CUT

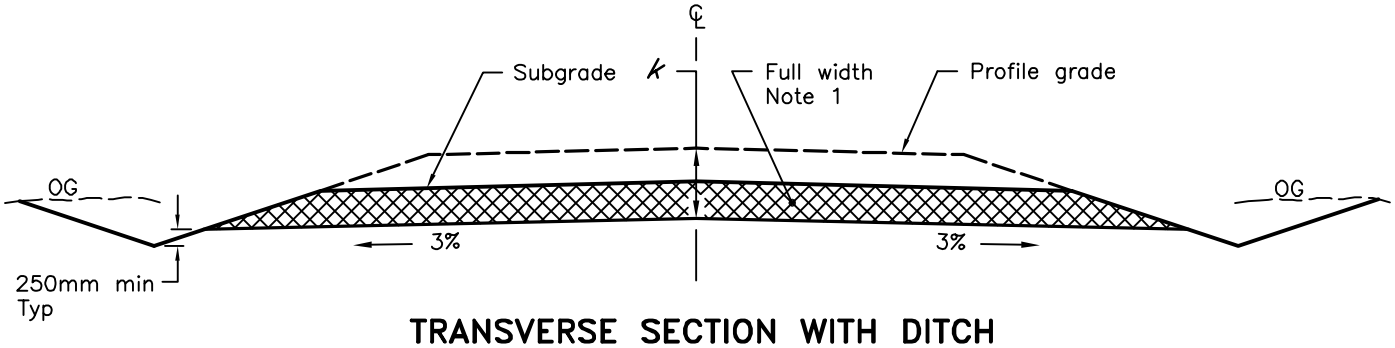
Nov 2009 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

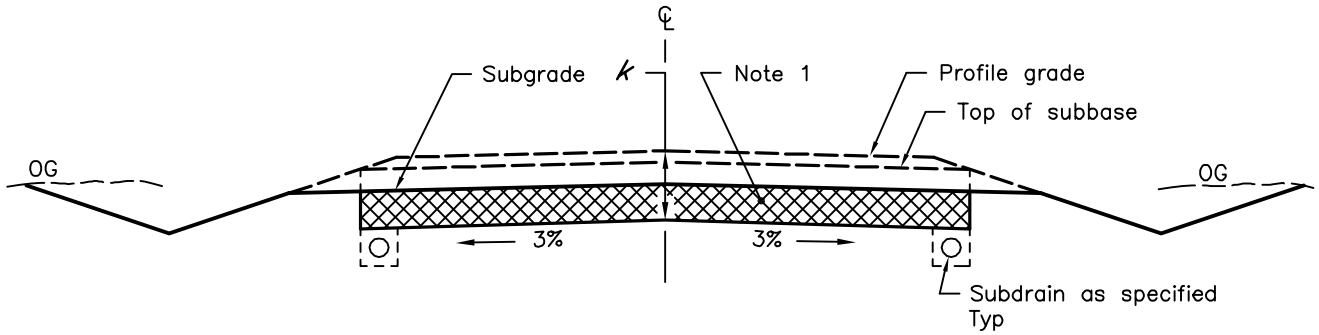
OPSD 205.050




## LONGITUDINAL SECTION




## TRANSVERSE SECTION WITH DITCH




## TRANSVERSE SECTION WITH SUBDRAIN

NOTES:

1 Material shall be excavated and replaced with specified granular material.

A Profile grade and subgrade lines apply across the transverse sections.

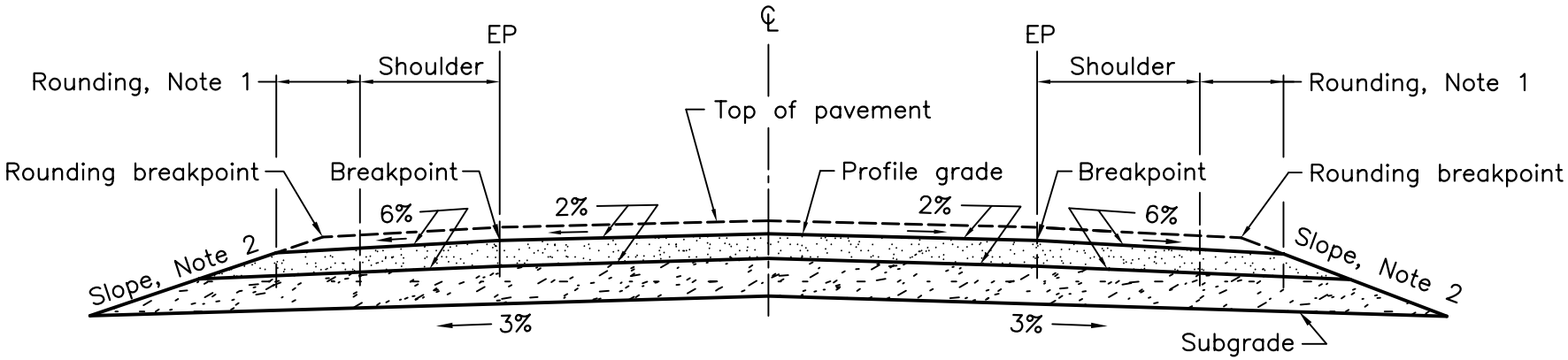
B All dimensions are in metres unless otherwise shown.

LEGEND:

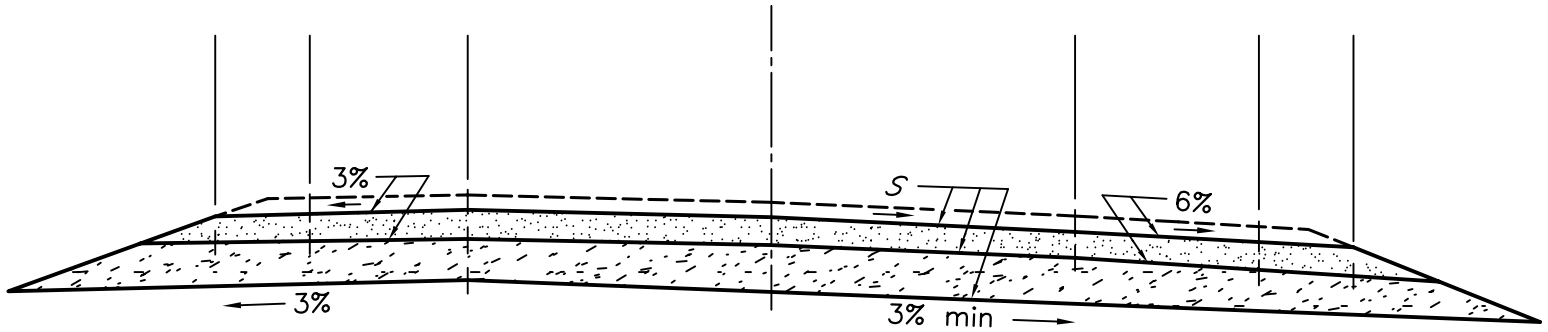
$d$ – Depth of granular base and subbase

$k$ – Depth of frost treatment below profile grade as specified

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 3 |
|---|---|---|---|
| FROST HEAVE TREATMENT | | | |
| | OPSD 205.060 | | |




**TANGENT SECTION**




**SUPERELEVATED SECTION**

LEGEND:

Granular base  Granular subbase

NOTES:

1 Rounding shall be 0.5m or greater when specified.
2 Slope shall be 3H:1V or flatter when specified.
A All dimensions are in metres unless otherwise shown.

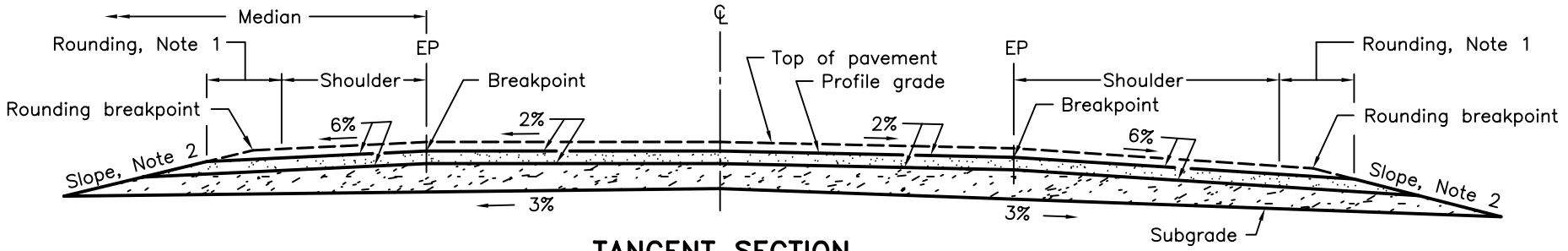
ONTARIO PROVINCIAL STANDARD DRAWING

# GRANULAR COURSES

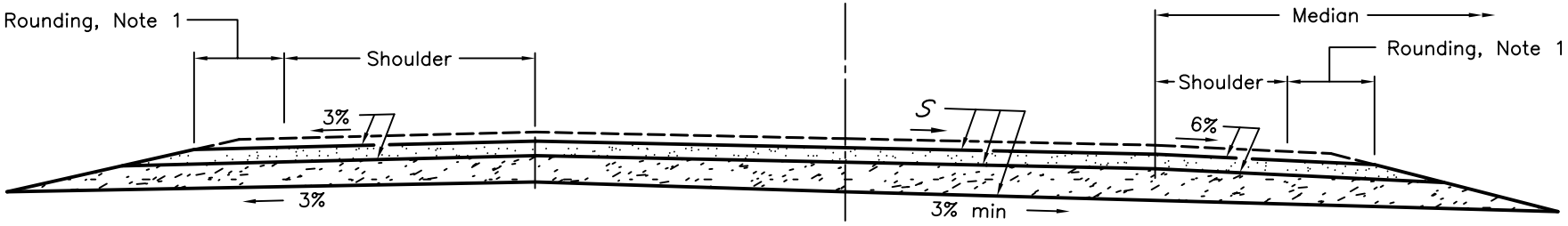
UNDIVIDED RURAL

Nov 2009 | Rev 1

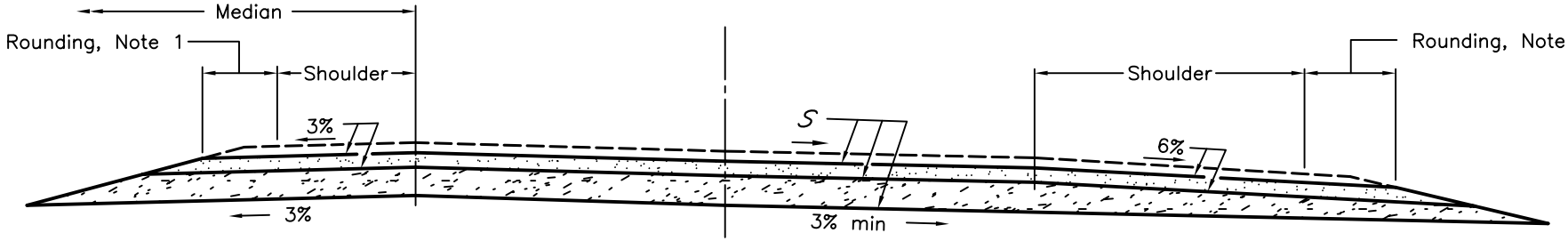
OPSD 206.010




**TANGENT SECTION**




**SUPERELEVATED SECTION**
**MEDIAN ON LOW SIDE**




**SUPERELEVATED SECTION**
**MEDIAN ON HIGH SIDE**

LEGEND:

Granular base  Granular subbase

NOTES:

1 Rounding shall be 1.0m or greater when specified.
2 Slope shall be 4H:1V or flatter when specified.
A All dimensions are in metres unless otherwise shown.

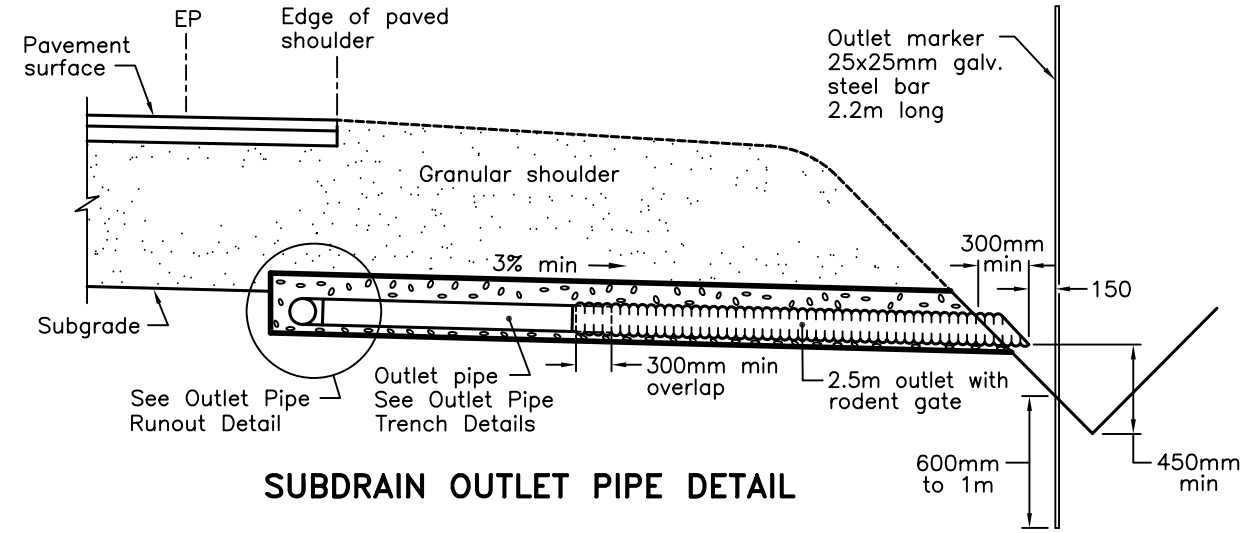
ONTARIO PROVINCIAL STANDARD DRAWING

# GRANULAR COURSES

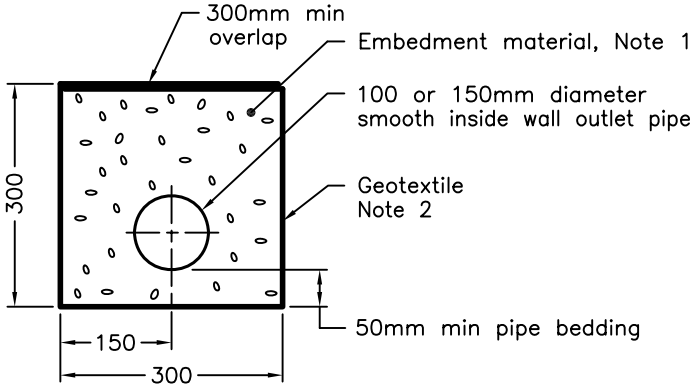
DIVIDED RURAL

Nov 2009 | Rev 1

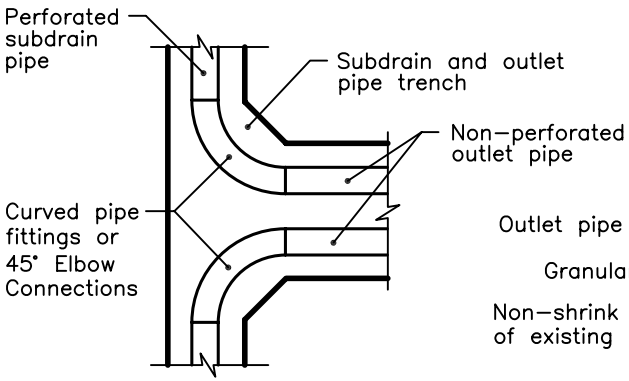
OPSD 206.020



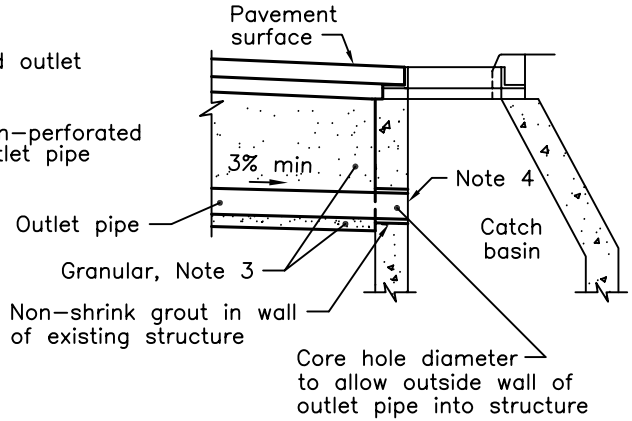

## SUBDRAIN OUTLET PIPE DETAIL



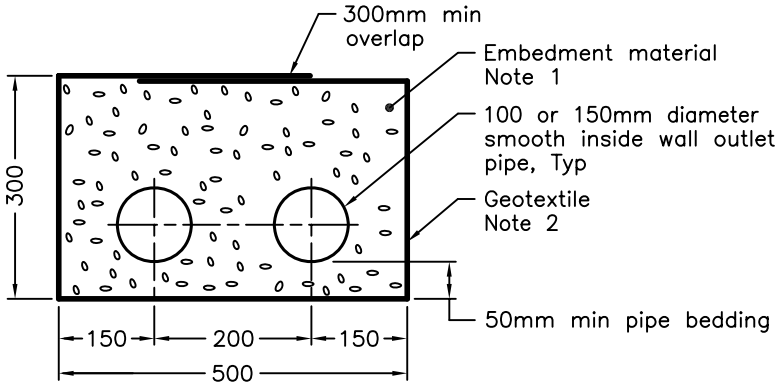

## SINGLE OUTLET PIPE TRENCH DETAIL




## OUTLET PIPE RUNOUT DETAIL




## OUTLET PIPE CONNECTION TO CATCH BASIN DETAIL




## DUAL OUTLET PIPE TRENCH DETAIL

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

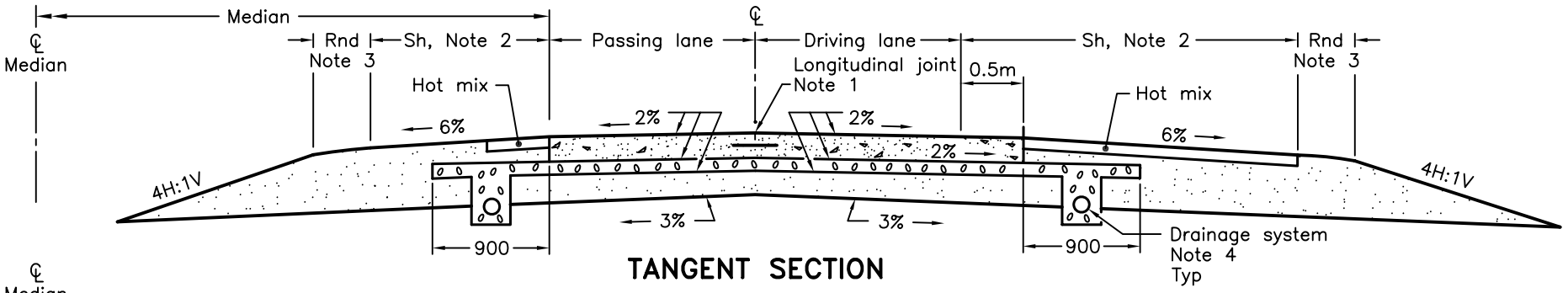
# SUBDRAIN PIPE CONNECTION AND OUTLET

RURAL

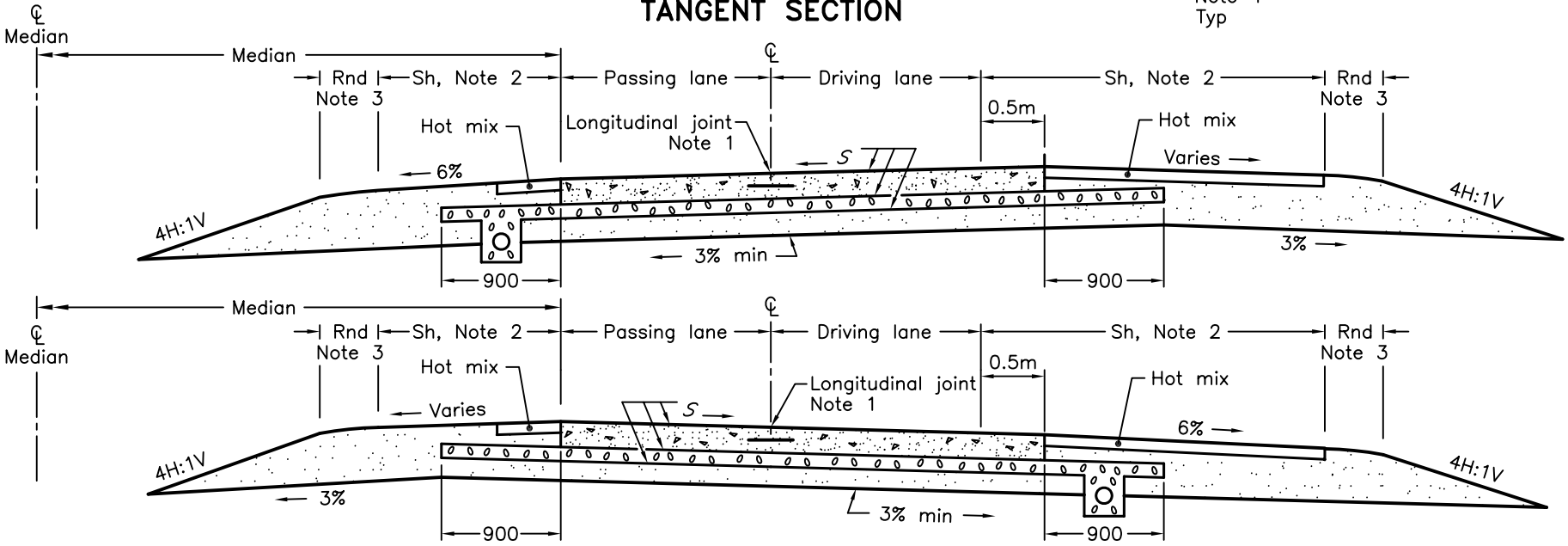
Nov 2008 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 206.050




**TANGENT SECTION**




**SUPERELEVATED SECTIONS**

LEGEND:

$S$ – rate of superelevation in %

Open graded drainage layer

Granular

Concrete pavement

NOTES:

1 For longitudinal joint details refer to OPSD 552.010.

2 Paved shoulder as specified.

3 Rounding shall be 0.5m or greater as specified.

4 For drainage system details refer to OPSD 207.041 and 207.044.

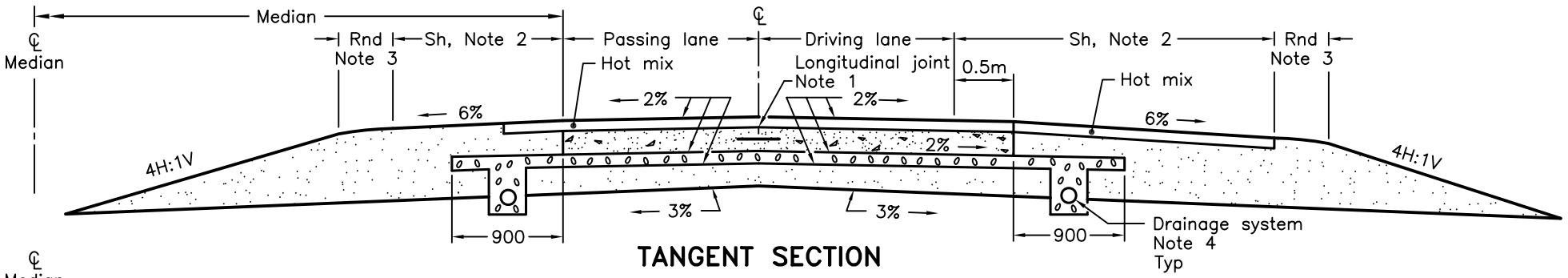
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

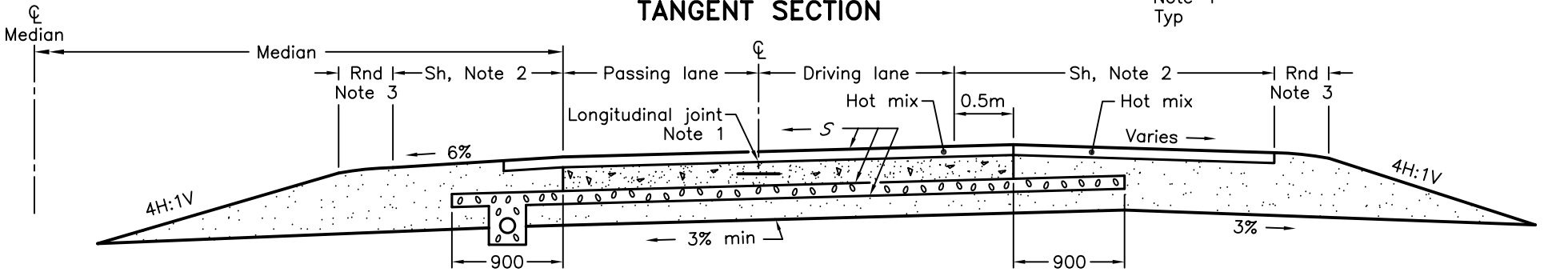
# CONCRETE PAVEMENT ON OPEN GRADED DRAINAGE LAYER DIVIDED HIGHWAY

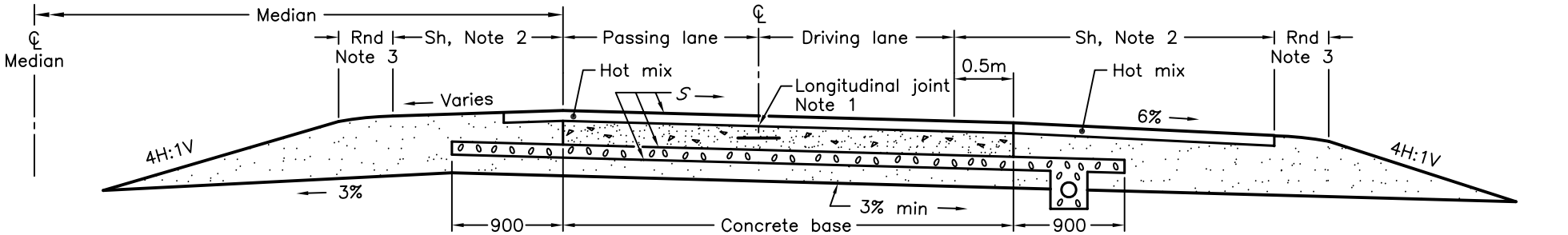
Nov 2007 | Rev 2

OPSD 207.010




## TANGENT SECTION




## SUPERELEVATED SECTIONS

LEGEND:

$S$ – rate of superelevation in %

Open graded drainage layer

Granular

Concrete base

NOTES:

1 For longitudinal joint details refer to OPSD 552.020.

2 Paved shoulder as specified.

3 Rounding shall be 0.5m or greater as specified.

4 For drainage system details refer to OPSD 207.041 and 207.044.

A All dimensions are in millimetres unless otherwise shown.

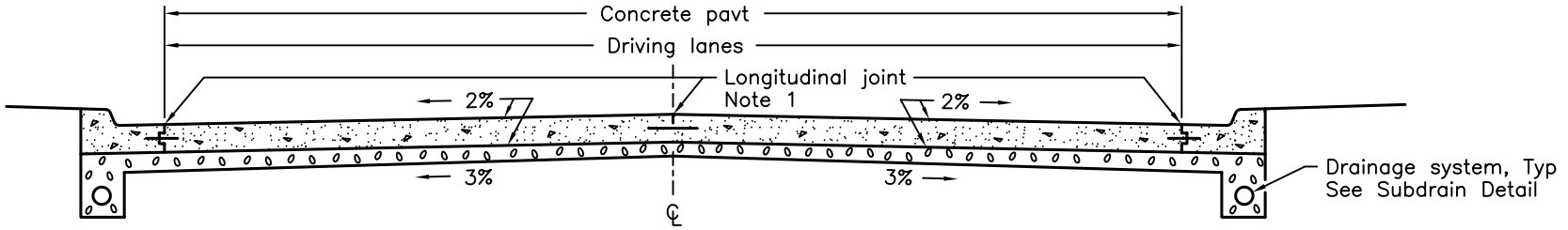
ONTARIO PROVINCIAL STANDARD DRAWING

# COMPOSITE PAVEMENT ON OPEN GRADED DRAINAGE LAYER DIVIDED HIGHWAY

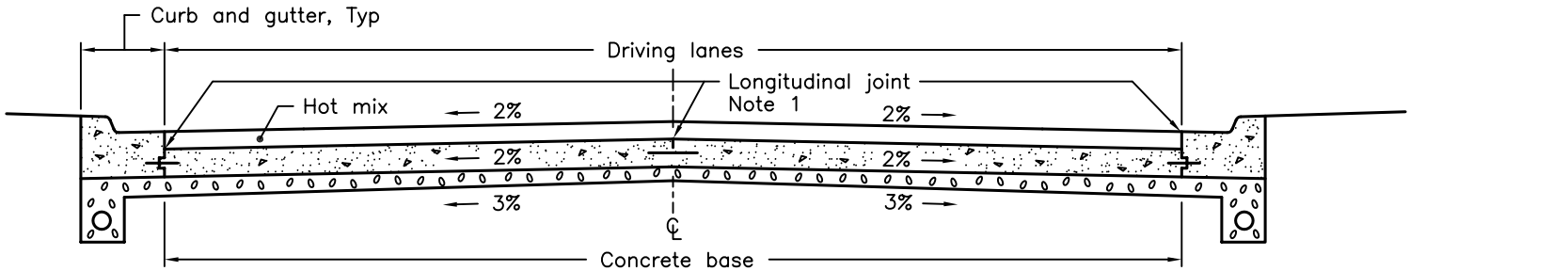
Nov 2007 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

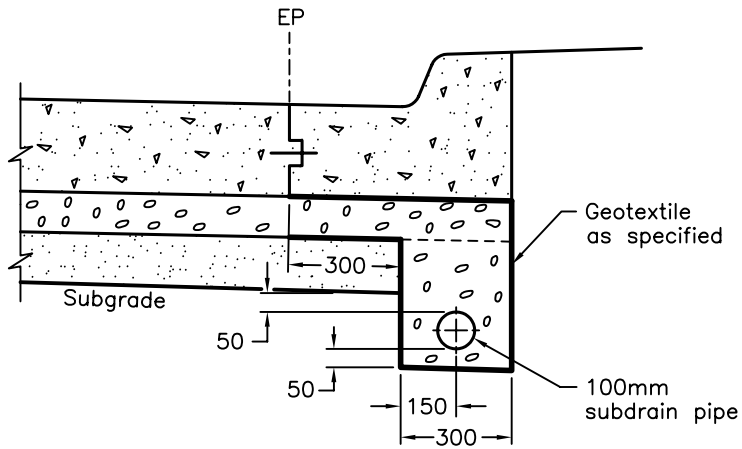
OPSD 207.020




**CONCRETE PAVEMENT**




**COMPOSITE PAVEMENT**




**SUBDRAIN DETAIL**

LEGEND:

- Granular
- Open graded drainage layer

NOTES:

1 For longitudinal joint details refer to OPSD–552.010 and 552.020.

A Drainage system outlets at every catch basin per OPSD–207.044.

B All dimensions are in millimetres. unless otherwise shown.

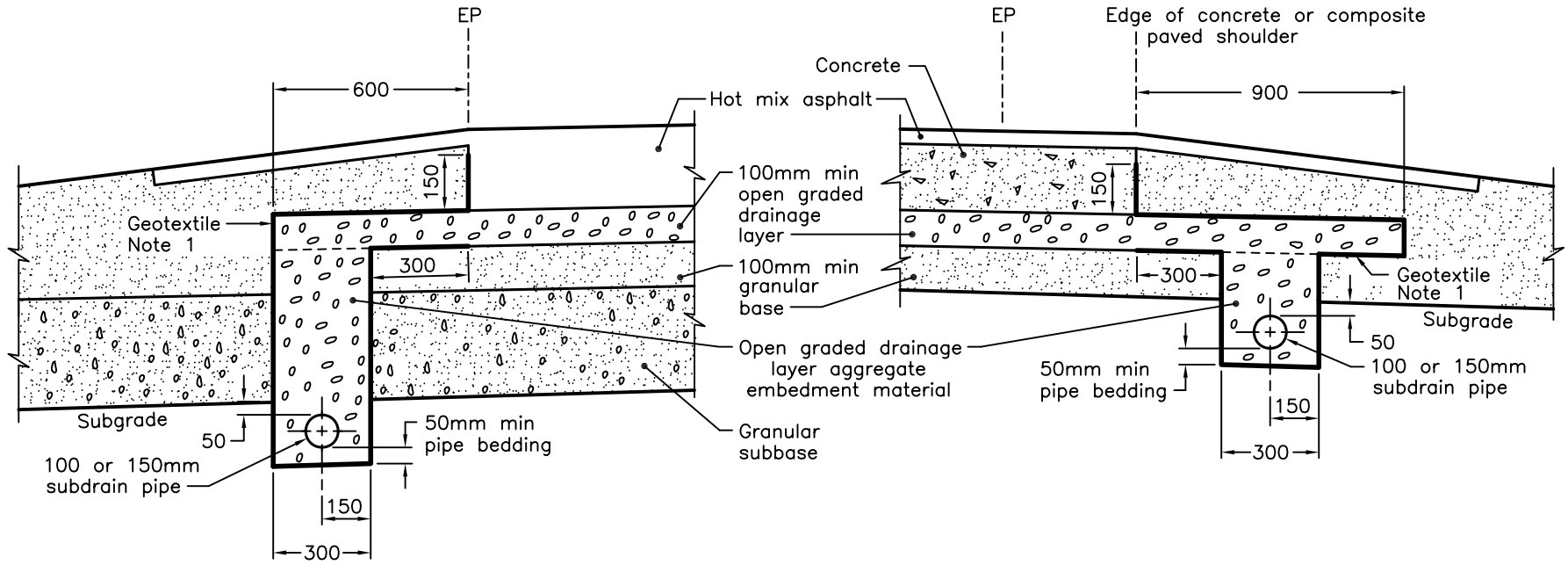
ONTARIO PROVINCIAL STANDARD DRAWING

# CONCRETE AND COMPOSITE PAVEMENT ON OPEN GRADED DRAINAGE LAYER

URBAN SECTION

Nov 2005 | Rev 1

OPSD – 207.030




**HOT MIX ASPHALT PAVEMENT**

**EXPOSED CONCRETE OR COMPOSITE PAVEMENT**

NOTES:

1 To prevent contamination of the trench embedment material, the 300mm geotextile flaps shall be fastened to securely enclose the subdrain trench until immediately prior to placing the open graded drainage layer, at which time the flaps shall be opened.

A This standard to be read in conjunction with OPSD 207.044.

B All dimensions are in millimetres unless otherwise shown.

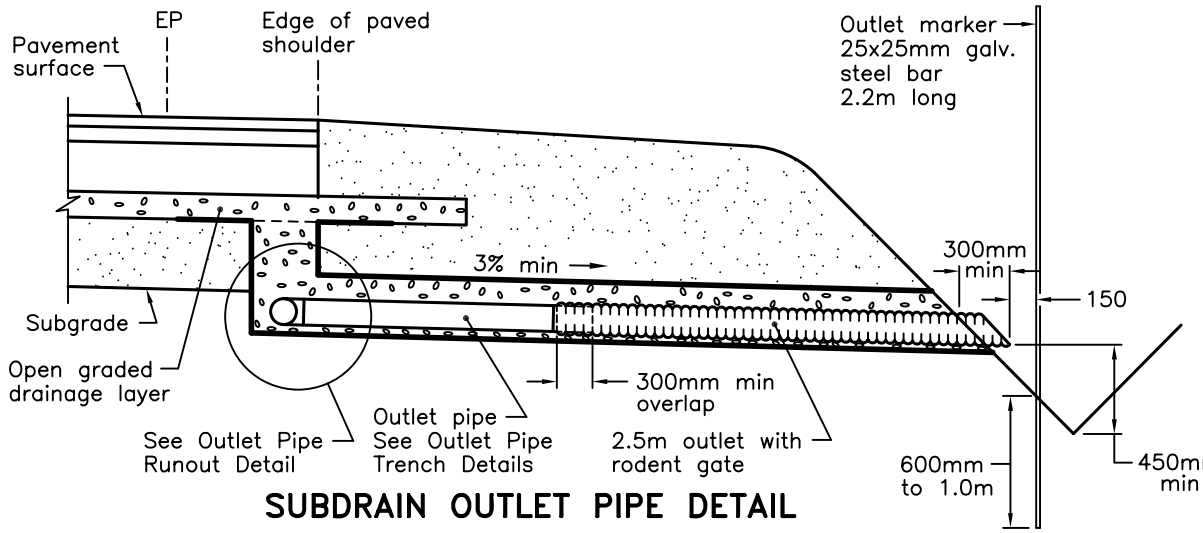
ONTARIO PROVINCIAL STANDARD DRAWING

# SUBDRAIN PIPE OPEN GRADED DRAINAGE LAYER

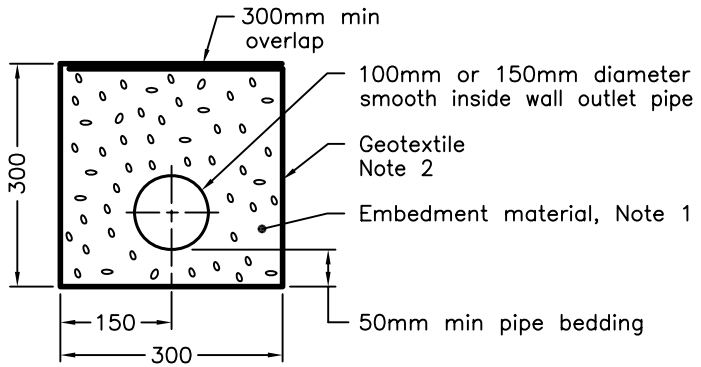
## HOT MIX ASPHALT, CONCRETE, OR COMPOSITE PAVEMENT

Nov 2008 | Rev 3

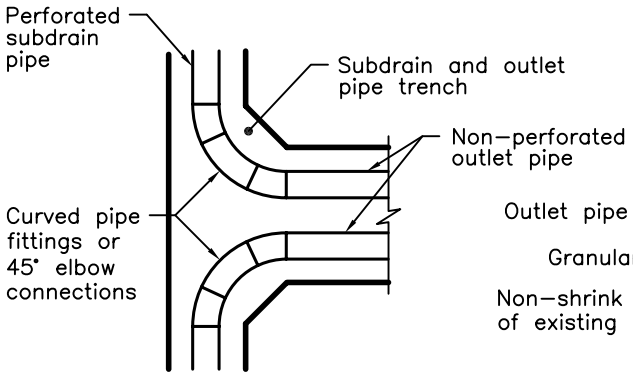
OPSD 207.041



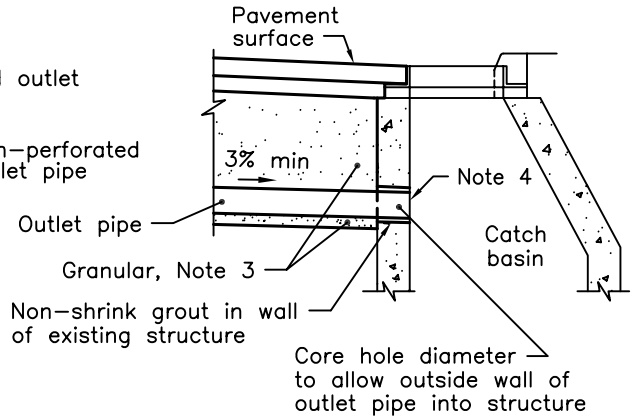

## SUBDRAIN OUTLET PIPE DETAIL



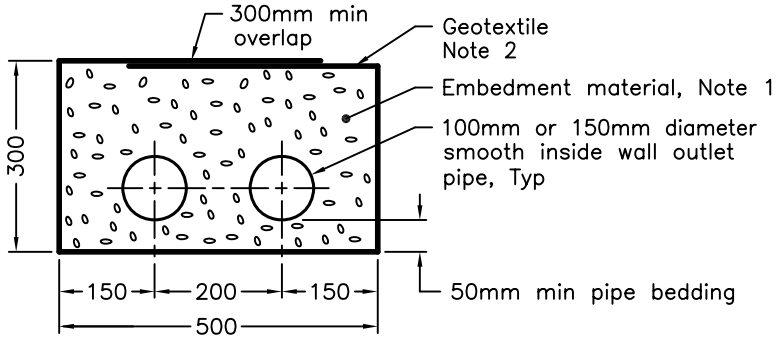

## SINGLE OUTLET PIPE TRENCH DETAIL




## OUTLET PIPE RUNOUT DETAIL




## OUTLET PIPE CONNECTION TO CATCH BASIN DETAIL




## DUAL OUTLET PIPE TRENCH DETAIL

NOTES:

1 Embedment material shall be open graded drainage layer aggregate.
2 Outlet pipe 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 This standard to be read in conjunction with OPSD 207.041.
B Use compatible manufactured fittings for all connectors and couplings.
C All dimensions are in millimetres unless otherwise shown.

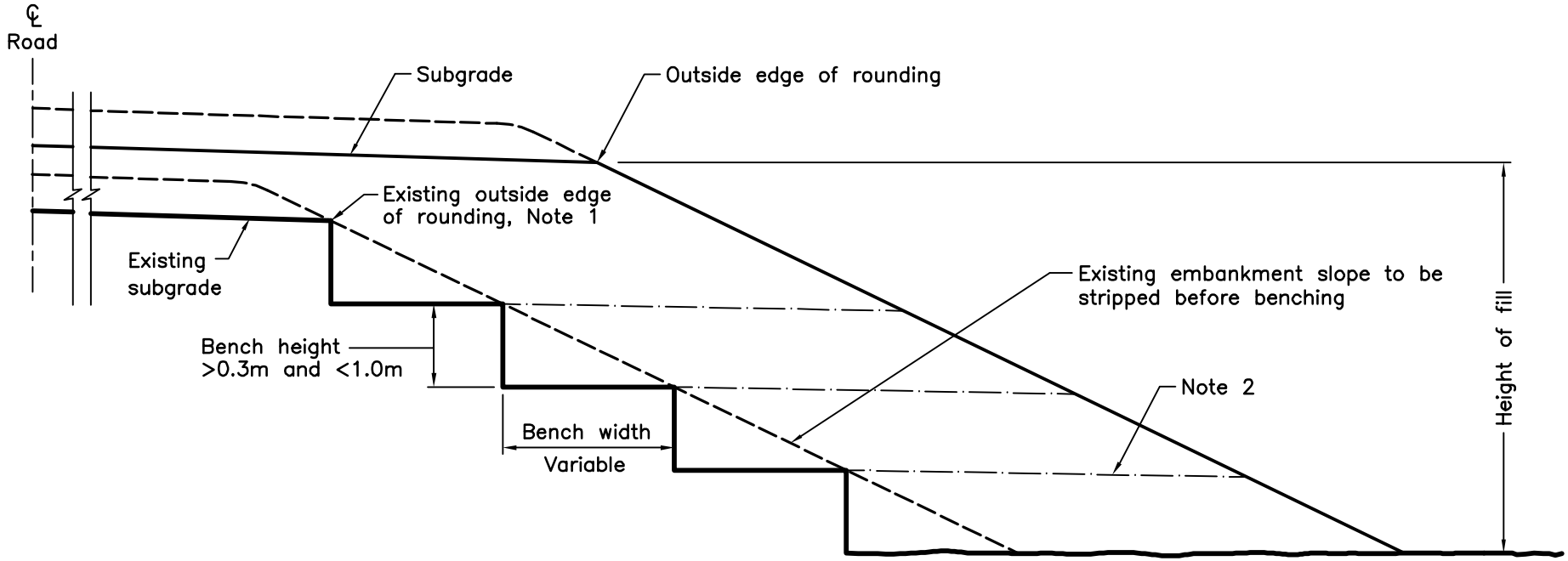
ONTARIO PROVINCIAL STANDARD DRAWING

# SUBDRAIN PIPE CONNECTION AND OUTLET OPEN GRADED DRAINAGE LAYER

Nov 2008 | Rev 4

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 207.044




NOTES:

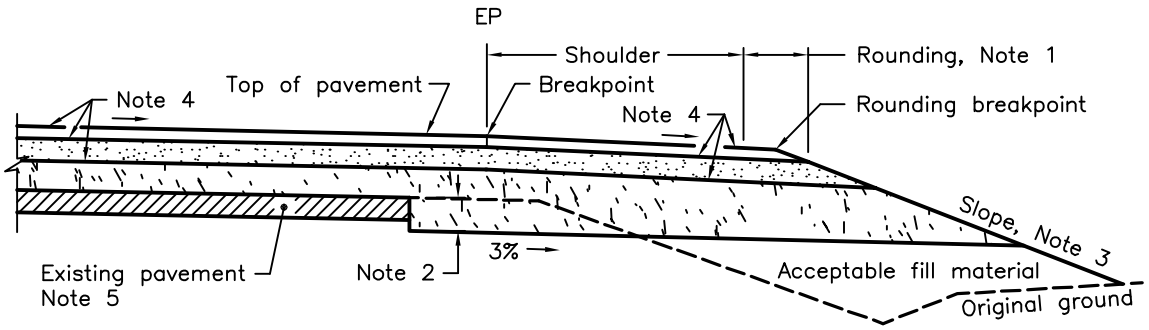
1 When the subgrade is below the existing outside edge of rounding, benching shall be carried out below the point where the subgrade intersects the existing slope.

2 Benches shall be excavated one level at a time and the fill placed and compacted before the next bench is excavated.

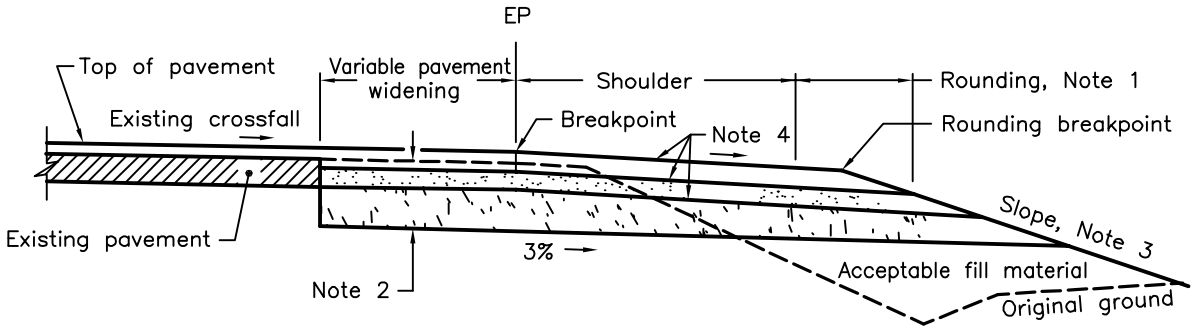
A Benching is not required on existing slopes flatter than 3H:1V.

B All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| BENCHING OF EARTH SLOPES | | | |
| | OPSD 208.010 | | |




# TYPE 1
# HALF GRADING SECTION
## HOT MIX WITH GRANULAR GRADE RAISE




# TYPE 2
# HALF GRADING SECTION
## RESURFACING AND GRANULAR WIDENING

LEGEND:

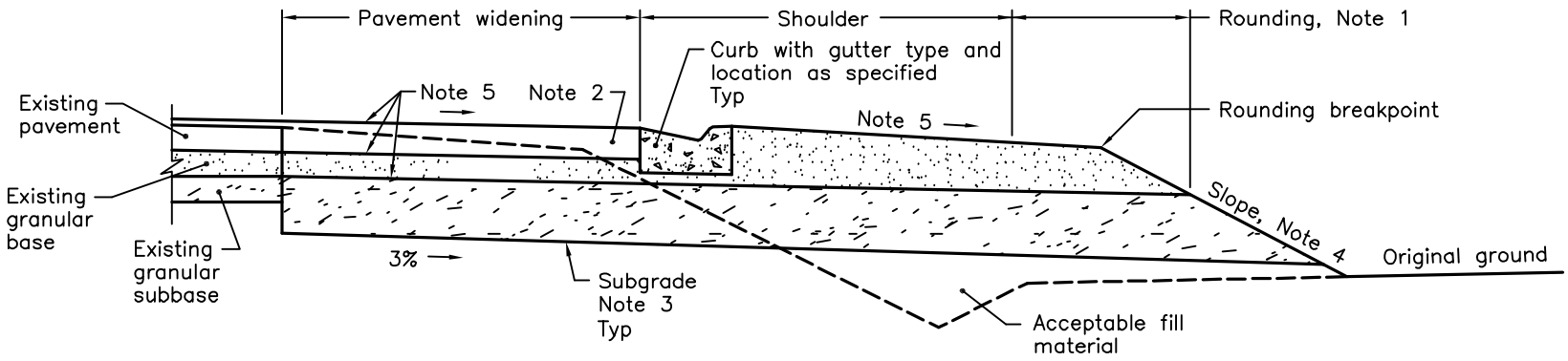
Granular base  Granular subbase

NOTES:

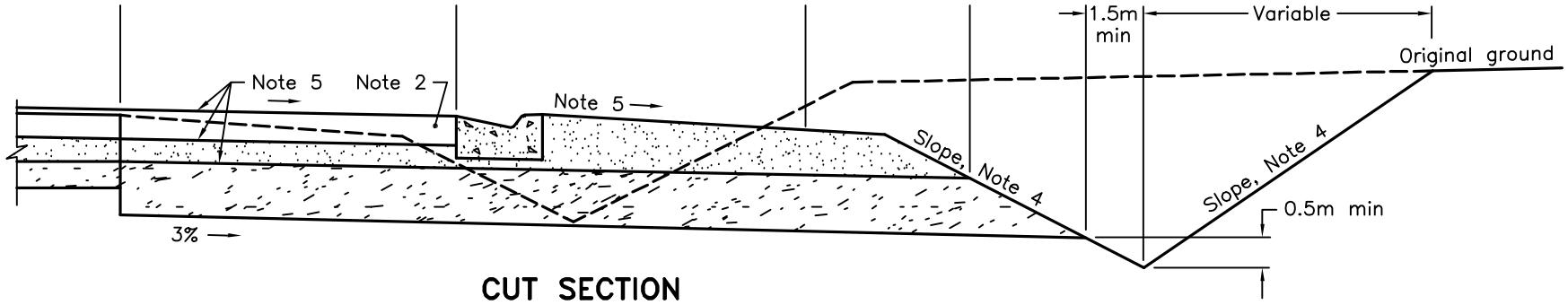
1 Rounding shall be 0.5m or greater when specified.
2 Depth of excavation shall be as specified.
3 Slope shall be as specified.
4 Crossfall shall be as specified.
5 Existing pavement under granular grade raise shall be removed, processed, or left in–place, as specified.

A This OPSD to be read in conjunction with OPSD 208.010.
B All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| RURAL PAVEMENT WIDENING | | | |
| | OPSD 209.010 | | |




**FILL SECTION**




**CUT SECTION**

NOTES:

1 Rounding shall be 0.5m or greater when specified.
2 Depths and locations of paving courses as specified.
3 Subgrade elevation for widening shall be lower than or match existing subgrade level to ensure drainage.
4 Slope shall be as specified.
5 Crossfall shall be as specified.

LEGEND:

Granular base  Granular subbase

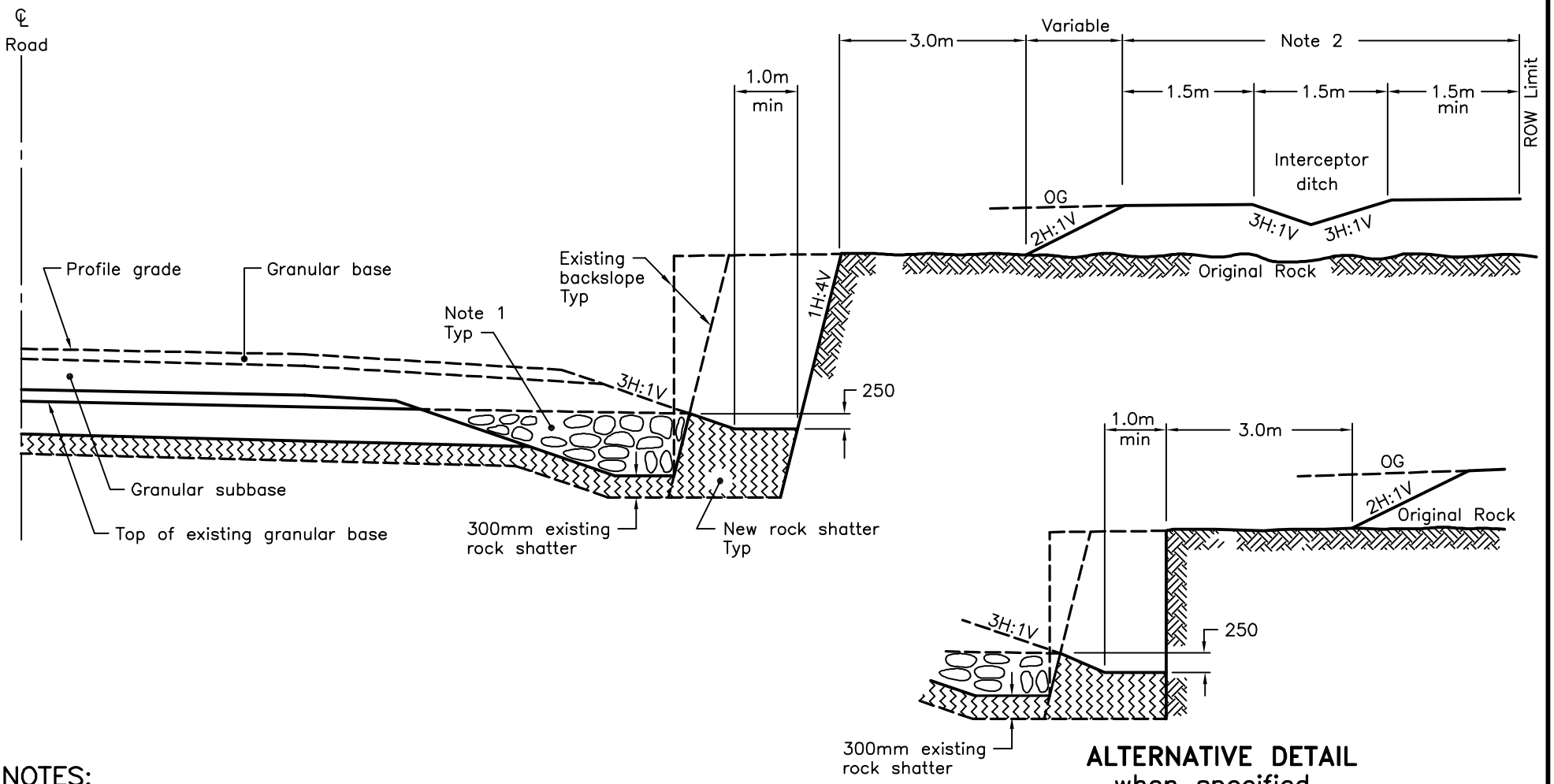
A For grading requirements beyond toe of embankment or CL of ditch, this OPSD to be read in conjunction with OPSD 200.010 or 200.020, as applicable.
B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# RURAL PAVEMENT WIDENING CURB WITH GUTTER

Nov 2009 | Rev 2

OPSD 209.011




**ALTERNATIVE DETAIL**
when specified

NOTES:

1 Approved rock or granular material.

2 Distance shall be 1.5m minimum when ditch is not required.

A Shale shall be treated according to earth grading standards.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

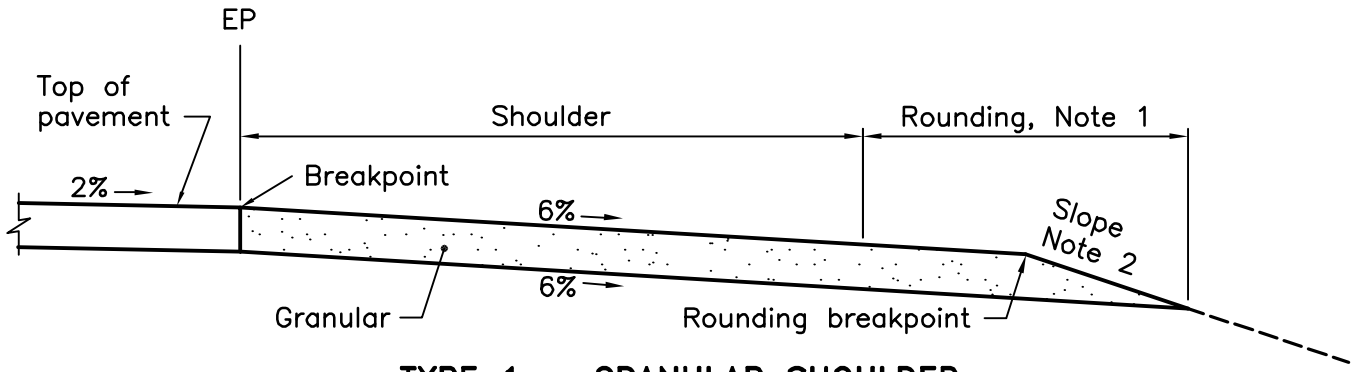
# WIDENING

EXISTING ROCK CUT WITH GRADE RAISE

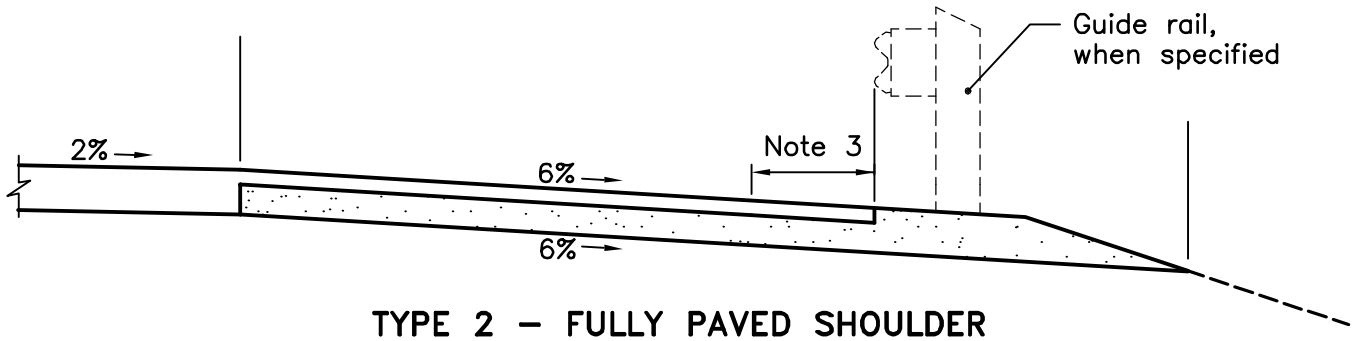
Apr 2010 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

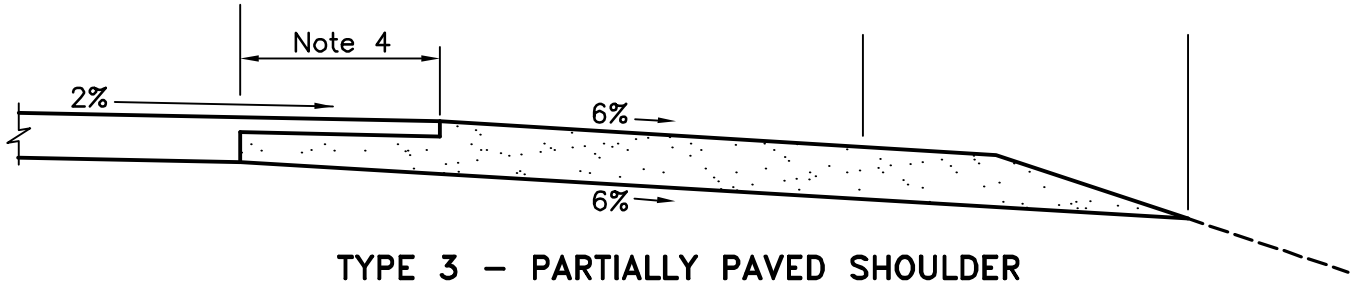
OPSD 209.020




**TYPE 1 – GRANULAR SHOULDER**




**TYPE 2 – FULLY PAVED SHOULDER**



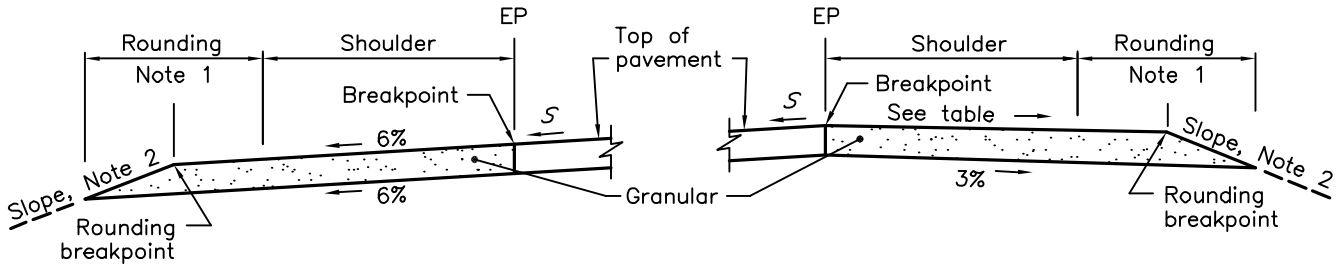

**TYPE 3 – PARTIALLY PAVED SHOULDER**

NOTES:

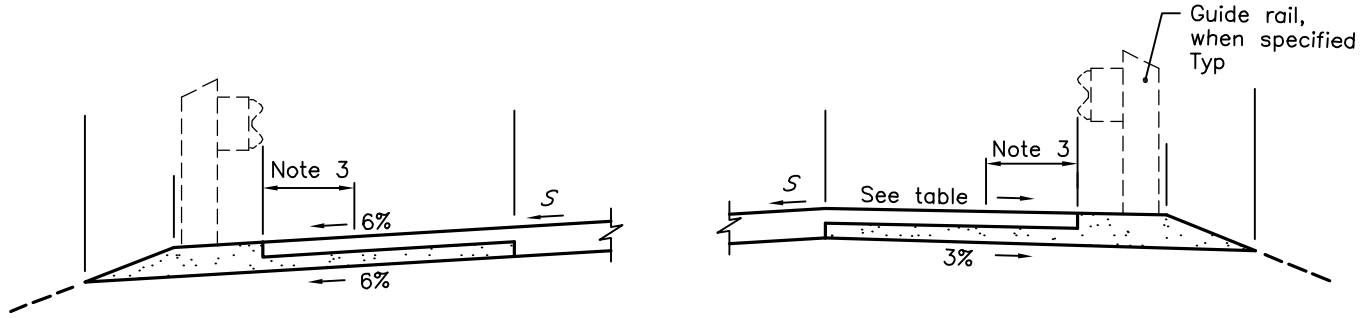
1 Rounding shall be 0.5m or greater when specified.
2 Slope shall be 3H:1V or flatter when specified.
3 Where cable and steel beam guide rail has been installed prior to shoulder paving and where shoulder paving is to be placed adjacent to the guide rail, the outside edge of shoulder paving shall end 300mm from the face of the guide rail.
4 Partially paved shoulder width shall be 0.5m minimum.

A All dimensions are in metres unless otherwise shown.

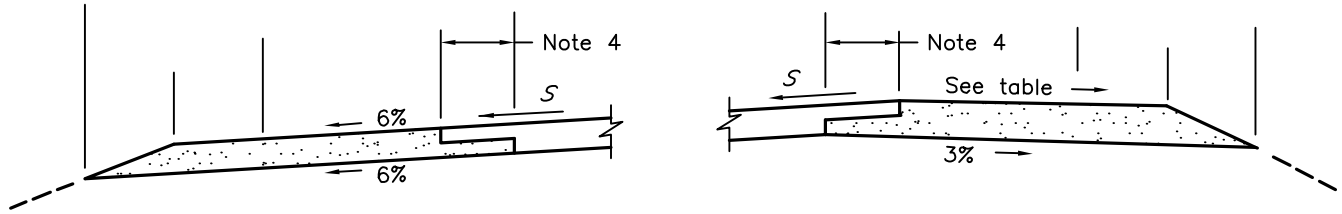
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| **TANGENT SHOULDERS**<br>RURAL | | | |
| | **OPSD 210.010** | | |




## TYPE 1 – GRANULAR SHOULDER




## TYPE 2 – FULLY PAVED SHOULDER




## TYPE 3 – PARTIALLY PAVED SHOULDER

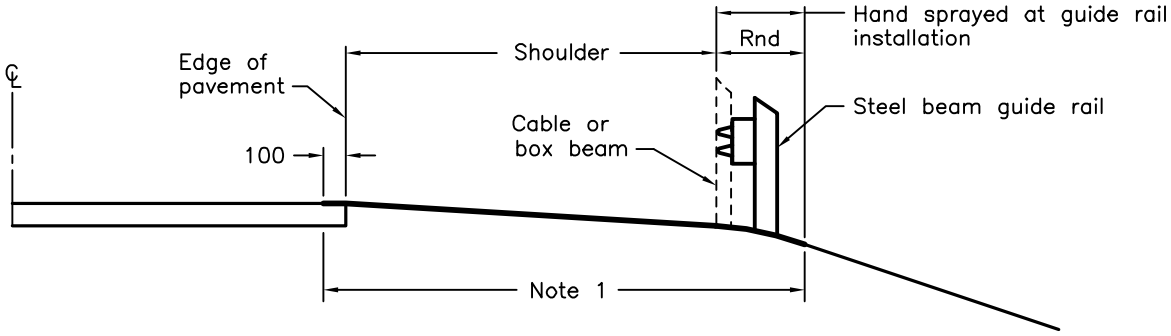
| CROSSFALL, % | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane and partially paved shoulder | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

NOTES:

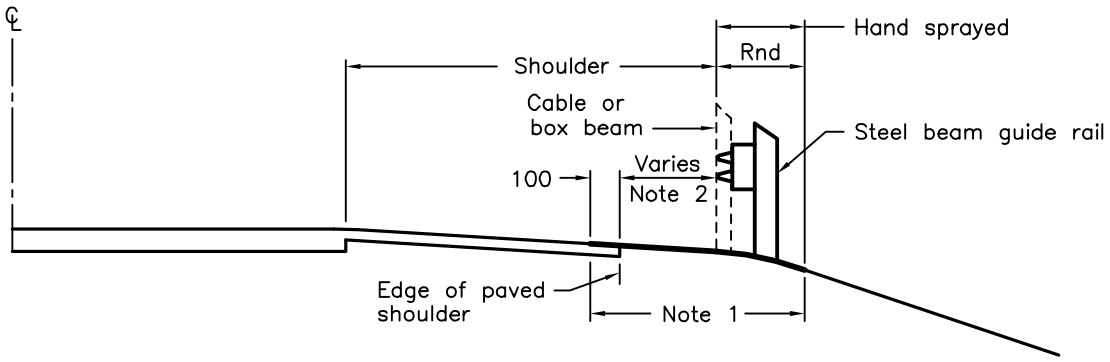
1 Rounding shall be 0.5m or greater when specified.
2 Slope shall be 3H:1V or flatter when specified.
3 Where cable and steel beam guide rail has been installed prior to shoulder paving and where shoulder paving is to be placed adjacent to the guide rail, the outside edge of shoulder paving shall end 300mm from the face of the guide rail.
4 Partially paved shoulder width shall be 0.5m minimum.

A All dimensions are in metres unless otherwise shown.

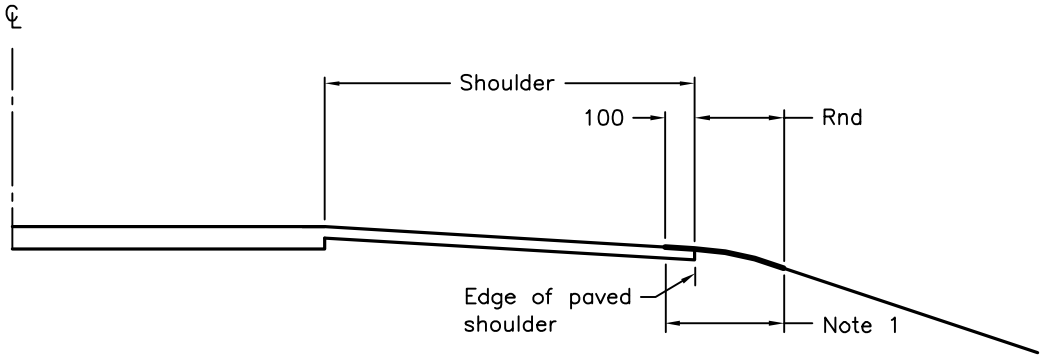
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| **SUPERELEVATED SHOULDERS** RURAL | | | |
| | **OPSD 210.020** | | |




GRANULAR SHOULDER WITH OR WITHOUT GUIDE RAIL




PAVED SHOULDER WITH GUIDE RAIL




PAVED SHOULDER WITHOUT GUIDE RAIL

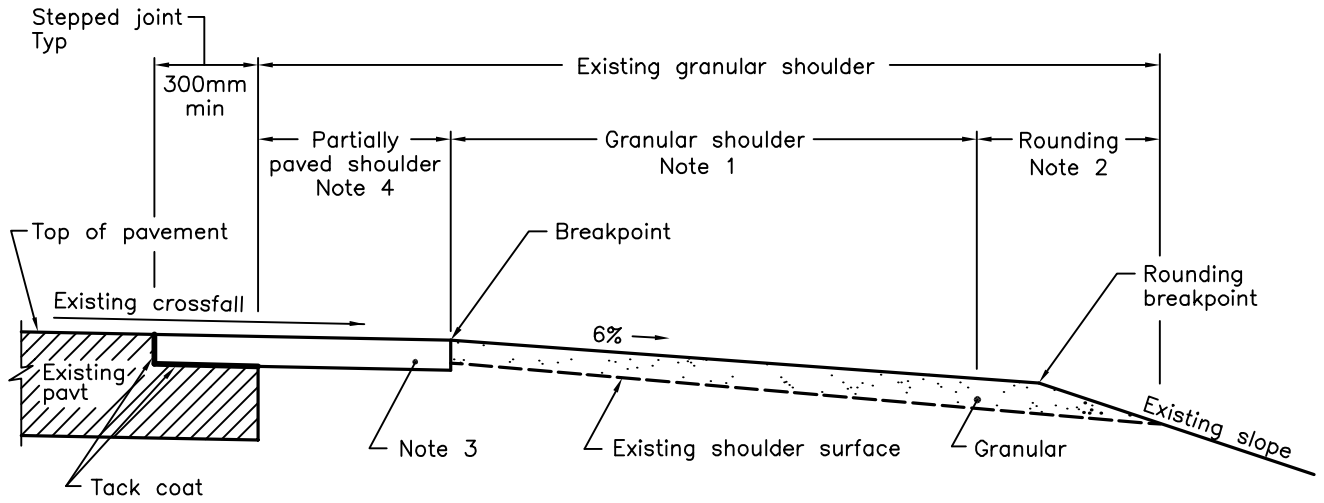
NOTES:

1 Extent of granular sealer.

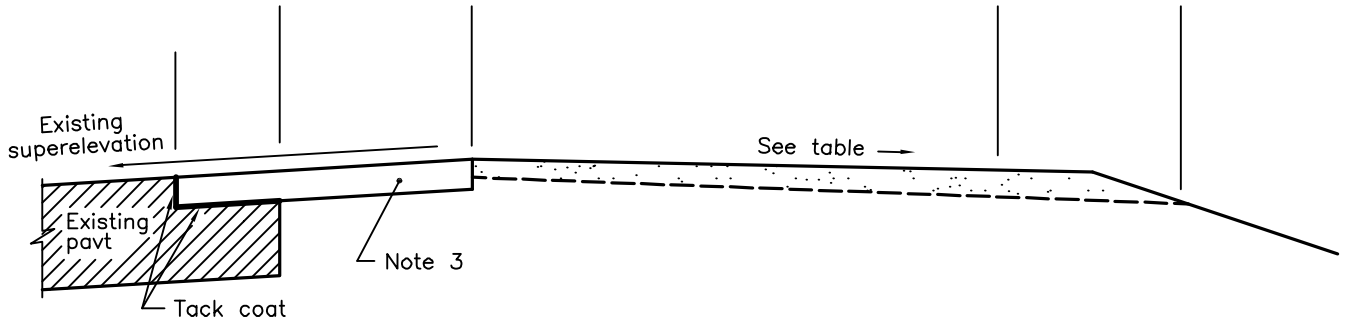
2 When the width of granular shoulder in front of the guide rail is 300mm or less, granular sealer may be applied by hand spraying for the full width of this application.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| GRANULAR SEALING | | | |
| | OPSD 210.070 | | |




**TANGENT SECTION**




**SUPERELEVATED SECTION**

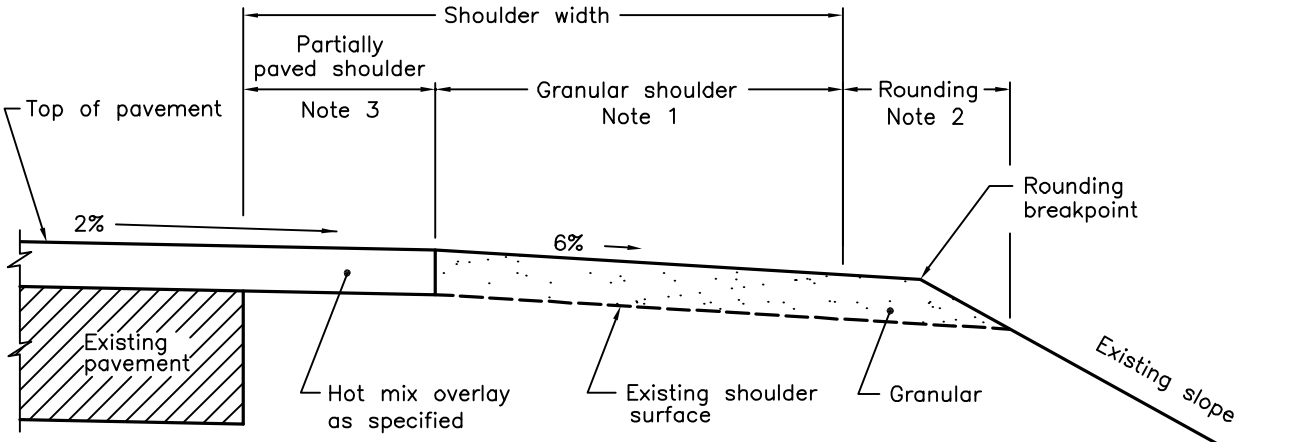
| CROSSFALL TABLE, % | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane and partially paved shoulder | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Granular shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

NOTES:

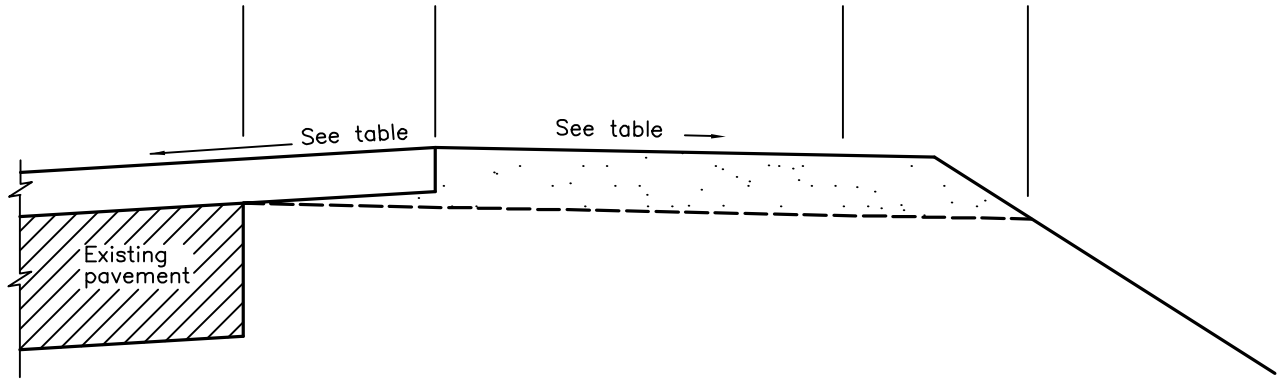
1 Minimum width of granular shoulder 1.0m.
2 Rounding shall be 0.5m or greater, when specified.
3 Thickness of hot mix paving courses as specified.
4 Partially paved shoulder shall be 0.5m minimum.

A All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| PARTIALLY PAVED SHOULDERS<br>EXISTING PAVEMENT MAINTAINED | | | |
| | OPSD 211.010 | | |




**TANGENT SECTION**




**SUPERELEVATED SECTION**

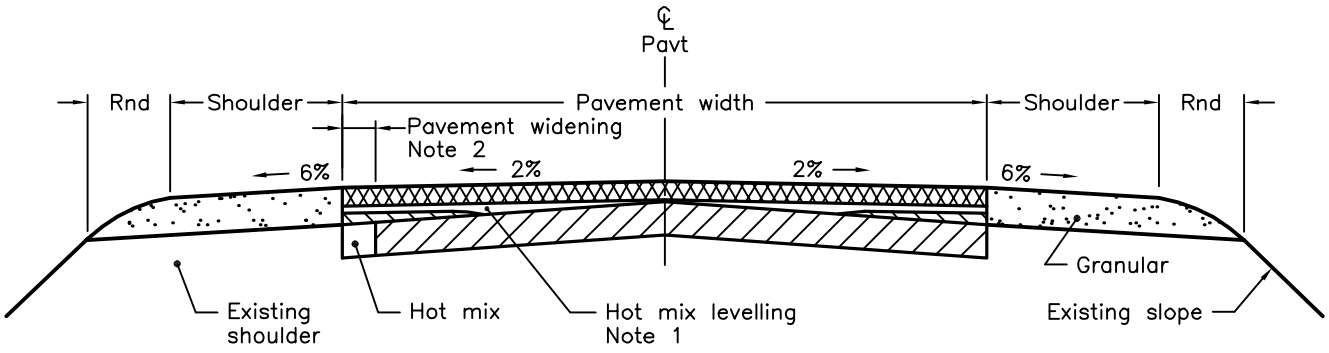
| CROSSFALL TABLE, % | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane and partially paved shoulder | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Granular shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

NOTES:

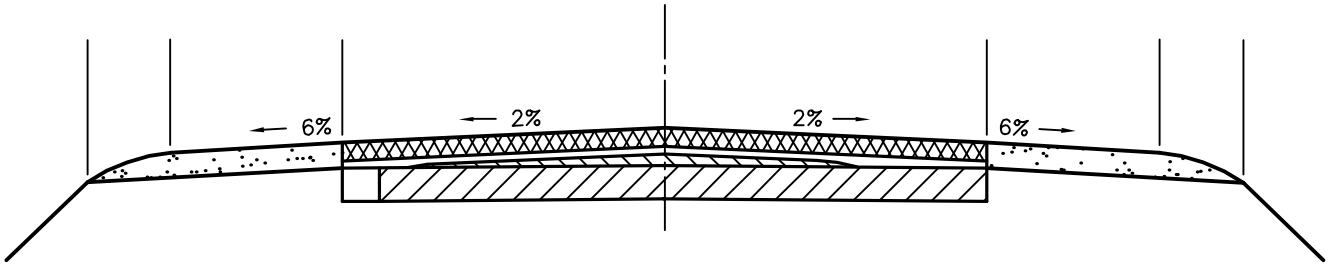
1 Minimum width of granular shoulder 1.0m.
2 Rounding shall be 0.5m or greater, when specified.
3 Partially paved shoulder shall be 0.5m minimum.

A All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| **PARTIALLY PAVED SHOULDERS EXISTING PAVEMENT RESURFACED** | | | |
| | **OPSD 211.020** | | |




**CASE 1**




**CASE 2**

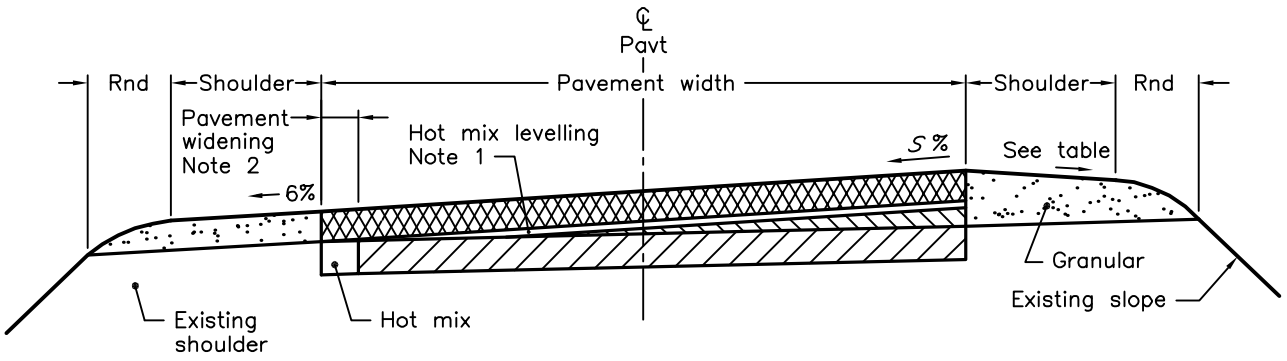
LEGEND:

- Existing pavement
- Hot mix padding, Note 2
- Hot mix surface, hot mix binder, Note 1

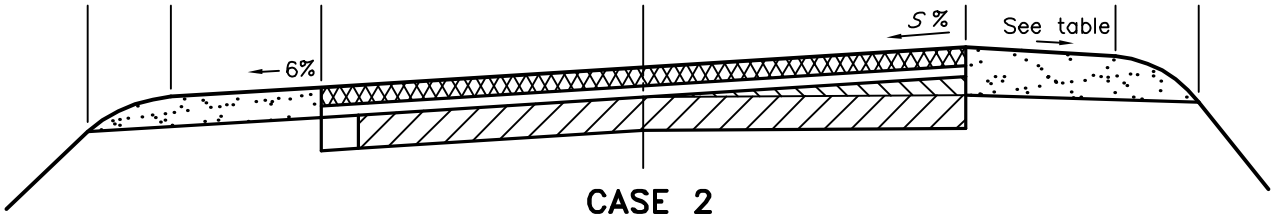
NOTES:

1 Depths and locations of paving or levelling courses or both shall be as specified.
2 Pavement widening or padding or both when specified.

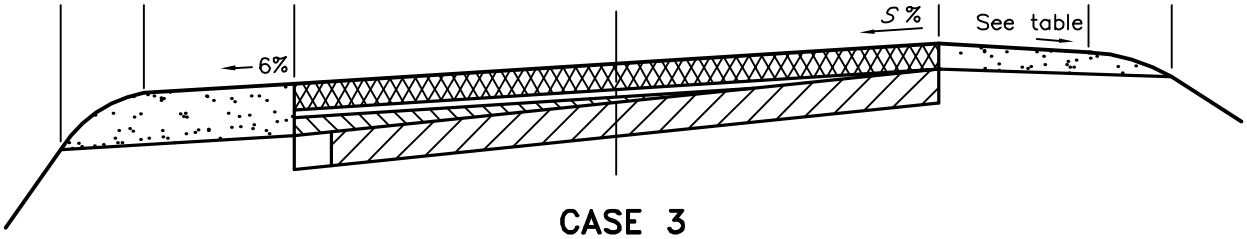
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| RESURFACING WITH CROSSFALL CORRECTION WITH HOT MIX ASPHALT TANGENT SECTION | | | |
| | OPSD 212.010 | | |



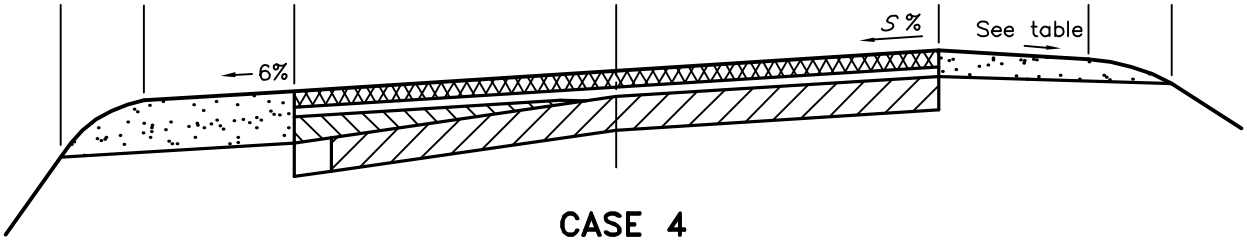

CASE 1




CASE 2




CASE 3




CASE 4

| CROSSFALL TABLE, % | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Granular shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

LEGEND:

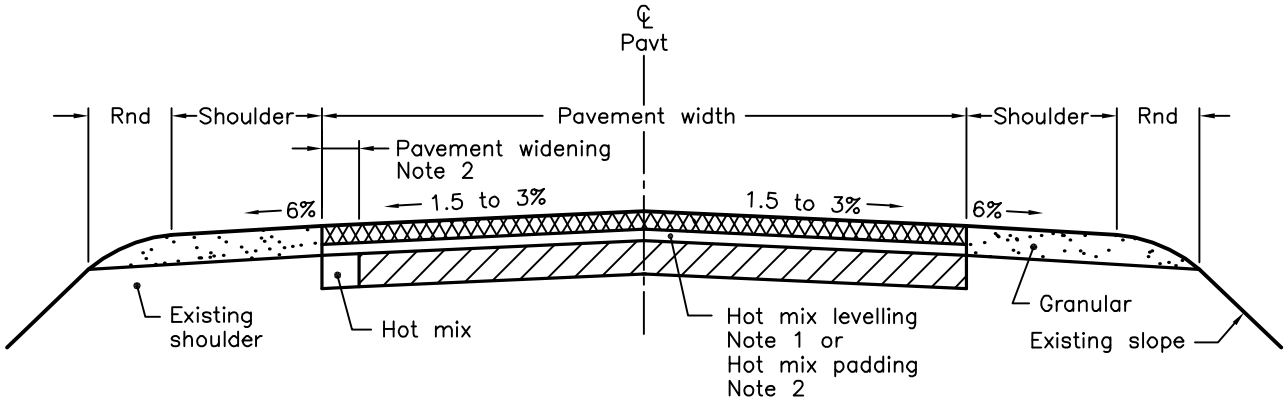
- Existing pavement
- Hot mix padding, Note 2
- Hot mix surface, hot mix binder, Note 1

NOTES:

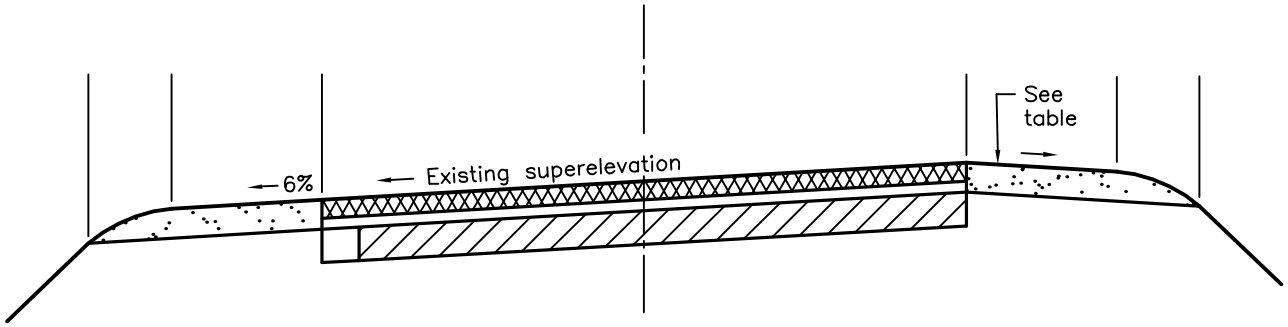
1 Depths and locations of paving or levelling courses or both shall be as specified.

2 Pavement widening or padding or both when specified.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| RESURFACING WITH CROSSFALL CORRECTION WITH HOT MIX ASPHALT SUPERELEVATED SECTION | | | |
| | OPSD 212.020 | | |




**TANGENT**




**SUPERELEVATED**

| CROSSFALL TABLE, % | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Granular shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

LEGEND:

Existing pavement

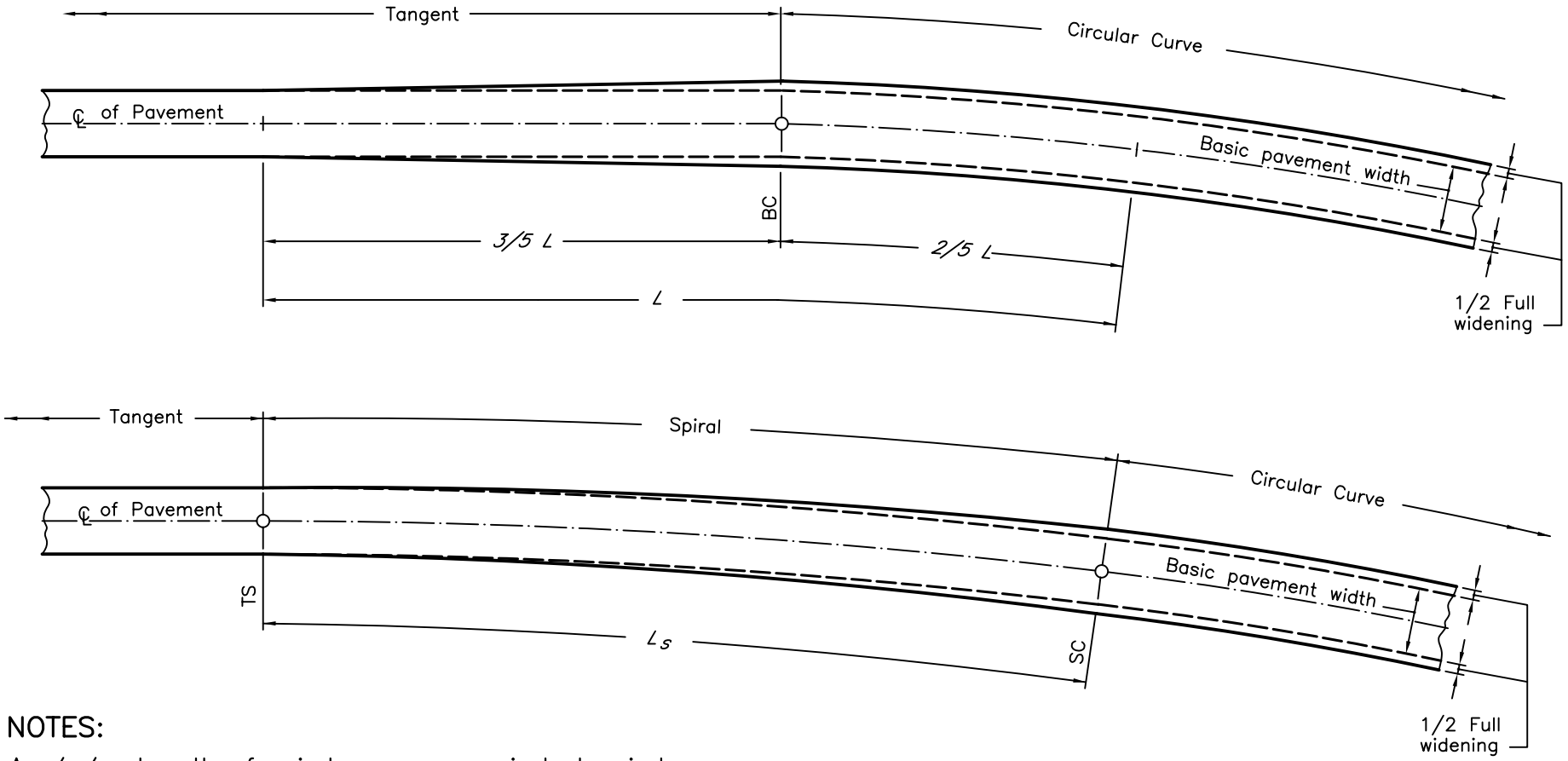
Hot mix surface, hot mix binder, Note 1

NOTES:

1 Depths and locations of paving or levelling courses or both shall be as specified.

2 Pavement widening or padding or both when specified.

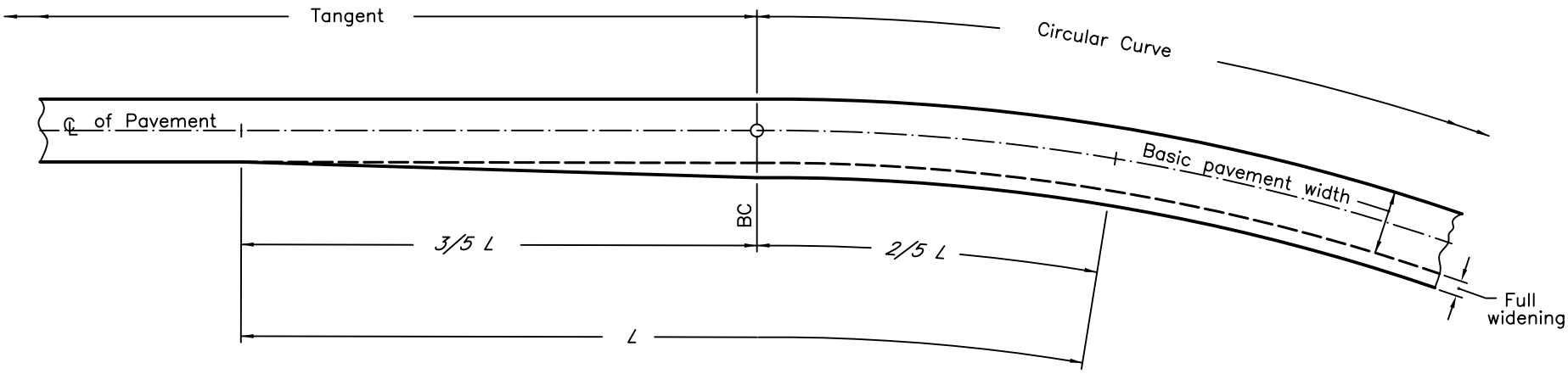
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| RESURFACING<br>EXISTING CROSSFALL MAINTAINED | | | |
| | OPSD 212.030 | | |

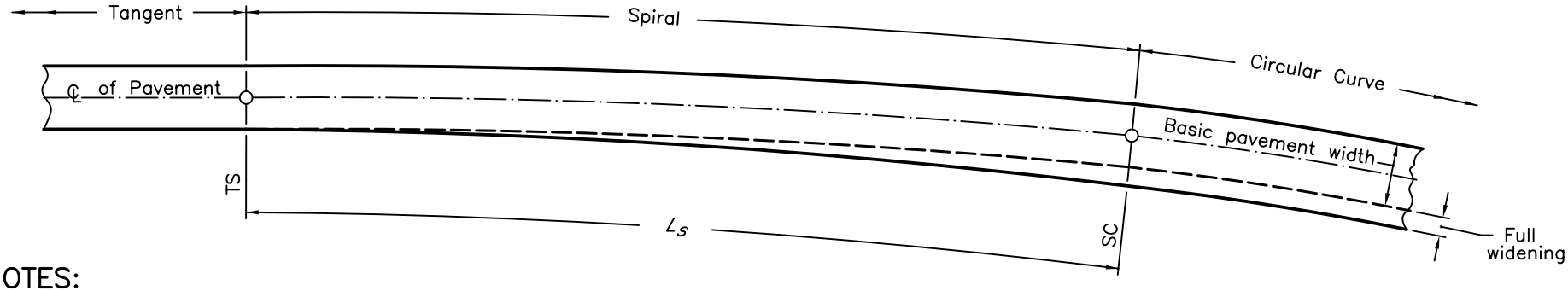



NOTES:

A $L = L_S$ – Length of spiral curve or equivalent spiral.
B Full widening to be attained over spiral curve or equivalent spiral.
C Widening to be divided evenly between the inside and outside of the curve.
D Widening at intermediate points to be proportioned to produce a smooth edge of pavement.
E All dimensions are in millimetres or metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Dec 1983 | Rev | 0 |
|---|---|---|---|
| **PAVEMENT WIDENING ON CURVES**<br>WIDENING ON BOTH SIDES OF CURVE<br>WITH OR WITHOUT SPIRALS | | | |
| | **OPSD – 213.01** | | |




NOTES:

A $L = L_S$ – Length of spiral curve or equivalent spiral.
B Full widening to be attained over spiral curve or equivalent spiral.
C Widening at intermediate points to be proportioned to produce a smooth edge of pavement.
D All dimensions are in millimetres or metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

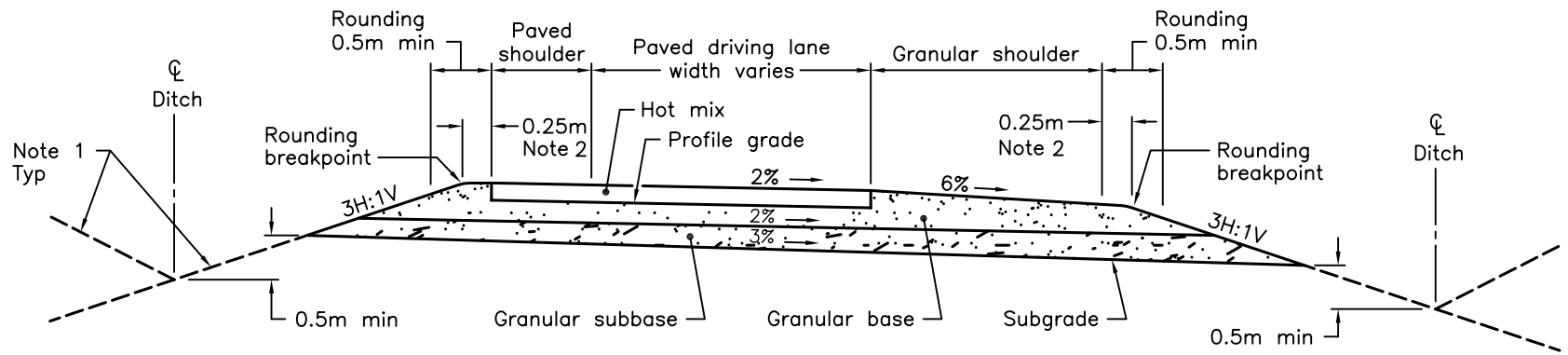
# PAVEMENT WIDENING ON CURVES

WIDENING ON INSIDE OF CURVES
WITH OR WITHOUT SPIRALS

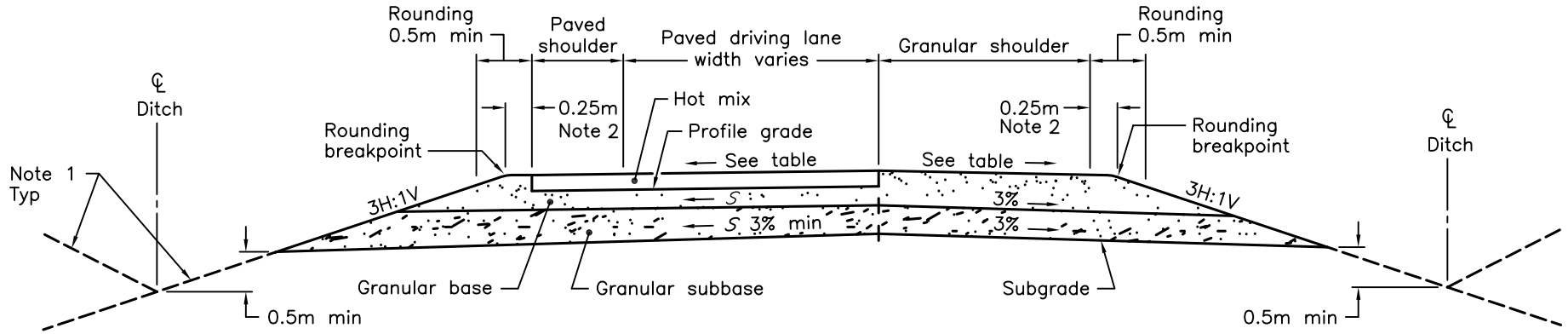
Dec 1983 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD – 213.02




## TANGENT SECTION




## SUPERELEVATED SECTION

LEGEND:

$S$ – rate of superelevation in percent

NOTES:

1 Fill and cut slopes shall be 3H:1V.

2 Where steel beam guide rail is specified, the minimum rounding shall be 1.0m, with 0.5m specified from edge of shoulder to rounding breakpoint.

A All dimensions are in metres unless otherwise shown.

TABLE
FOR SUPERELEVATED SECTION

| | CROSS FALL % | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Granular shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

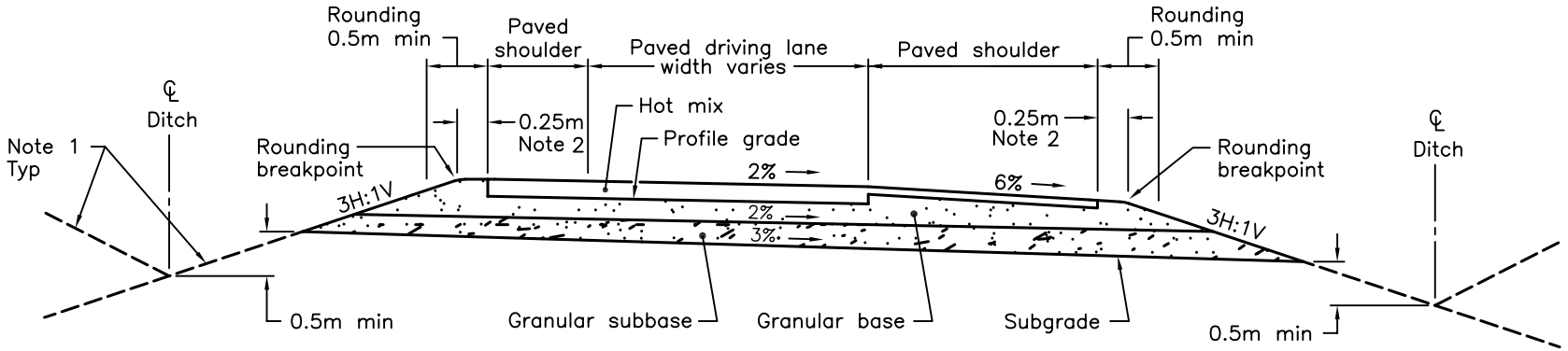
ONTARIO PROVINCIAL STANDARD DRAWING

# SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND SHOULDER

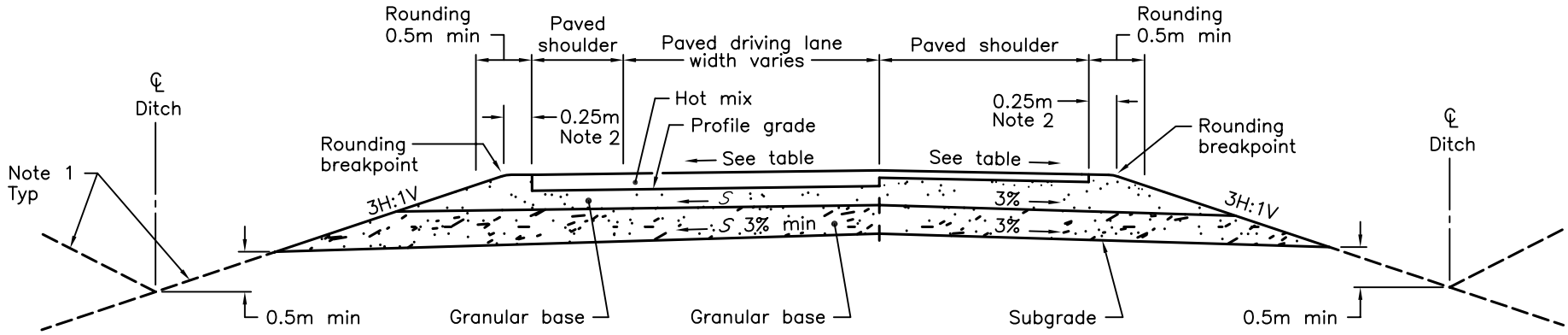
Nov 2007 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 214.010




## TANGENT SECTION




## SUPERELEVATED SECTION

LEGEND:

$S$ – rate of superelevation in percent

NOTES:

1 Fill and cut slopes shall be 3H:1V.

2 Where steel beam guide rail is specified, the minimum rounding shall be 1.0m, with 0.5m specified from edge of paved shoulder to rounding breakpoint.

A All dimensions are in metres unless otherwise shown.

TABLE
FOR SUPERELEVATED SECTION

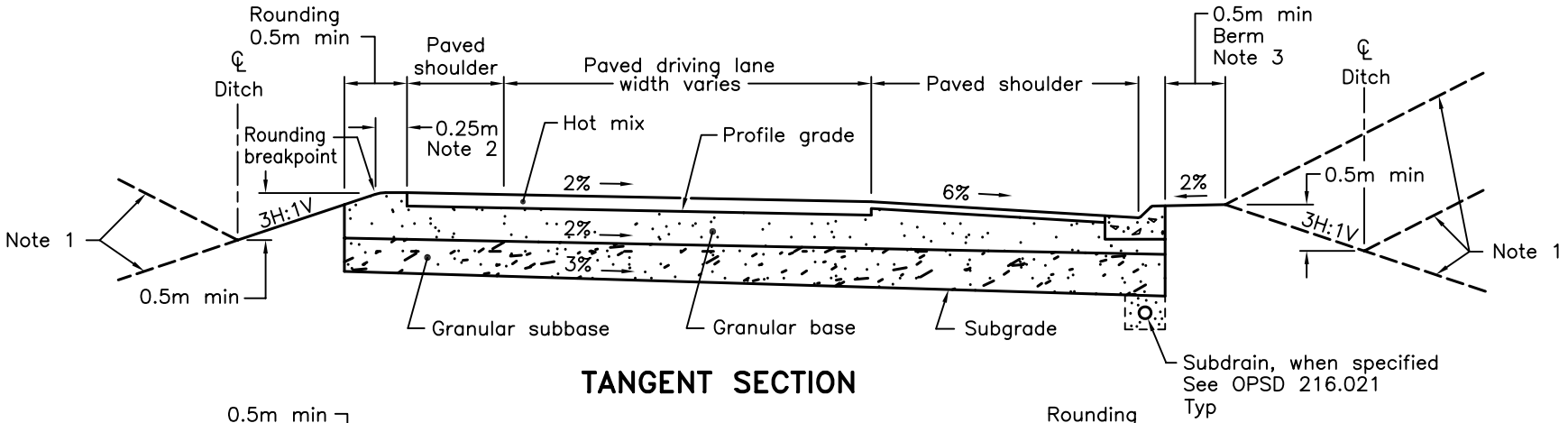
| | CROSS FALL % | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Paved shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

ONTARIO PROVINCIAL STANDARD DRAWING

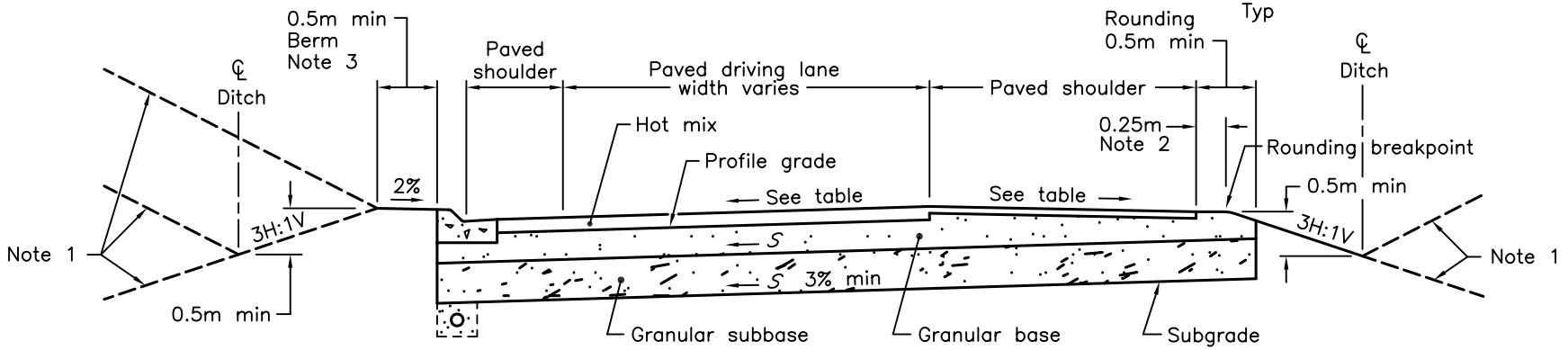
# SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND ASPHALT SHOULDER

Nov 2007 | Rev 1

OPSD 214.020




## TANGENT SECTION




## SUPERELEVATED SECTION

LEGEND:

$S$ – rate of superelevation in percent

NOTES:

1 Fill and cut slopes shall be 3H:1V.

2 Where steel beam guide rail is specified, the minimum rounding shall be 1.0m, with 0.5m specified from edge of paved shoulder to rounding breakpoint.

3 Where steel beam guide rail is specified, width of berm shall be 1.0m with the face of the guide rail installed 100mm beyond the gutter line.

A All dimensions are in metres unless otherwise shown.

TABLE
FOR SUPERELEVATED SECTION

| | CROSS FALL % | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Paved shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

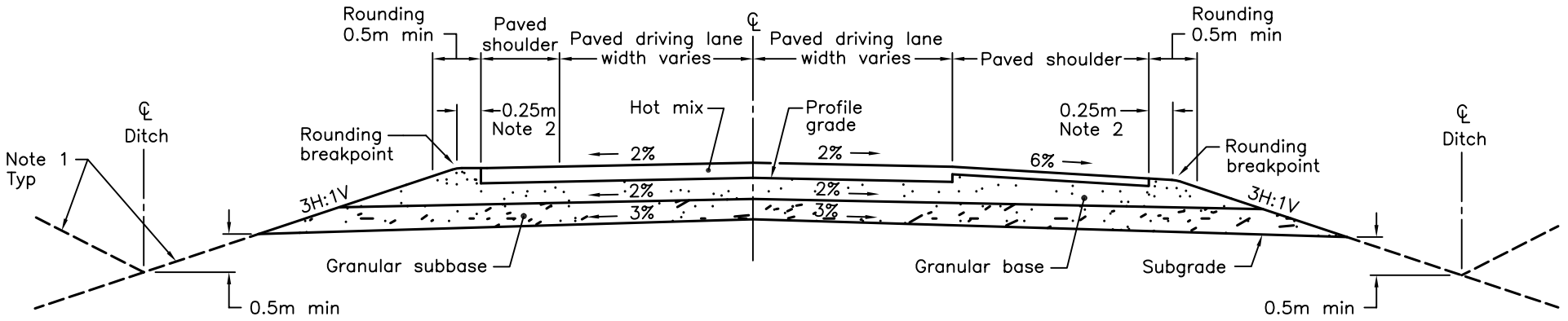
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2007 | Rev 2

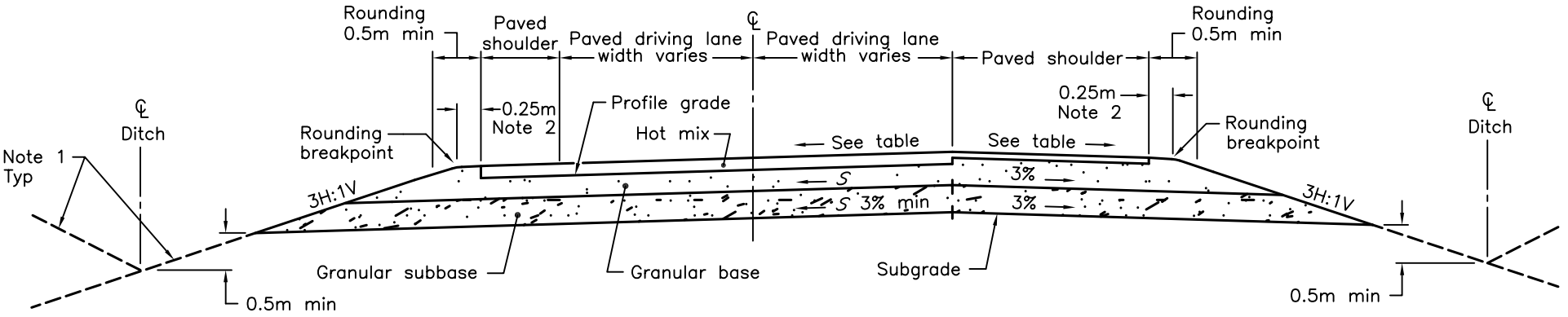
# SINGLE LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE, ASPHALT SHOULDER, AND CURB WITH GUTTER

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 214.030




## TANGENT SECTION




## SUPERELEVATED SECTION

TABLE
FOR SUPERELEVATED SECTION

| | CROSS FALL % | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Paved shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

LEGEND:

$S$ – rate of superelevation in percent

NOTES:

1 Fill and cut slopes shall be 3H:1V.

2 Where steel beam guide rail is specified, the minimum rounding shall be 1.0m, with 0.5m specified from edge of shoulder to rounding breakpoint.

A All dimensions are in metres unless otherwise shown.

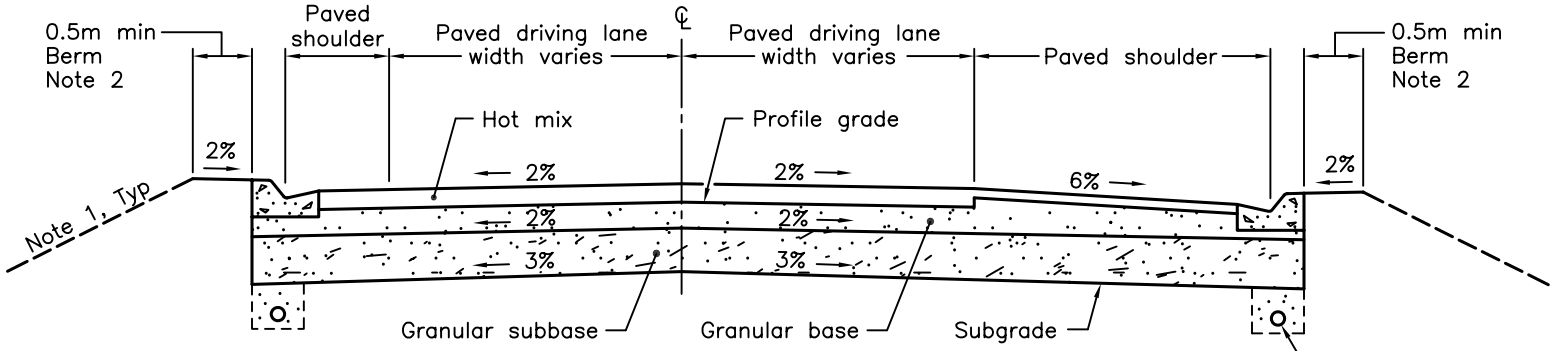
ONTARIO PROVINCIAL STANDARD DRAWING

# TWO LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE AND ASPHALT SHOULDER

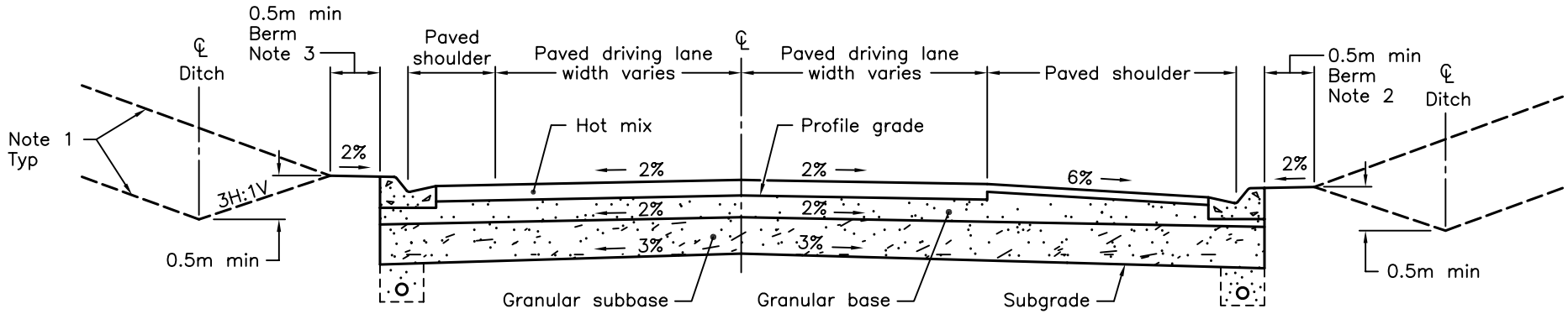
Nov 2007 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 215.010




**FILL**




**CUT**

NOTES:

1 Fill and cut slopes shall be 3H:1V.

2 Where steel beam guide rail is specified, width of berm shall be 1.0m, with the face of guide rail installed 100mm beyond the gutter line.

A All dimensions are in metres unless otherwise shown.

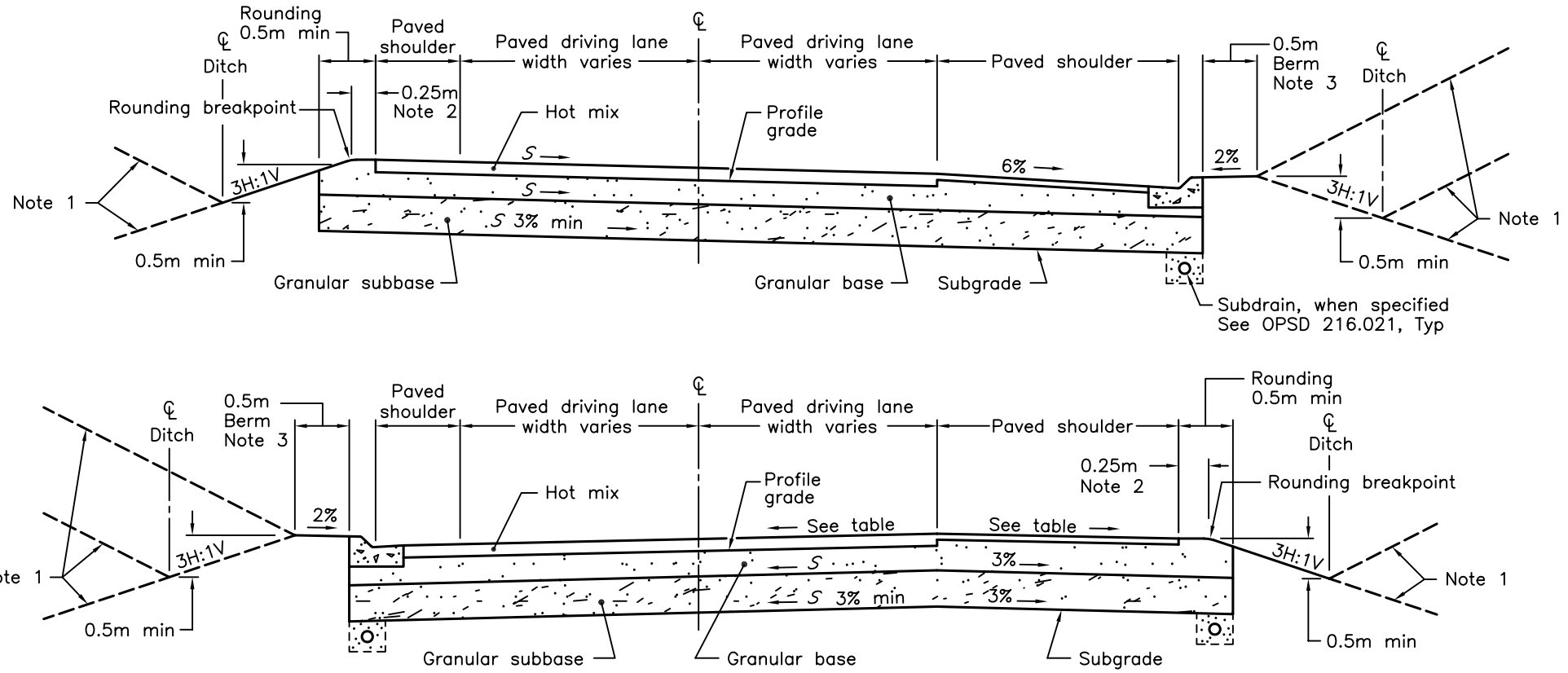
ONTARIO PROVINCIAL STANDARD DRAWING

# TWO LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE, ASPHALT SHOULDER, AND CURB WITH GUTTER FOR TANGENT SECTION

Nov 2007 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 215.020




## LEGEND:

$S$ – rate of superelevation in percent

## NOTES:

1 Fill and cut slopes shall be 3H:1V.

2 Where steel beam guide rail is specified, the minimum rounding shall be 1.0m, with 0.5m specified from edge of paved shoulder to rounding breakpoint.

3 Where steel beam guide rail is specified, width of berm shall be 1.0m, with the face of guide rail installed 100mm beyond the gutter line.

A All dimensions are in metres unless otherwise shown.

TABLE
FOR SUPERELEVATED SECTION

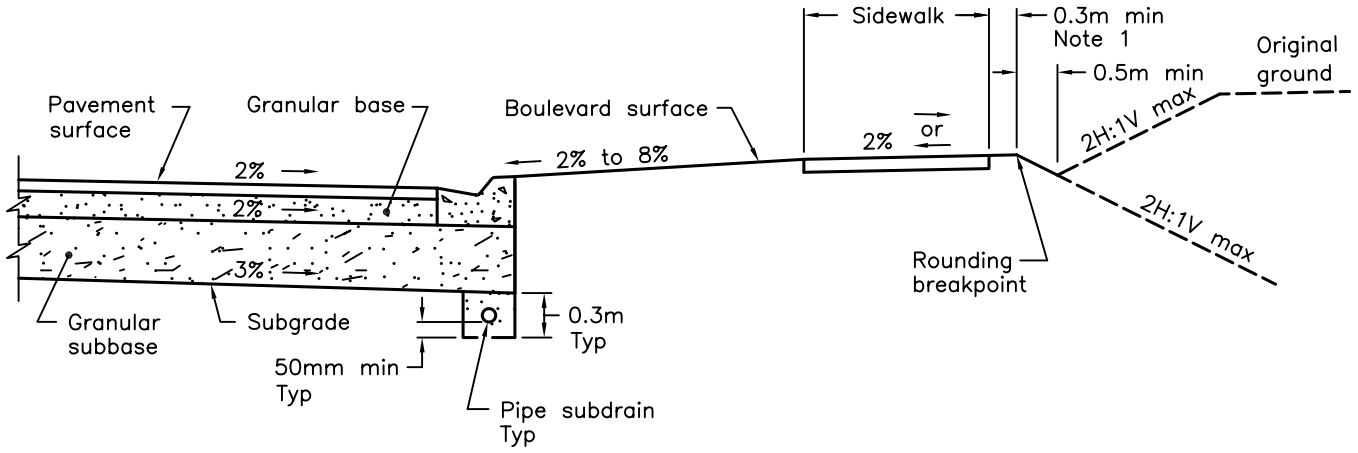
| | CROSS FALL % | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paved driving lane | +6 | +5 | +4 | +3 | +2 | +1 | 0 | −1 | −2 | −3 | −4 | −5 | −6 |
| Paved shoulder | −2 | −2 | −2 | −3 | −3 | −3 | −4 | −5 | −6 | −6 | −6 | −6 | −6 |

ONTARIO PROVINCIAL STANDARD DRAWING

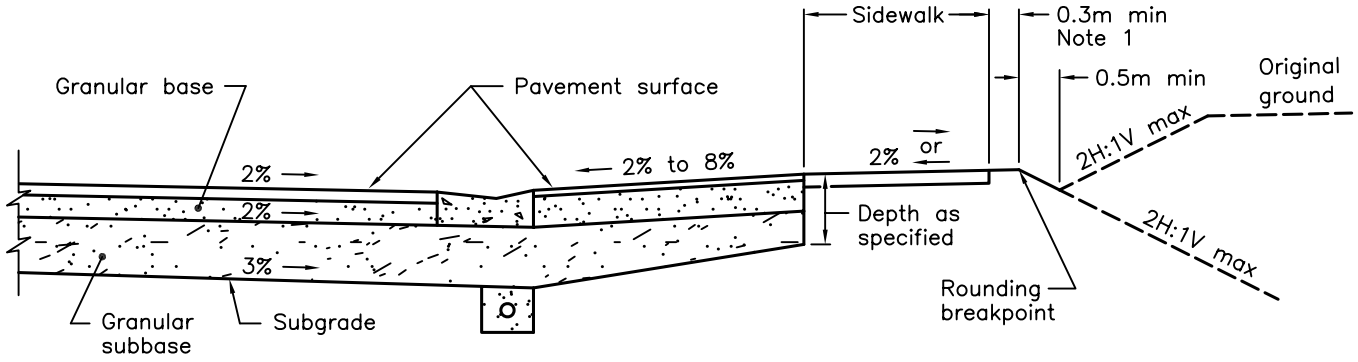
# TWO LANE RAMP GRADING FOR ASPHALT PAVEMENT WITH GRANULAR BASE, ASPHALT SHOULDER, AND CURB WITH GUTTER FOR SUPERELEVATED SECTION

Nov 2007 | Rev 2

OPSD 215.030




## CUT AND FILL SECTION WITH BARRIER CURB



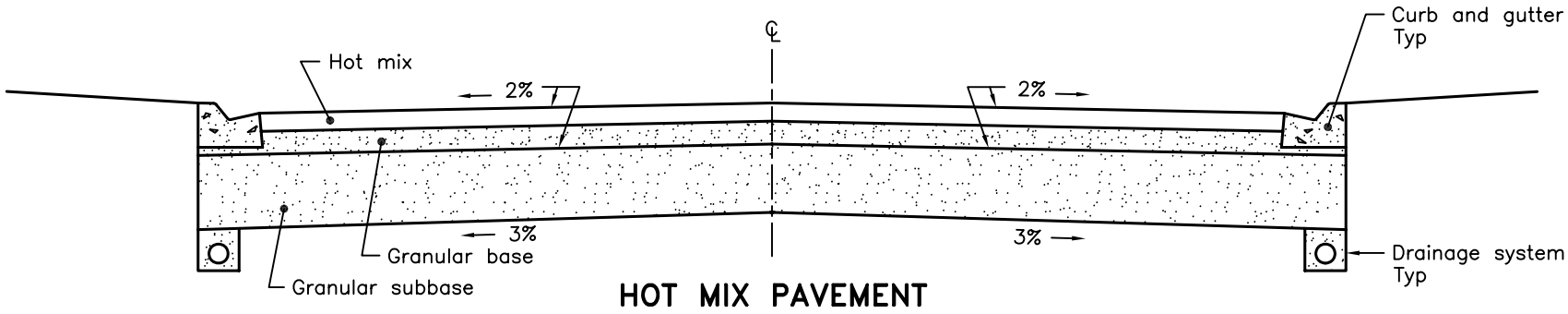

## CUT AND FILL SECTION WITH MOUNTABLE CURB

NOTES:

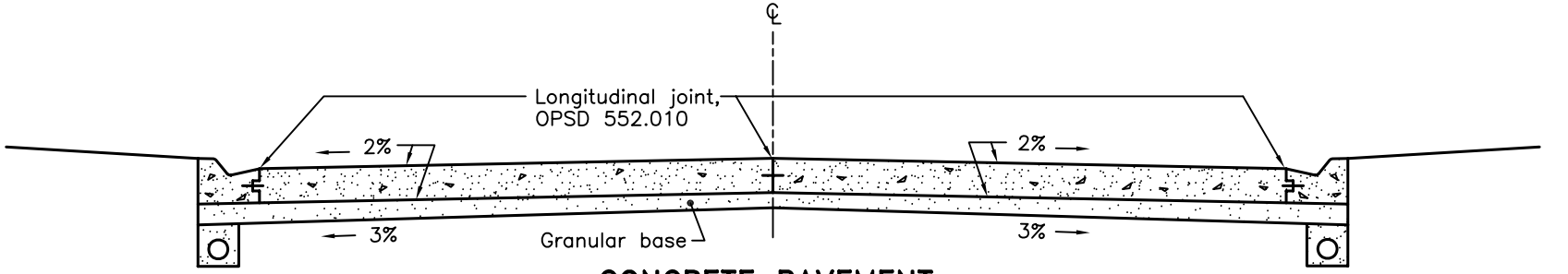
1 Where steel beam guide rail is indicated, the minimum rounding shall be 1.0m, with 0.5m required from edge of sidewalk to rounding breakpoint.

A All dimensions are in millimetres unless otherwise shown.

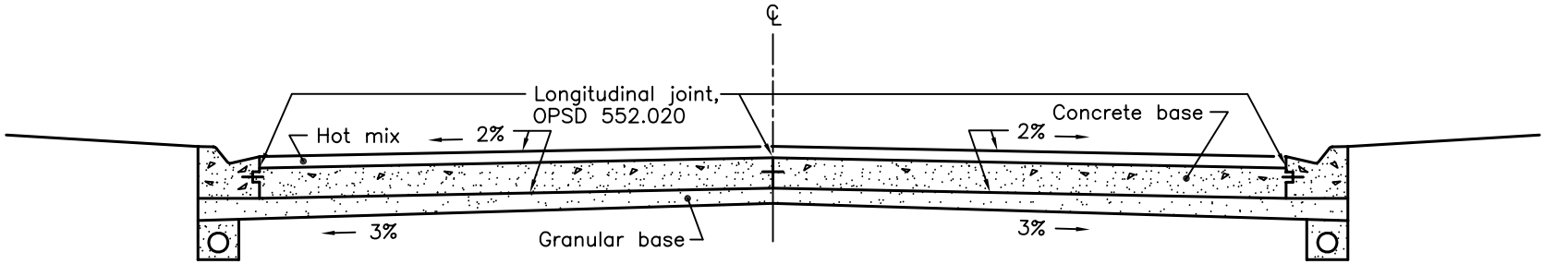
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **BOULEVARD TREATMENTS**<br>URBAN SECTION | | | |
| | **OPSD 216.010** | | |




HOT MIX PAVEMENT




CONCRETE PAVEMENT




COMPOSITE PAVEMENT

NOTES:

A Drainage system connection at every catch basin.

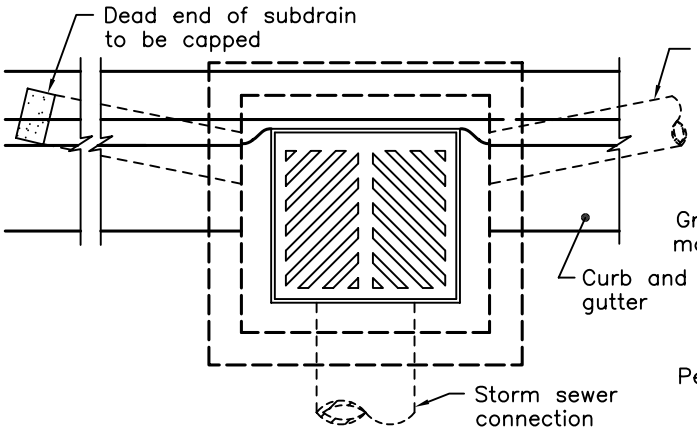
B Tie bars at all longitudinal joints.

ONTARIO PROVINCIAL STANDARD DRAWING

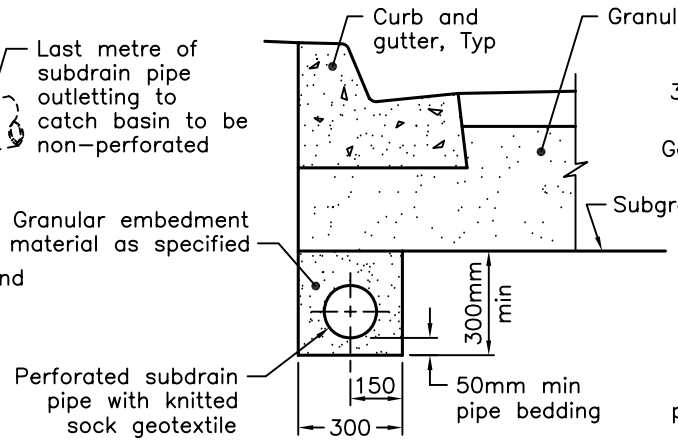
# HOT MIX, CONCRETE, AND COMPOSITE PAVEMENT ON GRANULAR BASE URBAN SECTION

Nov 2008 | Rev 1

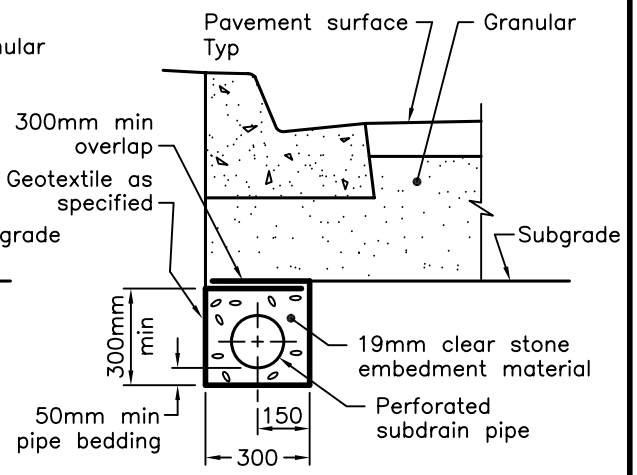
OPSD 216.020



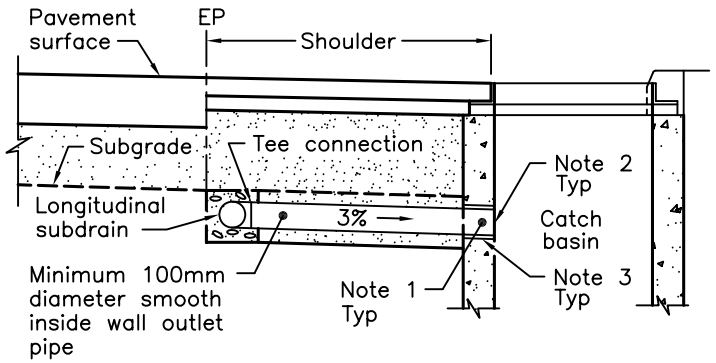

## LONGITUDINAL SUBDRAIN CONNECTION TO CATCH BASIN




## UNWRAPPED TRENCH




## WRAPPED TRENCH




## LATERAL SUBDRAIN OUTLET PIPE CONNECTION TO CATCH BASIN

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.

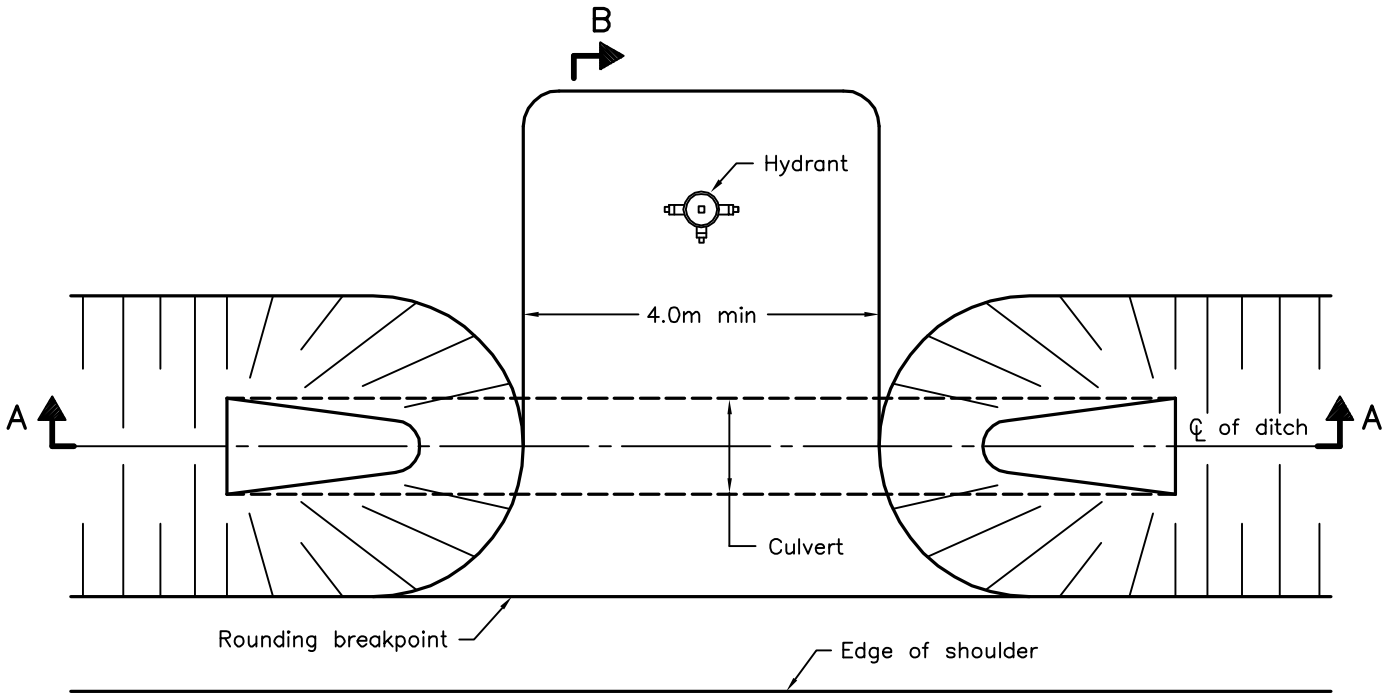
A Use compatible manufactured fittings for all connectors, couplings, and caps.

B Trench dimensions shown to accommodate 100 or 150mm diameter subdrain pipe.

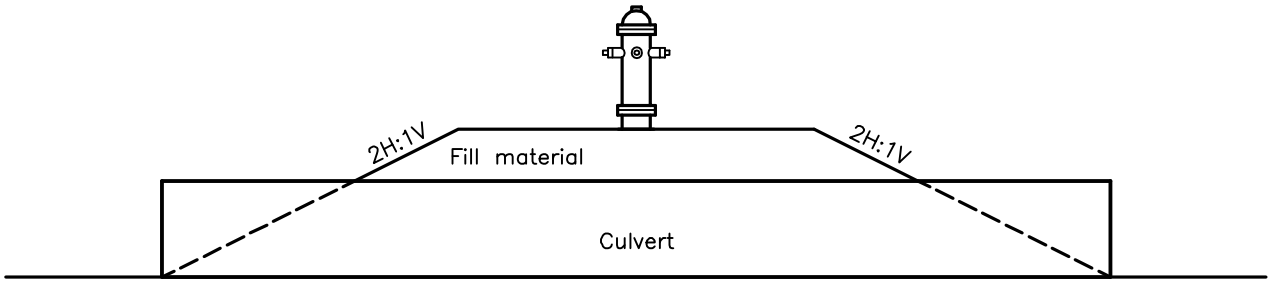
C Longitudinal subdrain pipe shall be installed parallel to the grade of the gutter.

D All dimensions are in millimetres unless otherwise shown.

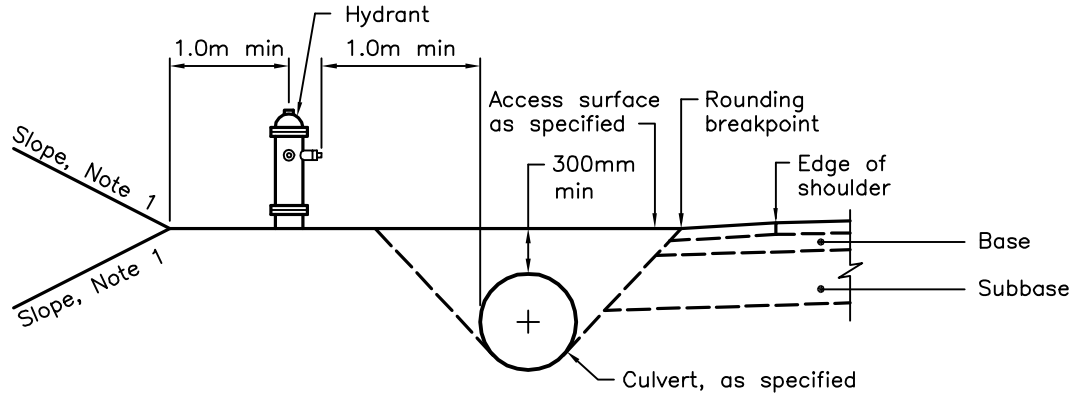
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 2 |
|---|---|---|---|
| **SUBDRAIN PIPE CONNECTION AND OUTLET** URBAN | | | |
| | | | **OPSD 216.021** |




PLAN




SECTION A–A



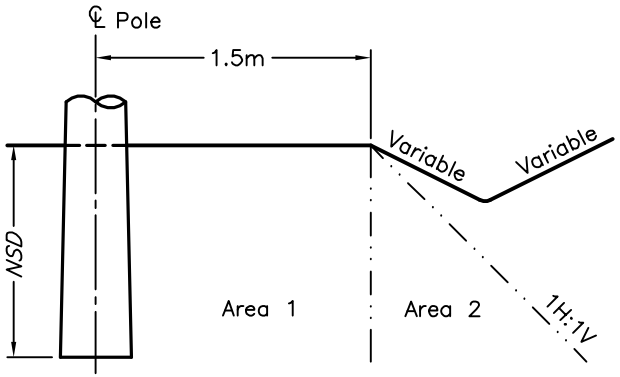

SECTION B–B

NOTE:

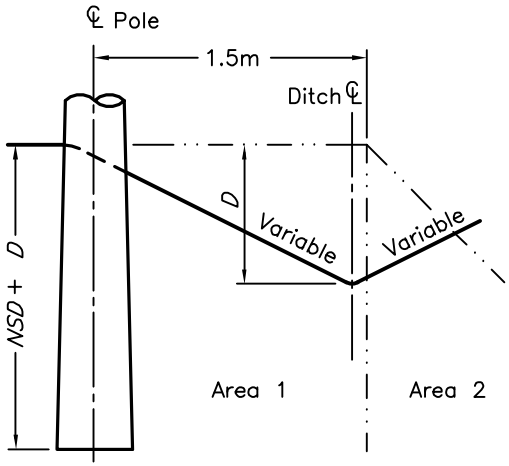
1 Slope shall be 2H:1V or flatter.

A All dimensions are in millimetres unless otherwise shown.

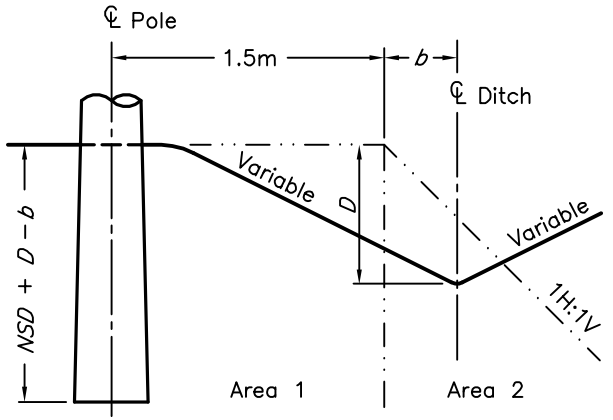
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 2 |
|---|---|---|---|
| ACCESS TO HYDRANT ACROSS DITCH | | | |
| | OPSD 217.050 | | |



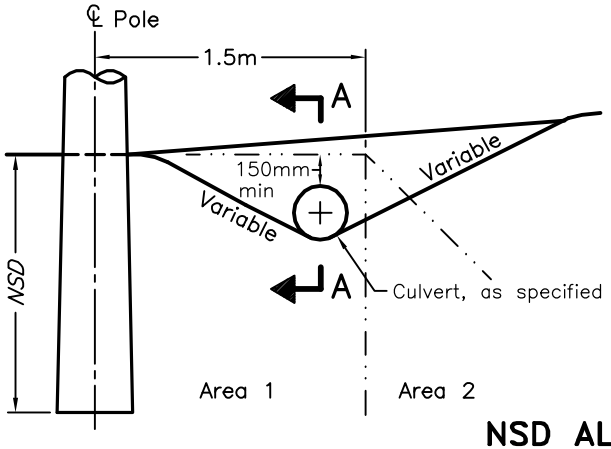

DITCH BEYOND AREAS 1 AND 2

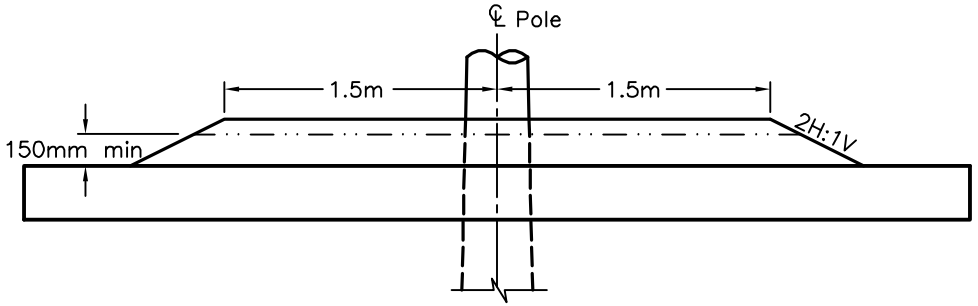



DITCH BOTTOM WITHIN AREA 1




DITCH BOTTOM WITHIN AREA 2




SECTION A–A

NSD ALTERNATIVE USING CULVERT
NOTE 1

NOTES:

1 When pipe cover is less than Dia/3, NSD Alternative Using Culvert shall not be used.

A All dimensions are in millimetres unless otherwise shown.

LEGEND:

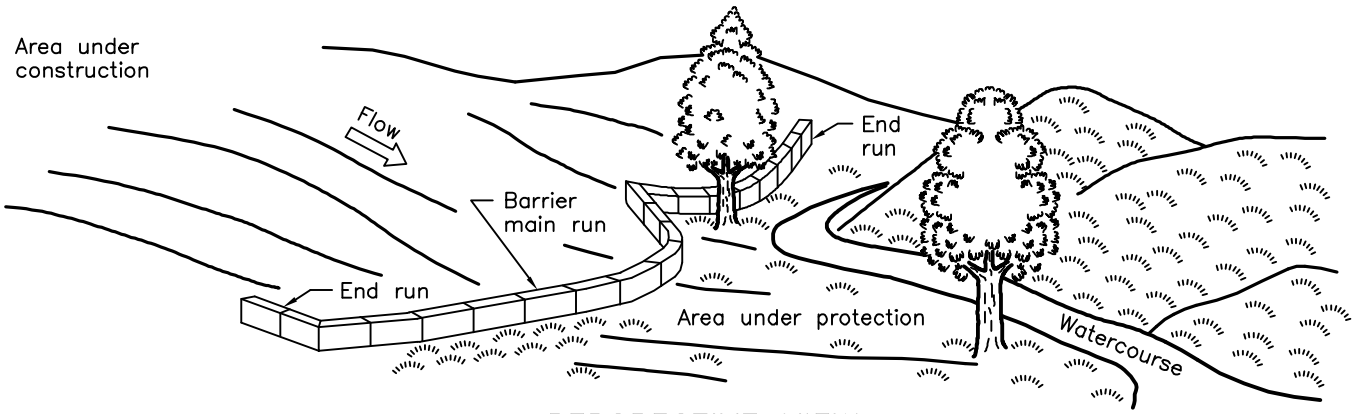
— · — · — – Boundary of theoretical area

*NSD* – Normal setting depth

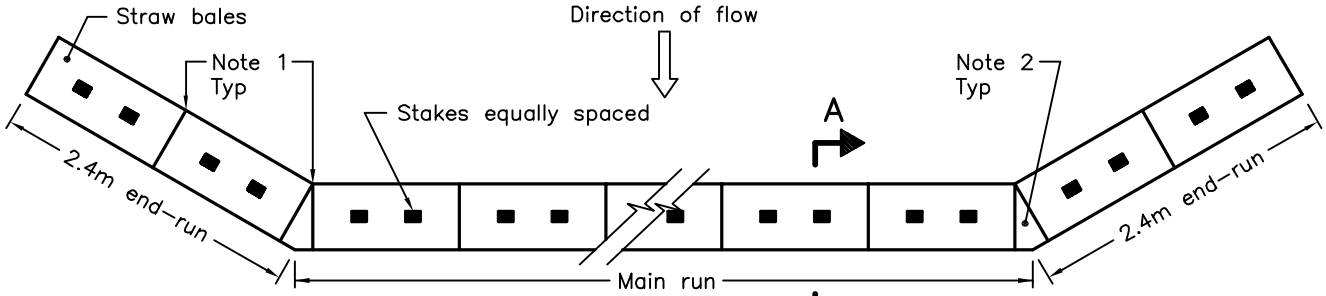
*D* – The difference in elevation between the ditch bottom and the ground line at the pole

*b* – The horizontal distance between pole and ditch centre line minus 1.5m

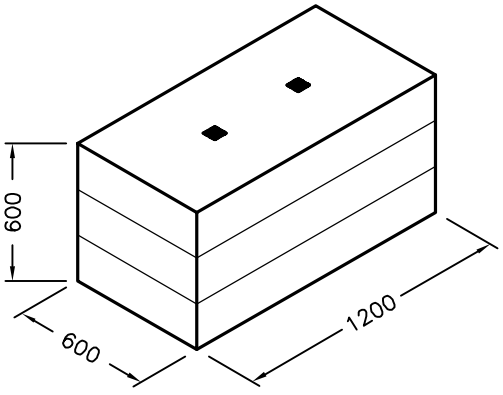
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 2 |
|---|---|---|---|
| UTILITY POLE SETTING DEPTH AT DITCH LOCATIONS | | | |
| | OPSD 217.060 | | |



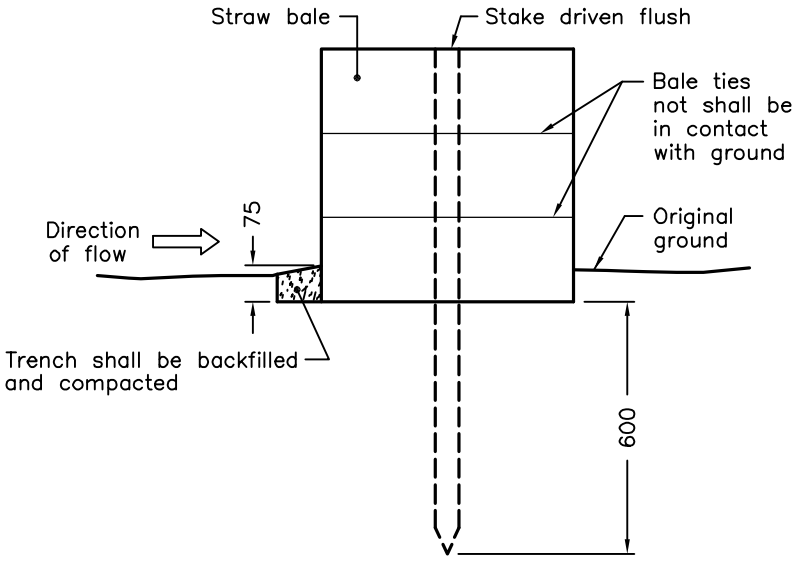

PERSPECTIVE VIEW




PLAN




ISOMETRIC VIEW




SECTION A–A

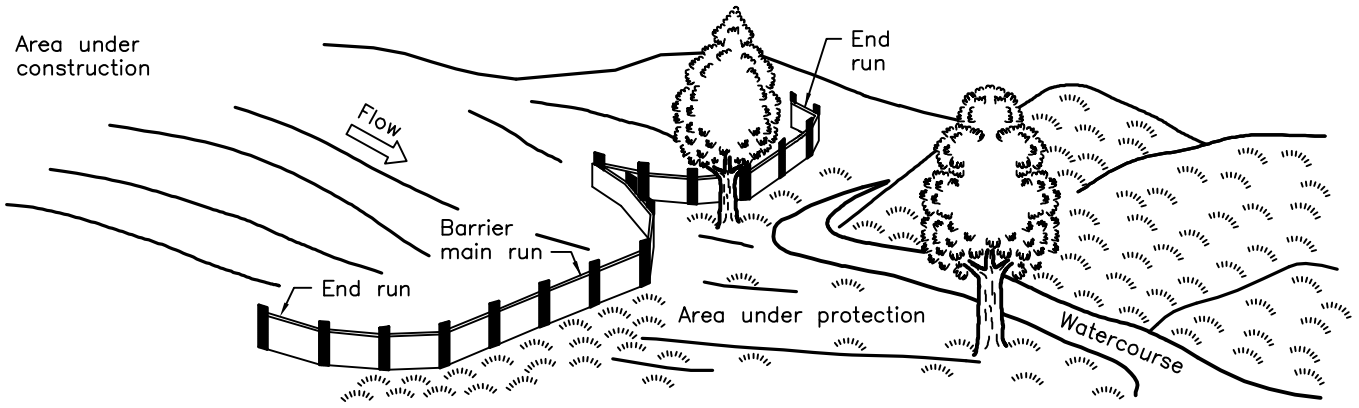
NOTES:

1 Straw bales shall be butted tightly against adjoining bales to prevent sediment flow through barrier.

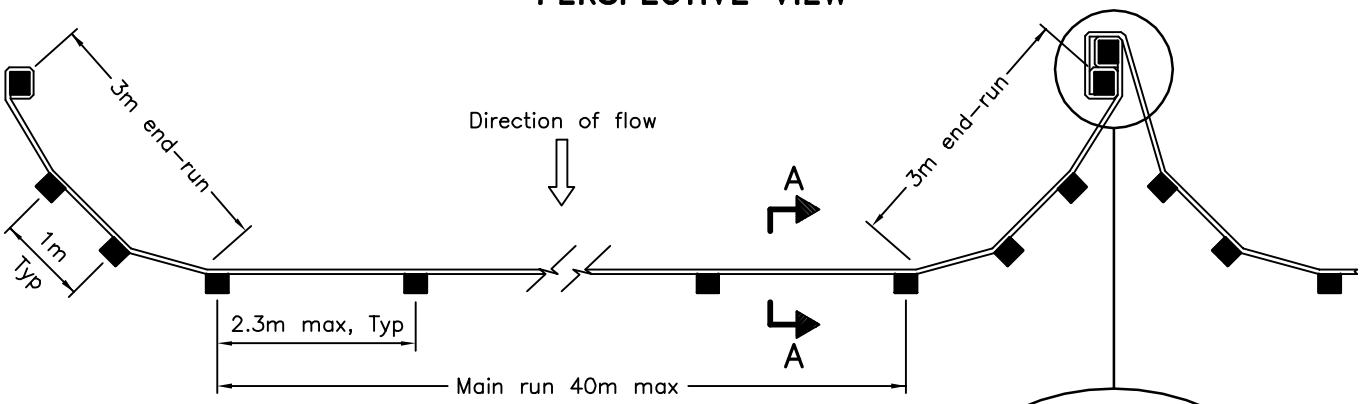
2 Caulk and compact gaps with loose straw.

A All dimensions are in millimetres unless otherwise shown.

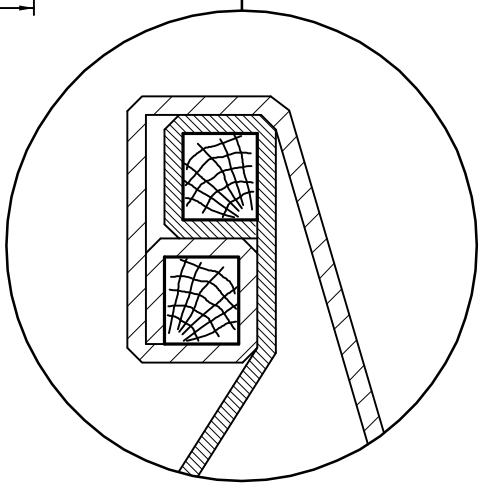
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| LIGHT–DUTY STRAW BALE BARRIER | | | |
| | OPSD 219.100 | | |



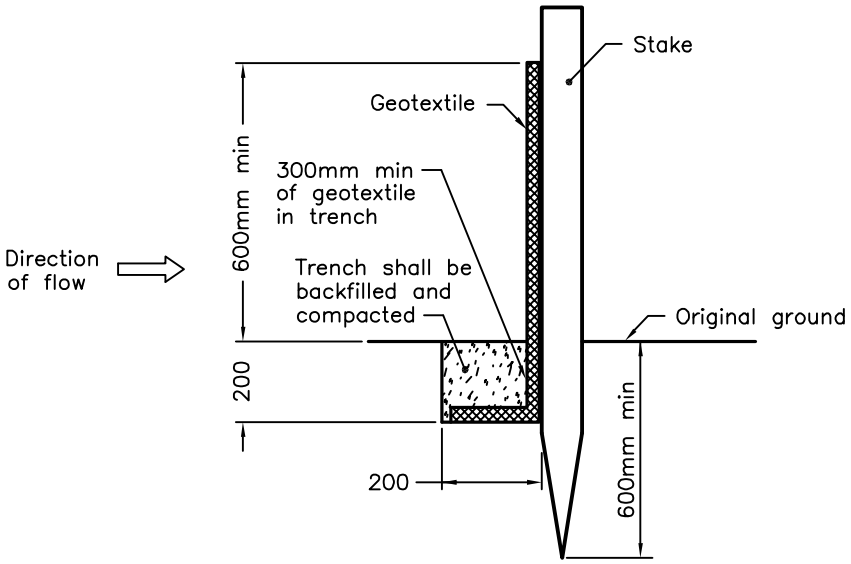

PERSPECTIVE VIEW




PLAN



JOINT DETAIL

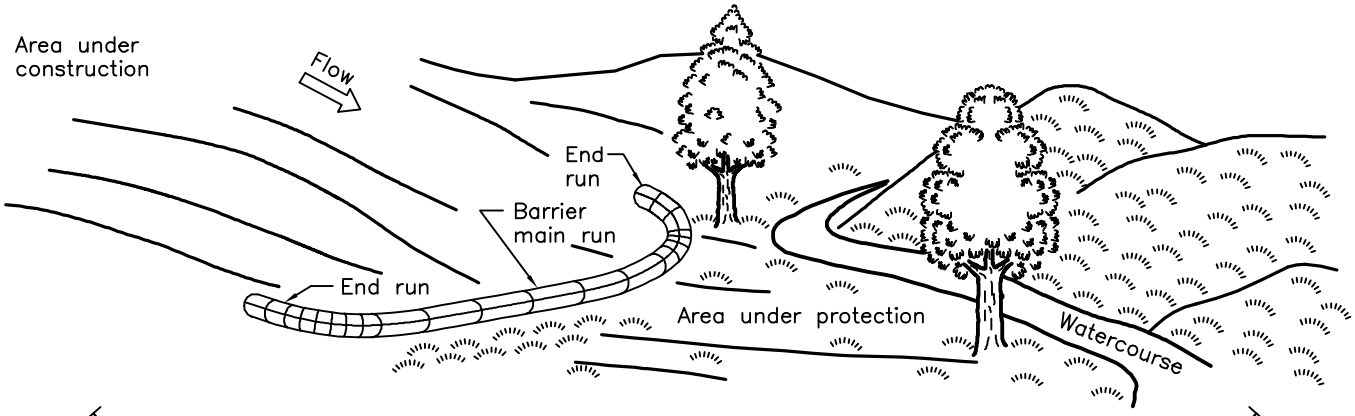



SECTION A–A

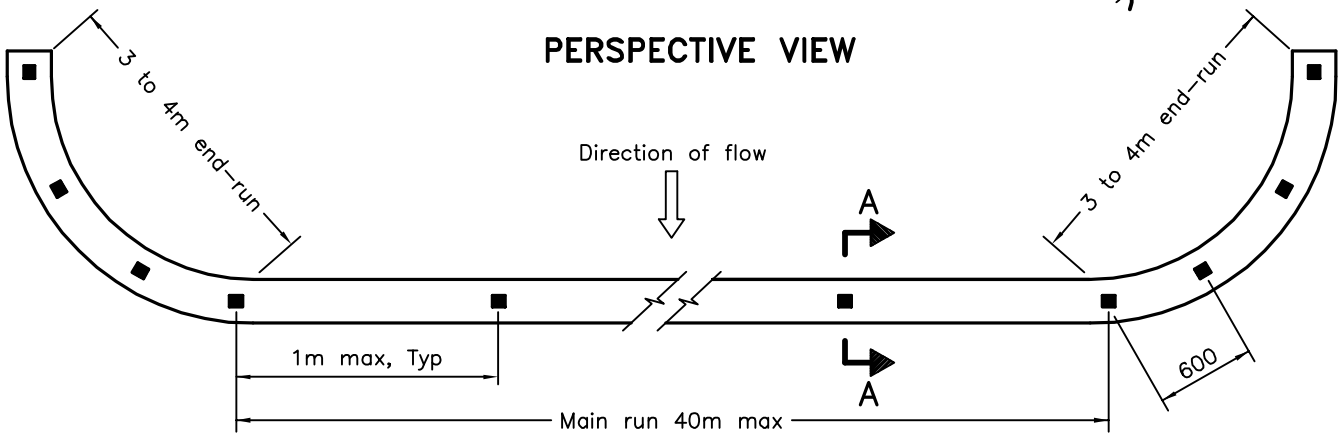
NOTE:

A All dimensions are in millimetres unless otherwise shown.

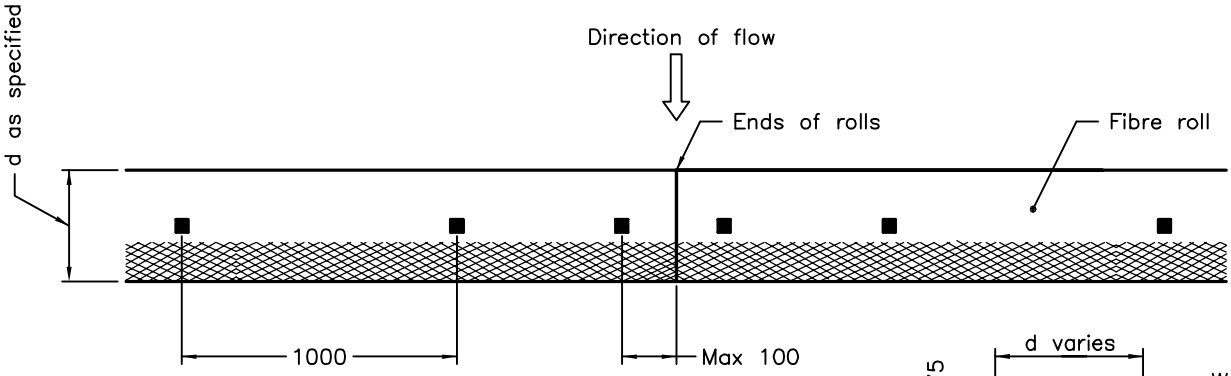
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| LIGHT–DUTY SILT FENCE BARRIER | | | |
| | OPSD 219.110 | | |



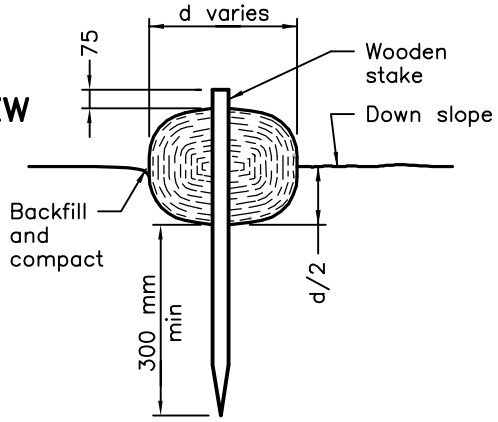

PERSPECTIVE VIEW




PLAN




FIBRE ROLL PLAN VIEW

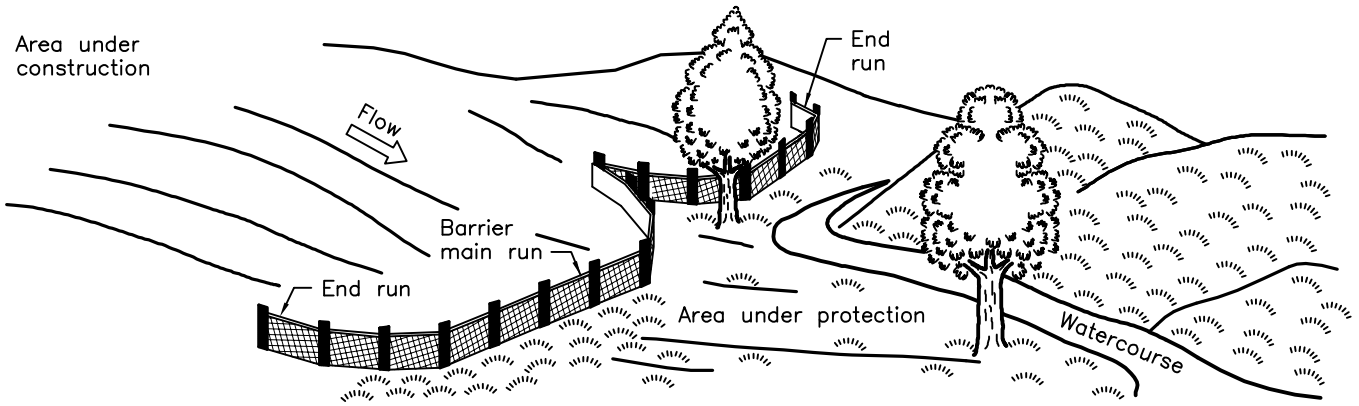



SECTION A–A

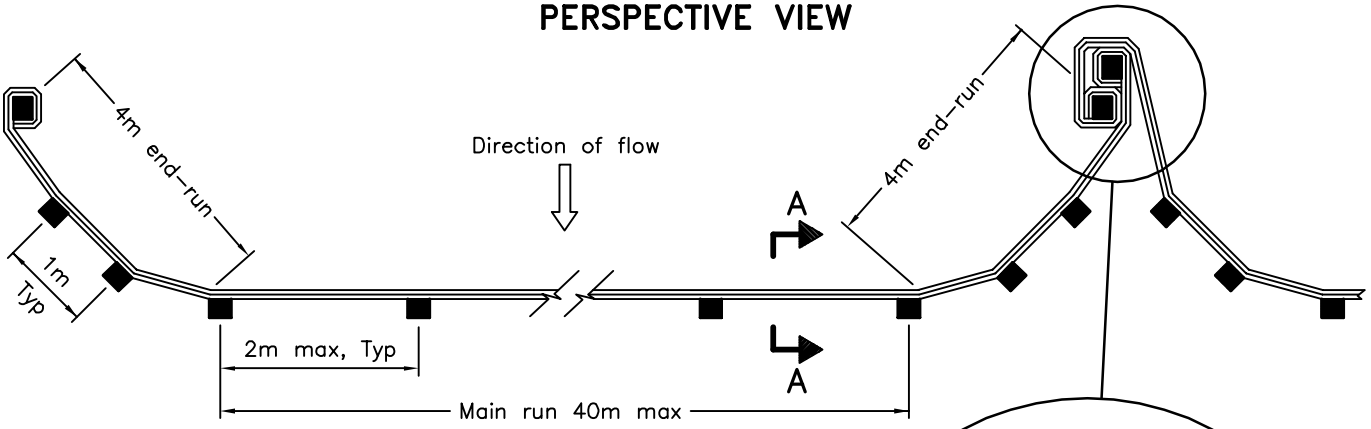
NOTES:

1 Remove all surface obstructions greater than 50mm from ground surface.
2 Ends of rolls shall be butted tightly together.
A All dimensions are in millimetres unless otherwise shown.

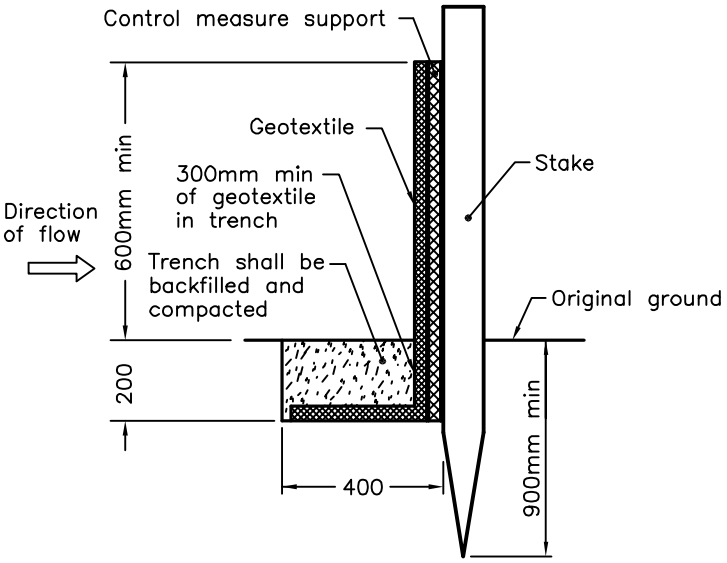
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| LIGHT–DUTY FIBRE ROLL BARRIER | | | |
| | OPSD 219.120 | | |



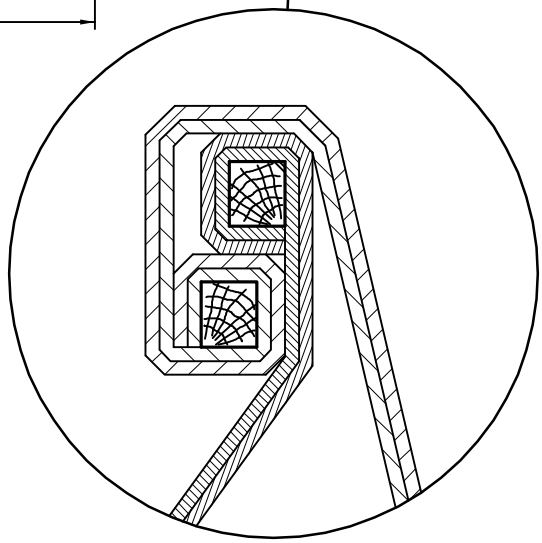

PERSPECTIVE VIEW




PLAN




SECTION A–A

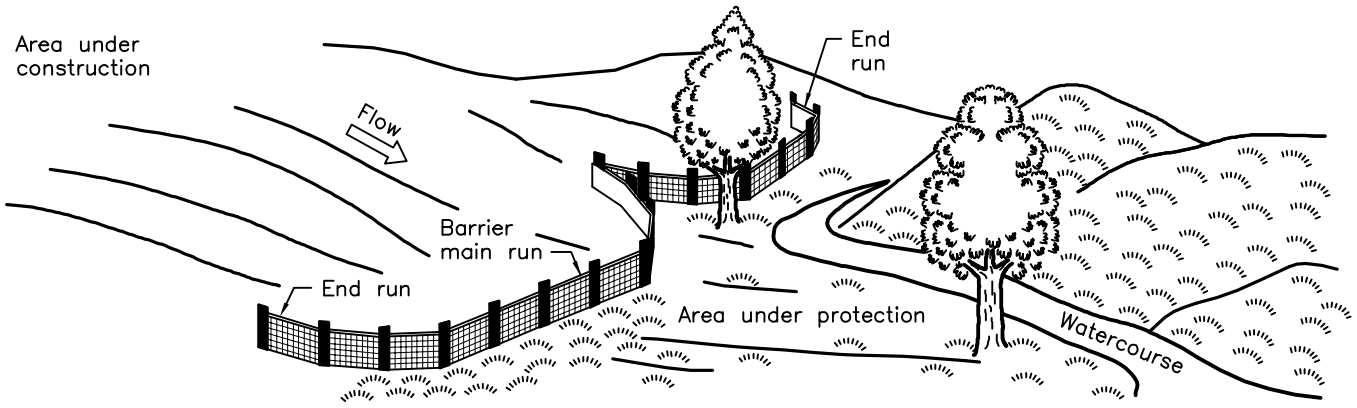


JOINT DETAIL

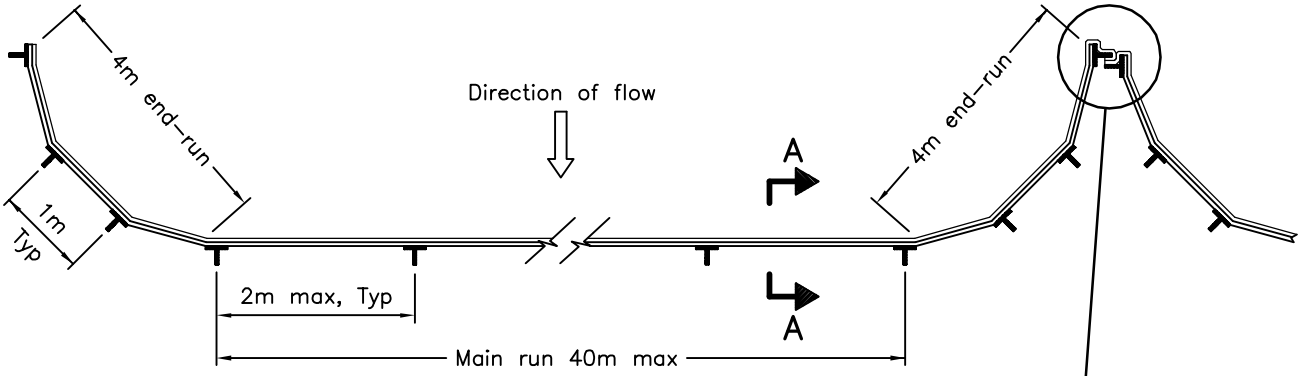
NOTE:

A All dimensions are in millimetres unless otherwise shown.

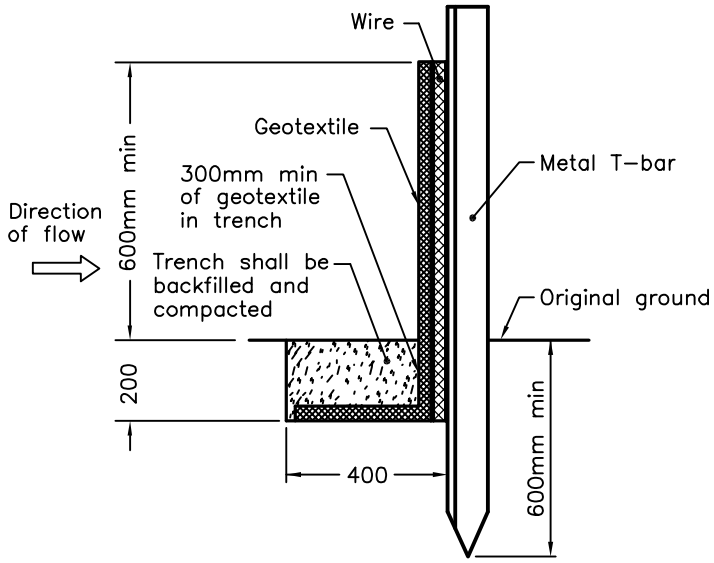
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| HEAVY–DUTY SILT FENCE BARRIER | | | |
| | OPSD 219.130 | | |



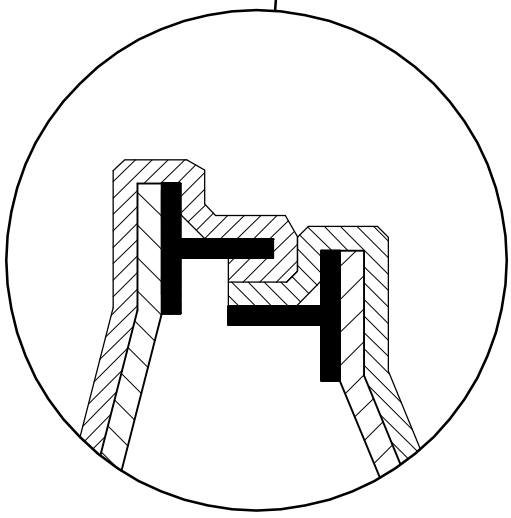

PERSPECTIVE VIEW




PLAN




SECTION A–A

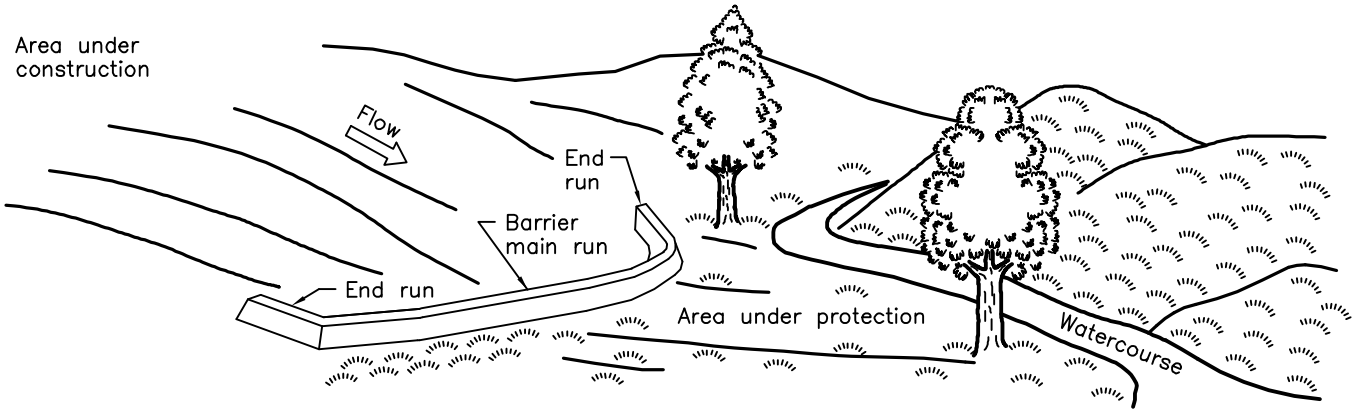


JOINT DETAIL

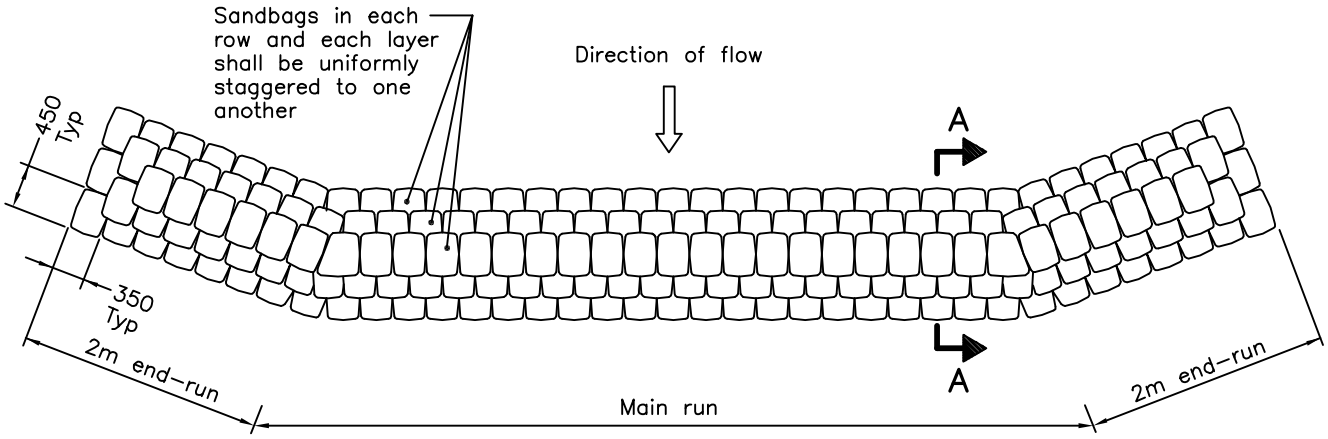
NOTE:

A All dimensions are in millimetres unless otherwise shown.

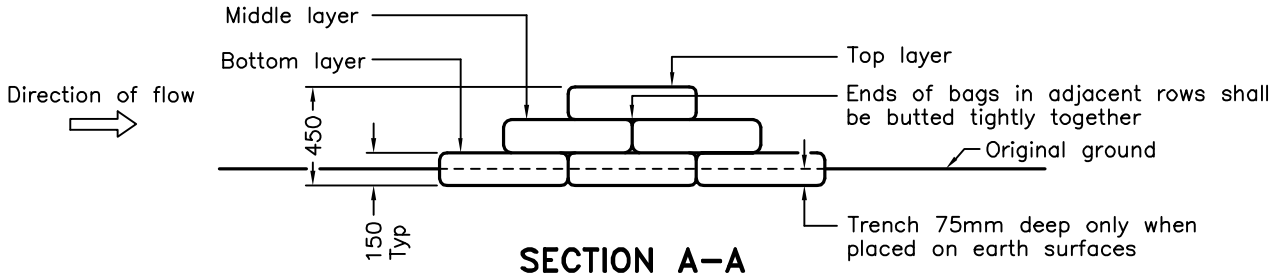
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| HEAVY–DUTY WIRE–BACKED SILT FENCE BARRIER | | | |
| | OPSD 219.131 | | |




**PERSPECTIVE VIEW**




**PLAN**

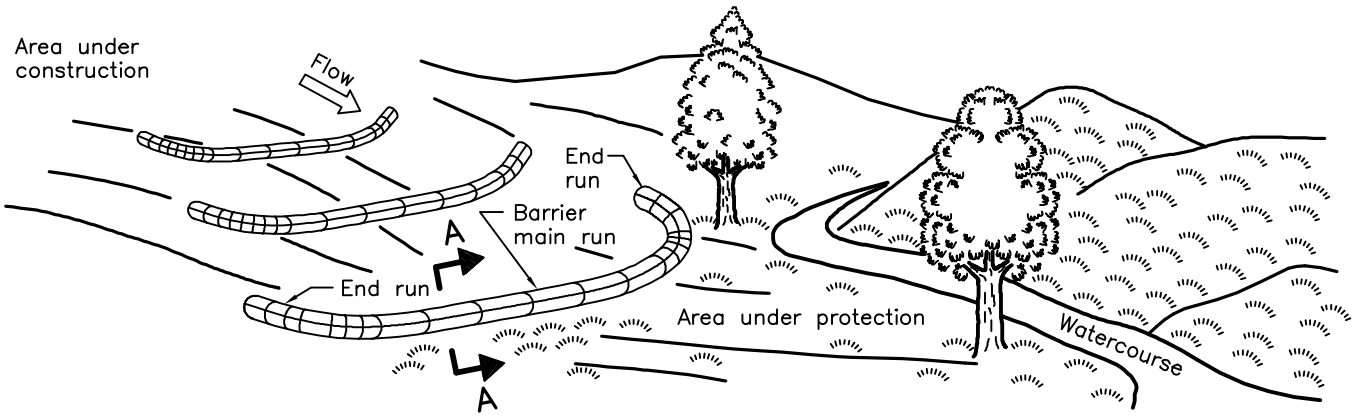



**SECTION A–A**

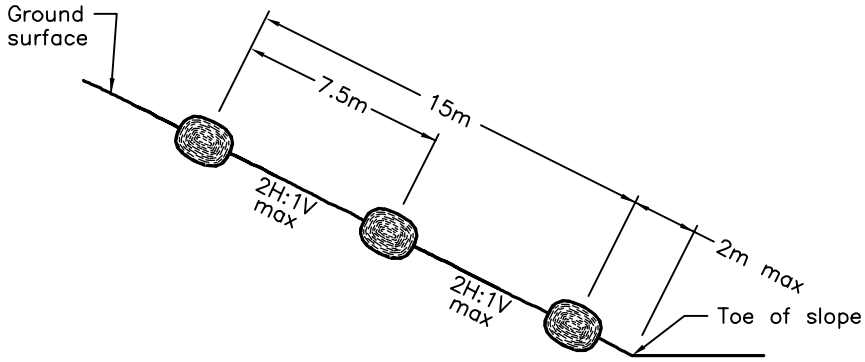
NOTE:

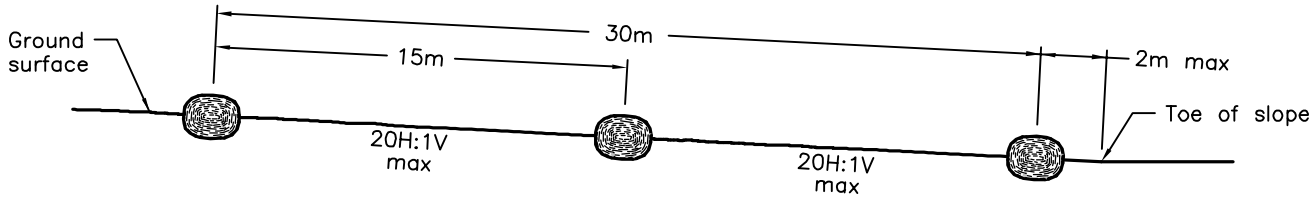
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **SANDBAG BARRIER** | | | |
| | **OPSD 219.150** | | |

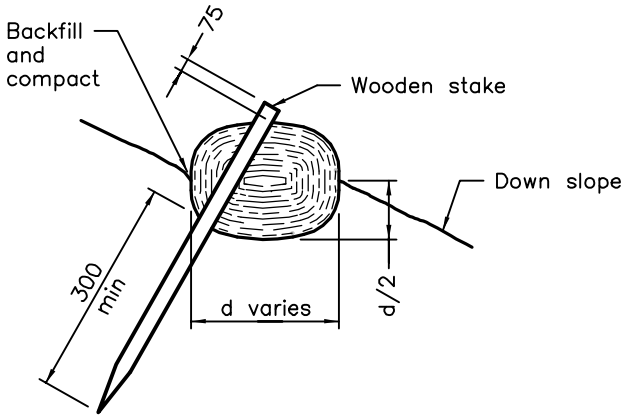



## PERSPECTIVE VIEW




## FIBRE ROLL SLOPE




## SECTION A–A

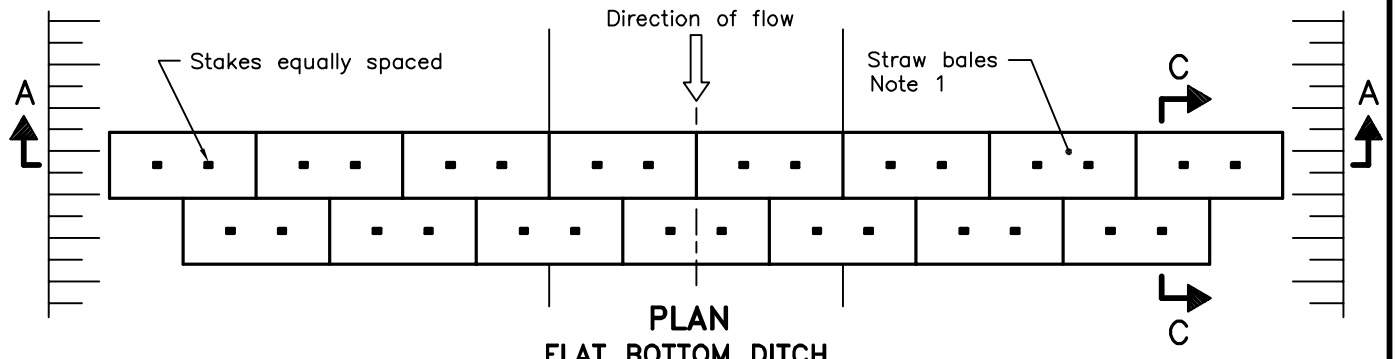
NOTES:

1 Remove all surface obstructions greater than 50mm from ground surface.

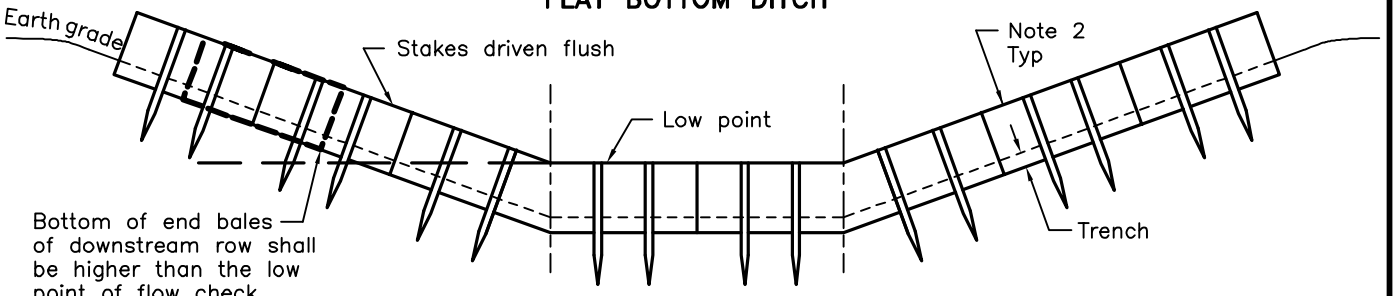
A This OPSD shall be read in conjunction with OPSD 219.120.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| FIBRE ROLL GRADE BREAKS | | | |
| | OPSD 219.160 | | |

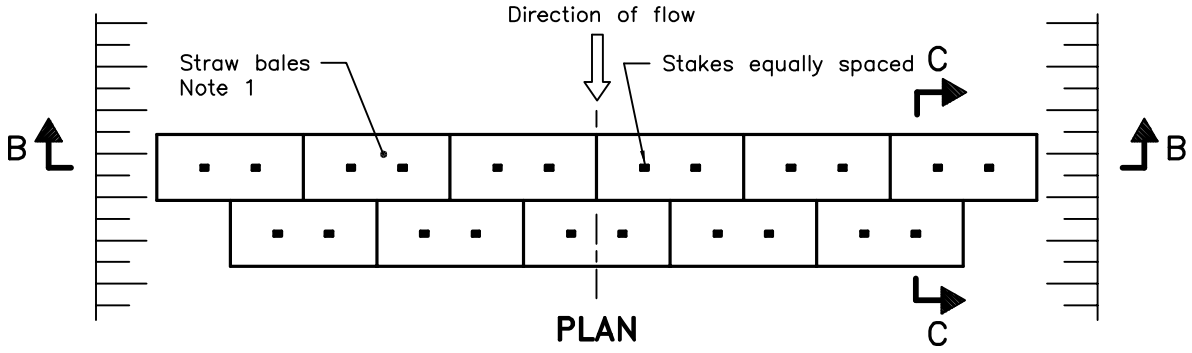



**PLAN**
**FLAT BOTTOM DITCH**

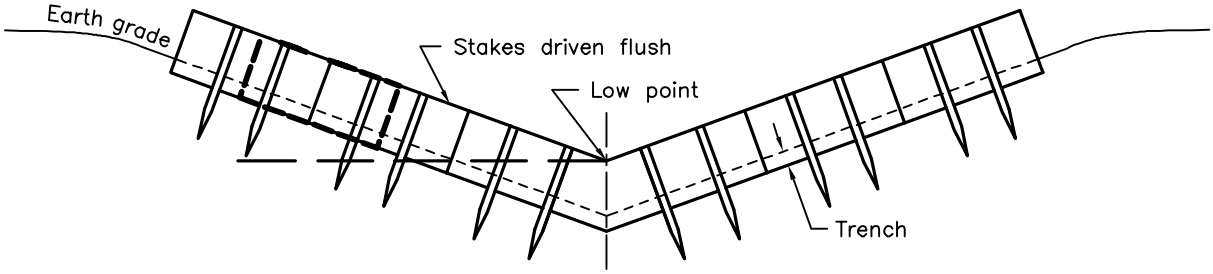



Bottom of end bales of downstream row shall be higher than the low point of flow check. Downstream bale position outlined. Typ

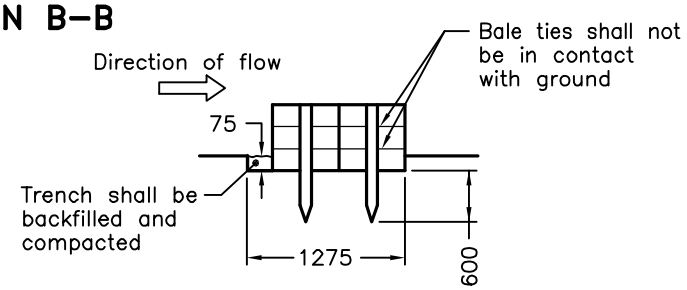
**SECTION A–A**




**PLAN**
**V–DITCH**




**SECTION B–B**



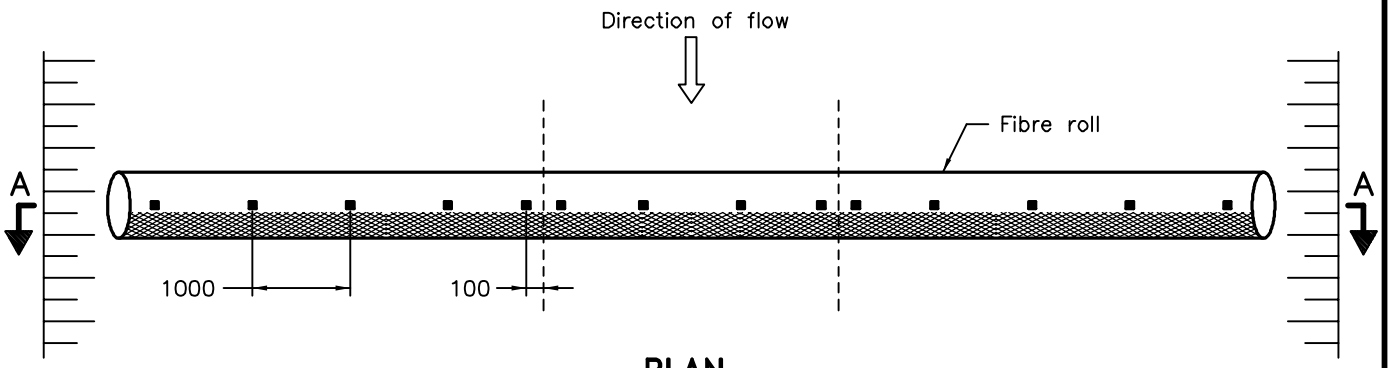

**SECTION C–C**

NOTES:

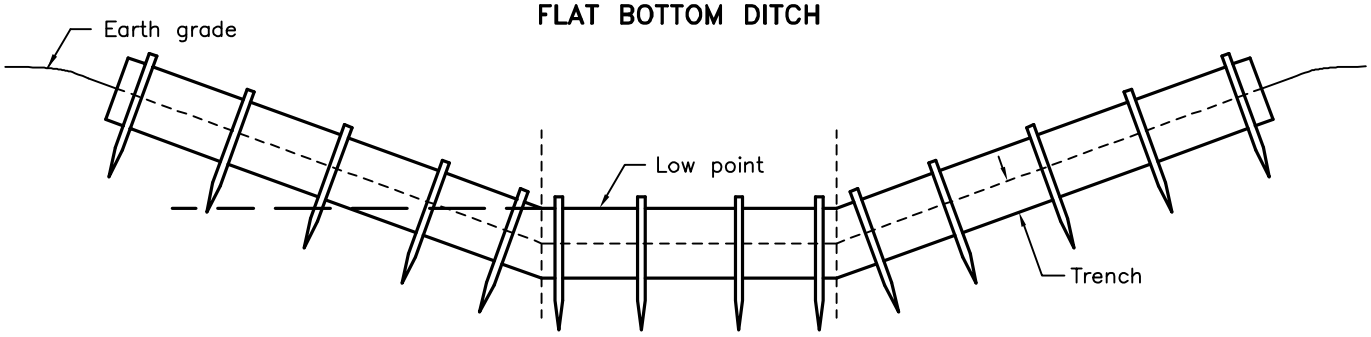
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.

A All dimensions are in millimetres unless otherwise shown.

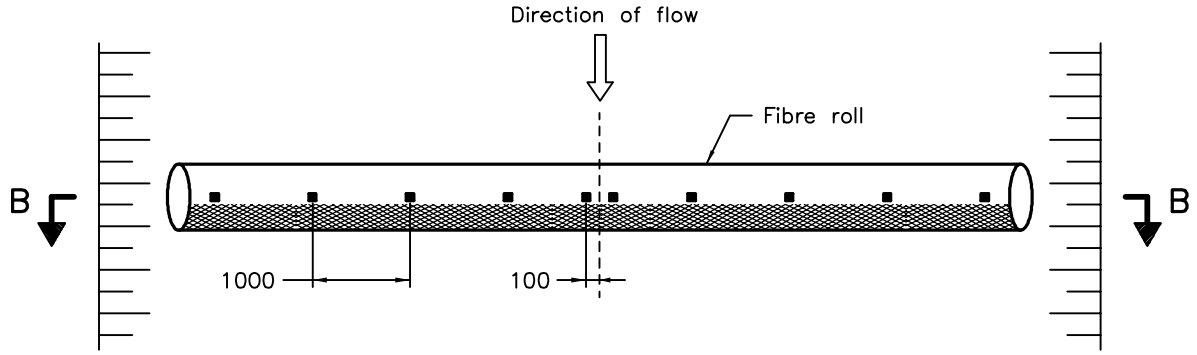
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **STRAW BALE FLOW CHECK DAM** | | | |
| | **OPSD 219.180** | | |



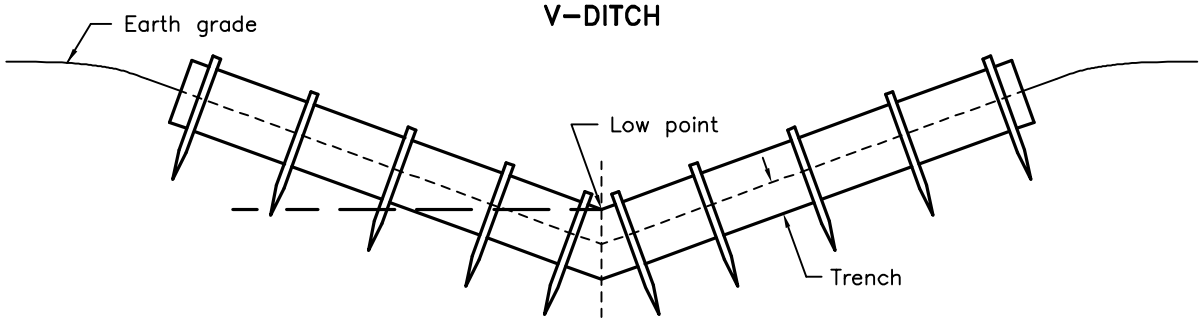

**PLAN**
**FLAT BOTTOM DITCH**




**SECTION A–A**




**PLAN**
**V–DITCH**



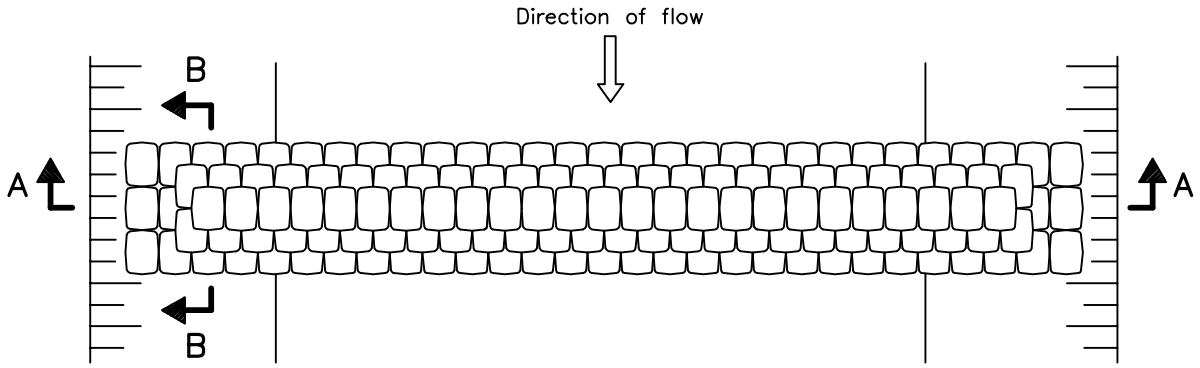

**SECTION B–B**

NOTES:

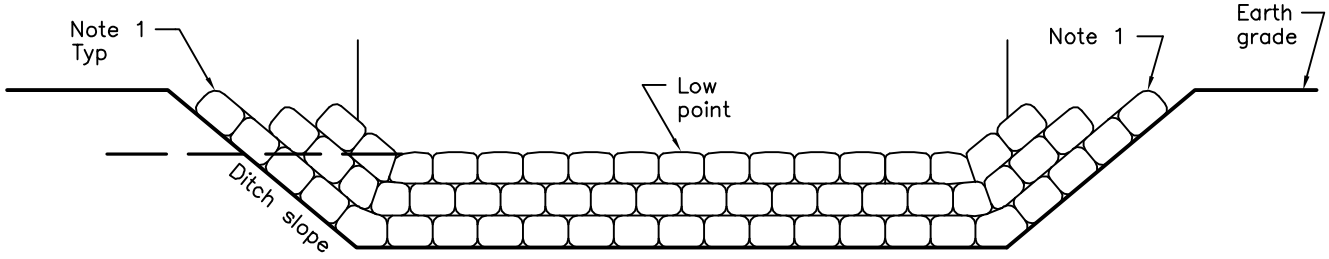
A Refer to OPSD 219.120 Section A–A installation detail.

B All dimensions are in millimetres unless otherwise shown.

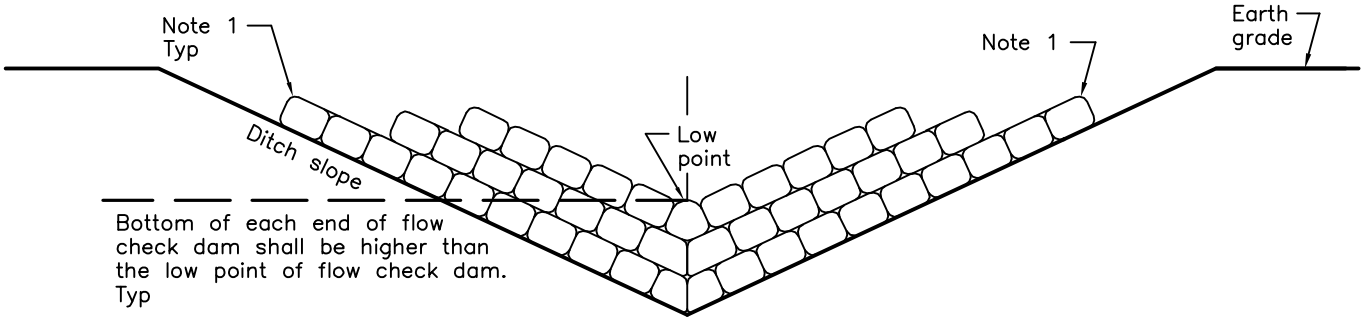
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| FIBRE ROLL FLOW CHECK DAMS | | | |
| | OPSD 219.191 | | |



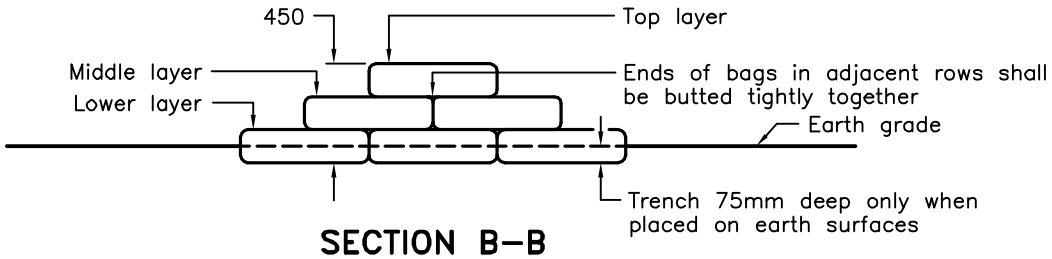

PLAN




SECTION A–A
FLAT BOTTOM DITCH




SECTION A–A
V–DITCH




SECTION B–B

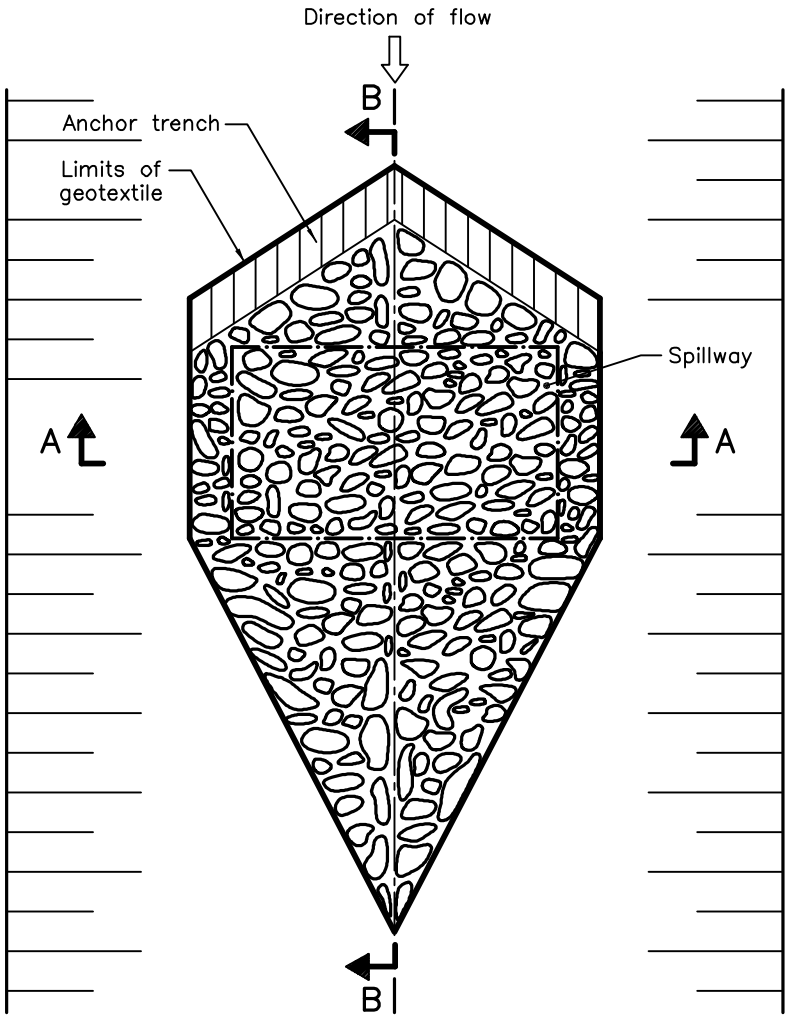
NOTES:

1 Sufficient sandbags shall be placed to prevent end scouring.

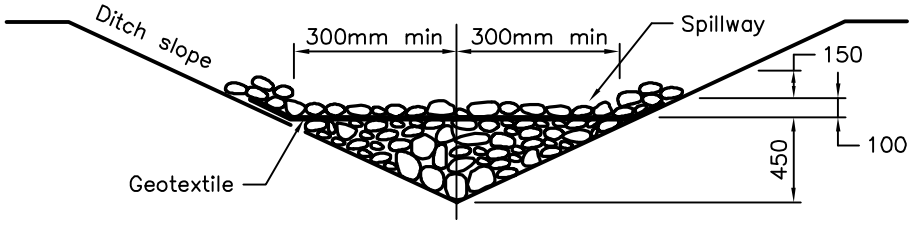
2 For sandbag dimensions see OPSD 219.150.

A All dimensions are in millimetres unless otherwise shown.

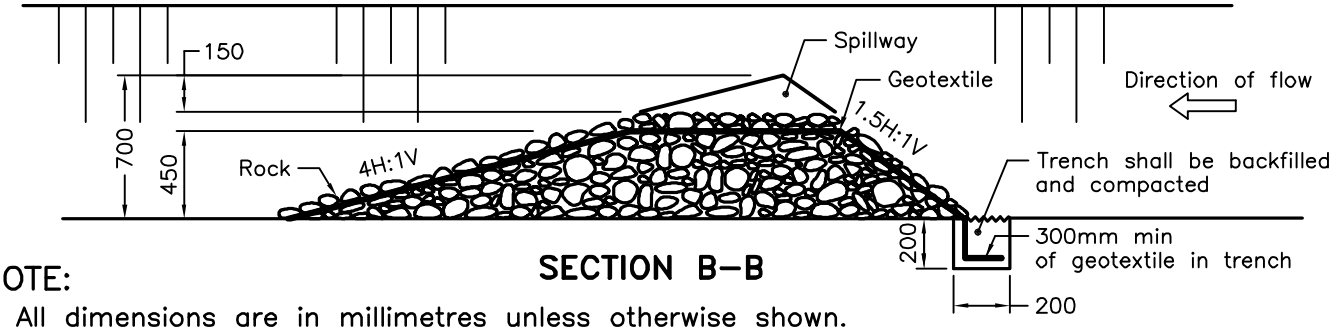
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| SANDBAG FLOW CHECK DAM | | | |
| | OPSD 219.200 | | |




**PLAN**
**SPILLWAY**



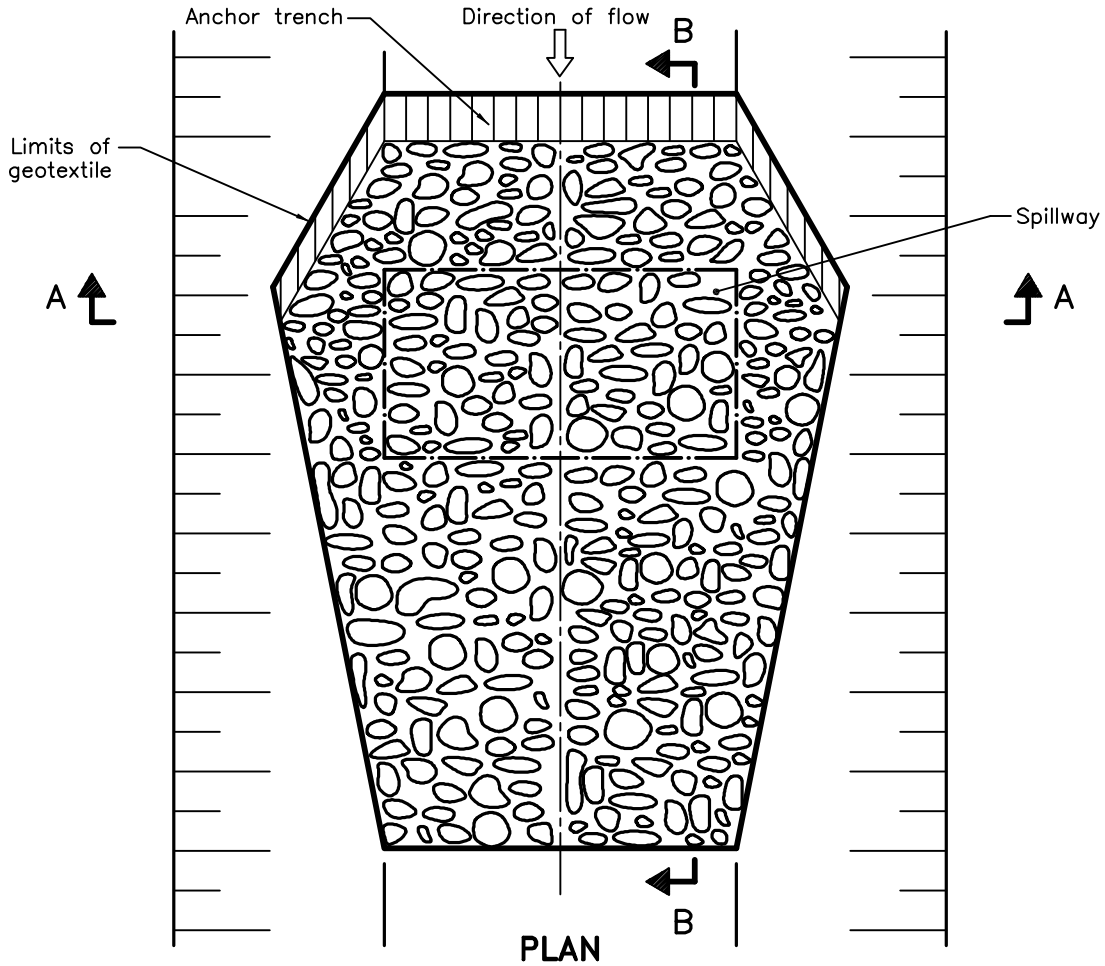

**SECTION A–A**



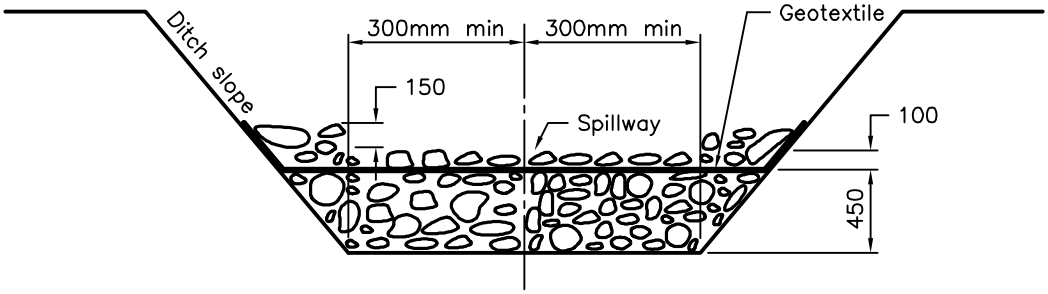

**SECTION B–B**

NOTE:
A All dimensions are in millimetres unless otherwise shown.

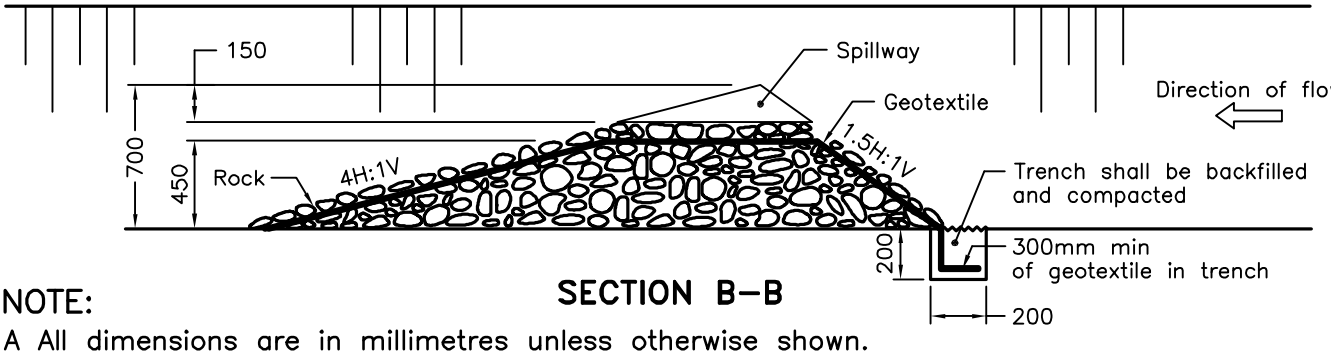
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **TEMPORARY ROCK FLOW CHECK DAM** V–DITCH | | | |
| | **OPSD 219.210** | | |




**PLAN**
**SPILLWAY**



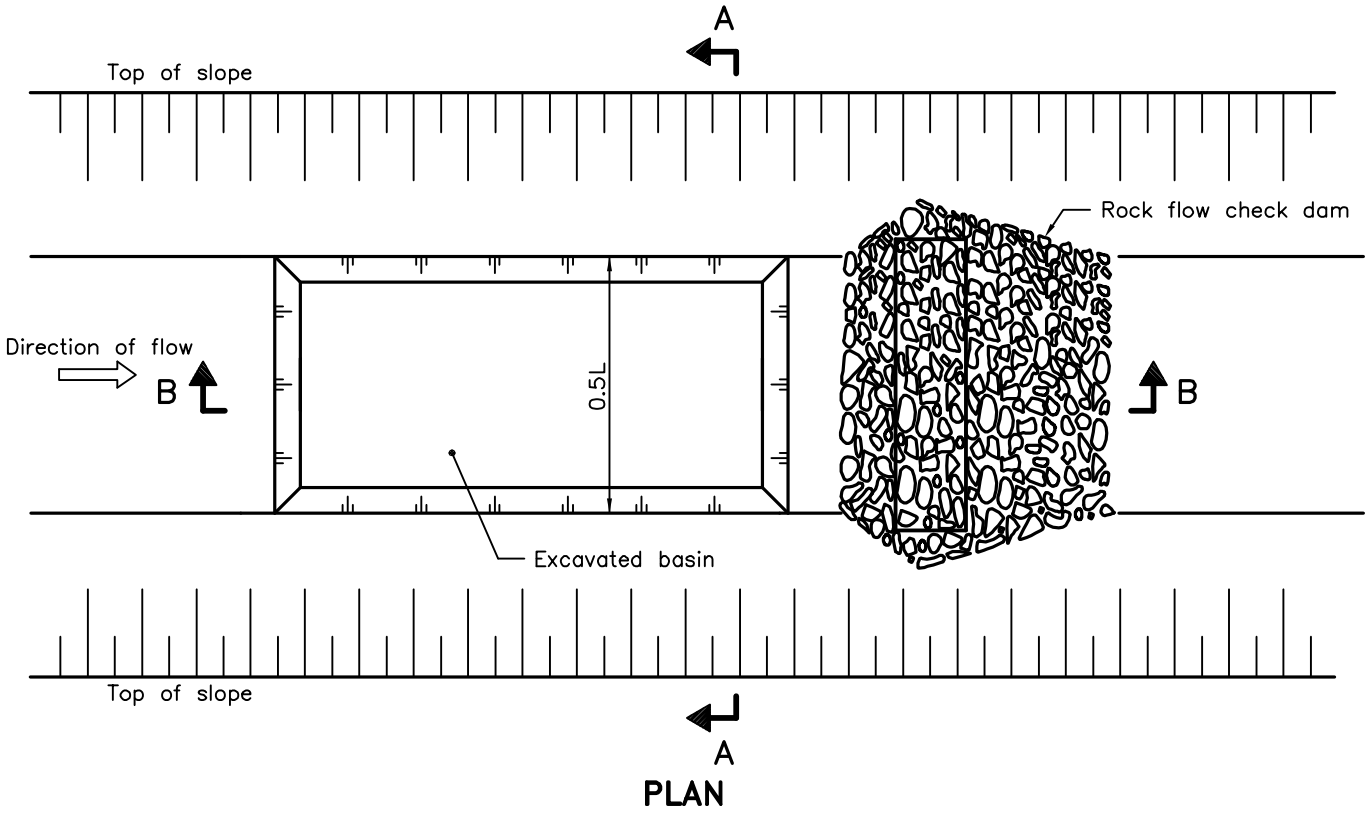

**SECTION A–A**



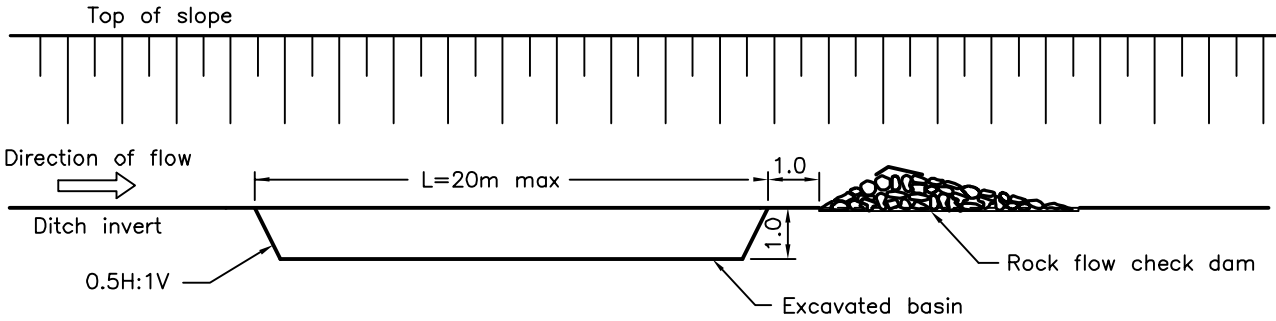

**SECTION B–B**

NOTE:
A All dimensions are in millimetres unless otherwise shown.

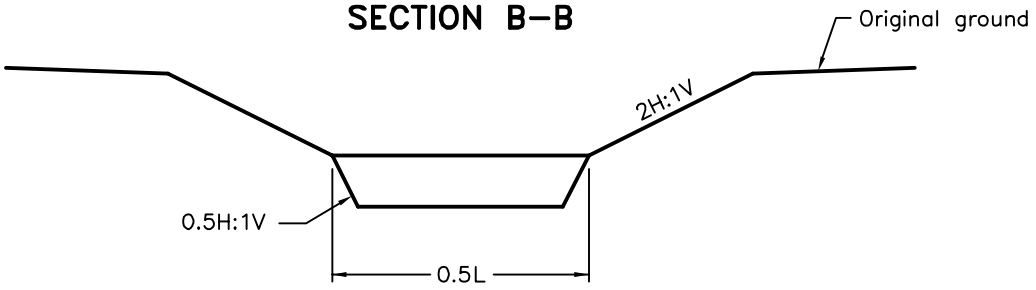
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **TEMPORARY ROCK FLOW CHECK DAM** FLAT BOTTOM DITCH | | | |
| | | | OPSD 219.211 |




PLAN




SECTION B–B




SECTION A–A

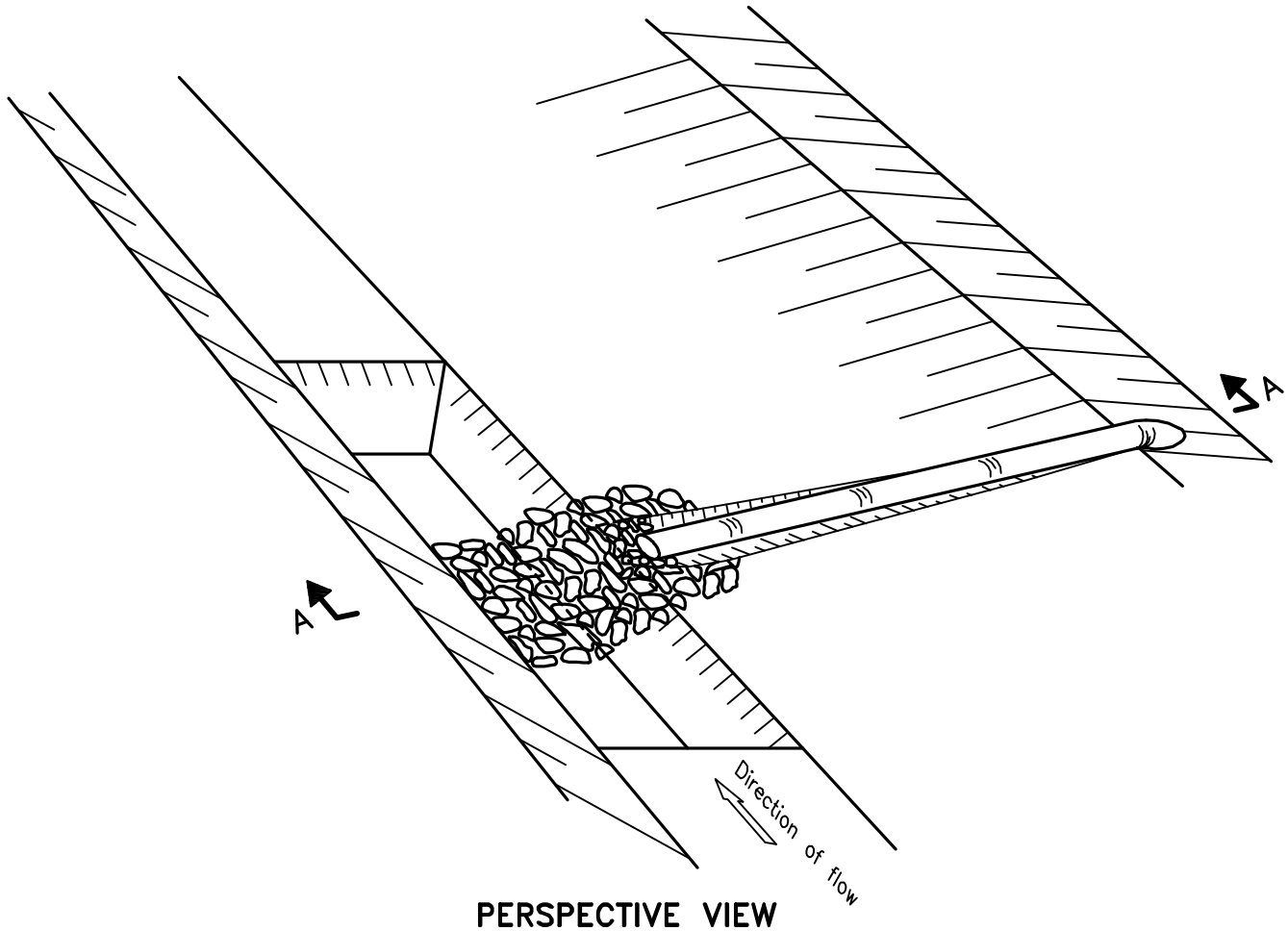
NOTES:

A Ditch cross–section upstream or downstream of sediment trap may be flat bottom or V–shaped. Flat bottom shown.

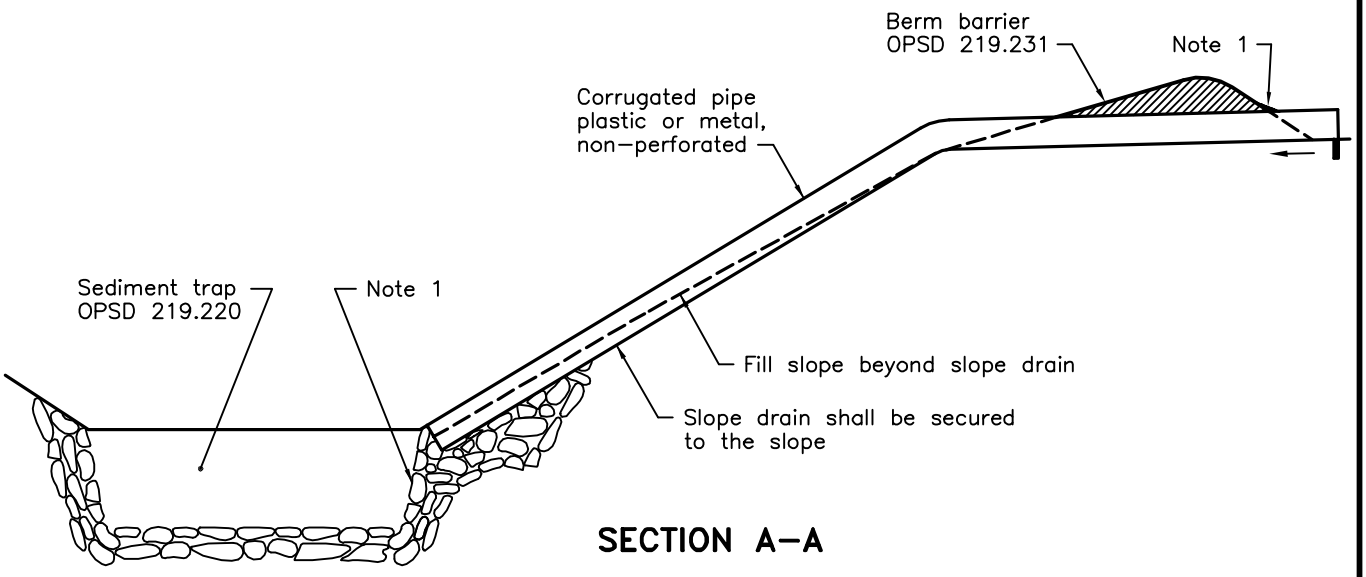
B This OPSD shall be read in conjuction with OPSD 219.210 or 219.211.

C All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| SEDIMENT TRAP IN DITCH | | | |
| | OPSD 219.220 | | |




PERSPECTIVE VIEW

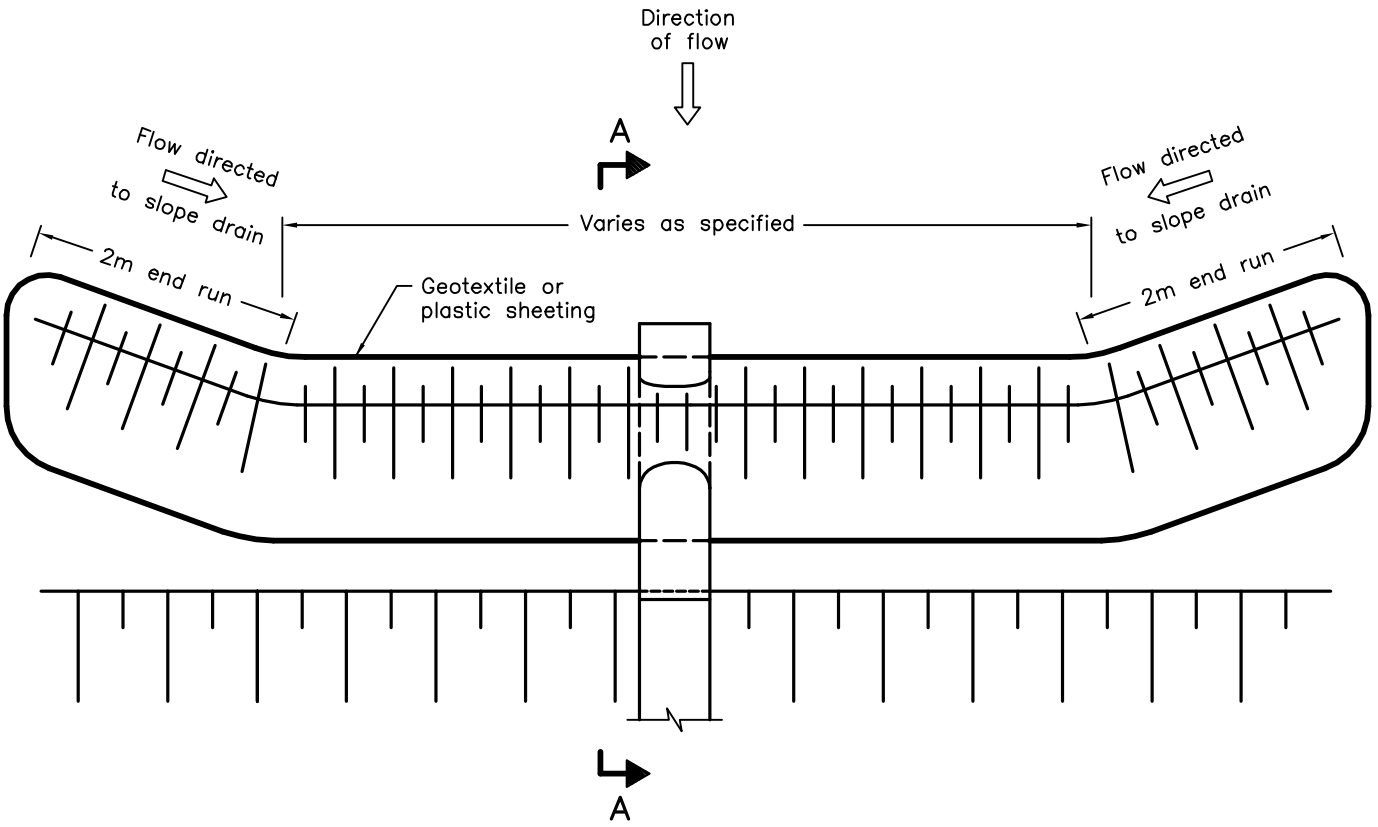



SECTION A–A

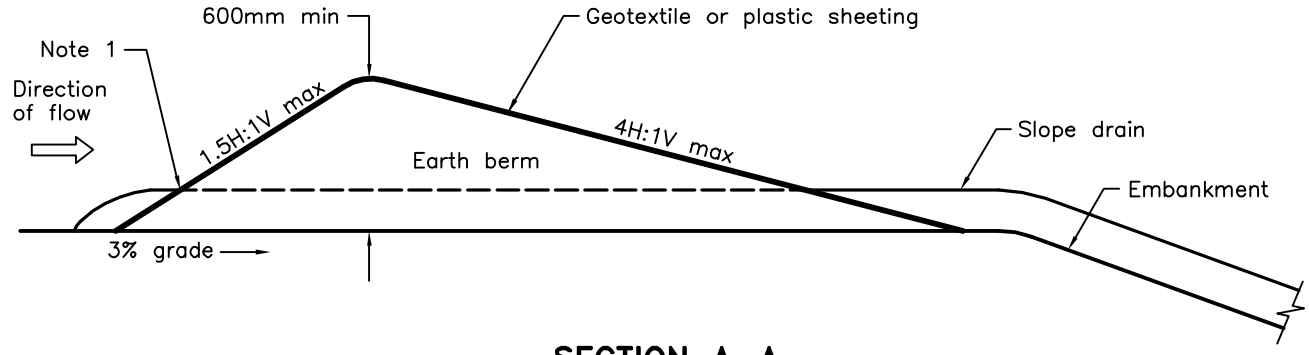
NOTES:

1 Scour protection according to OPSD 810.010.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 4 |
|---|---|---|---|
| TEMPORARY SLOPE DRAIN FOR SEDIMENT TRAP | | | |
| | OPSD 219.230 | | |




**PLAN**




**SECTION A–A**

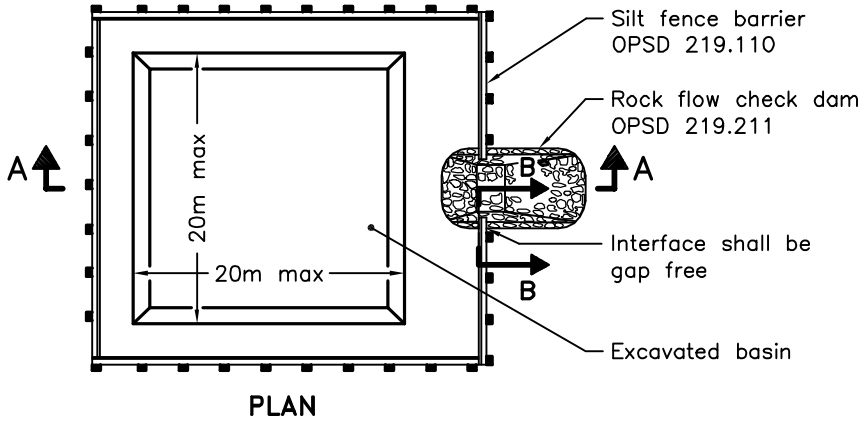
NOTES:

1 Scour protection according to OPSD 810.010.

A This OPSD shall be read in conjunction with OPSD 219.230.

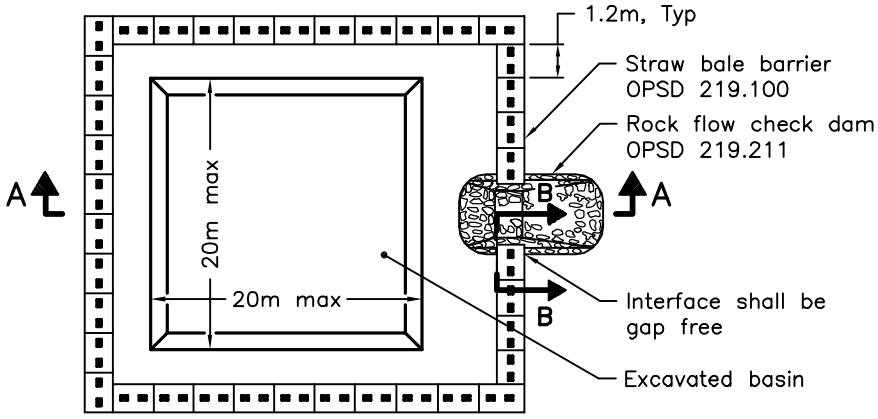
B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| TEMPORARY BERM BARRIER FOR SLOPE DRAIN | | | |
| | OPSD 219.231 | | |



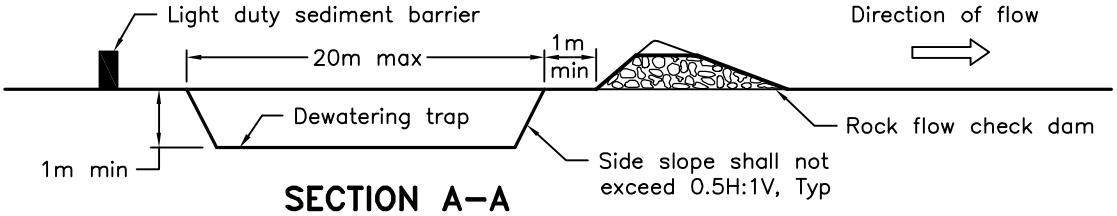

PLAN

## DEWATERING TRAP WITH SILT FENCE

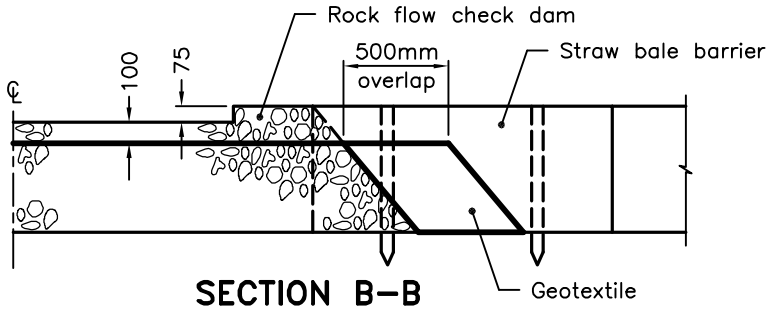



PLAN

## DEWATERING TRAP WITH STRAW BALES




## SECTION A–A



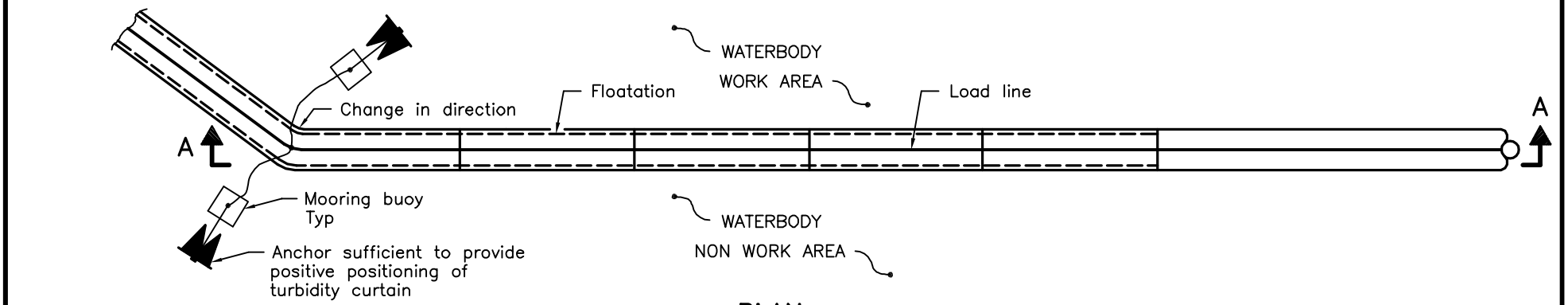

## SECTION B–B

STRAW BALE BARRIER SHOWN

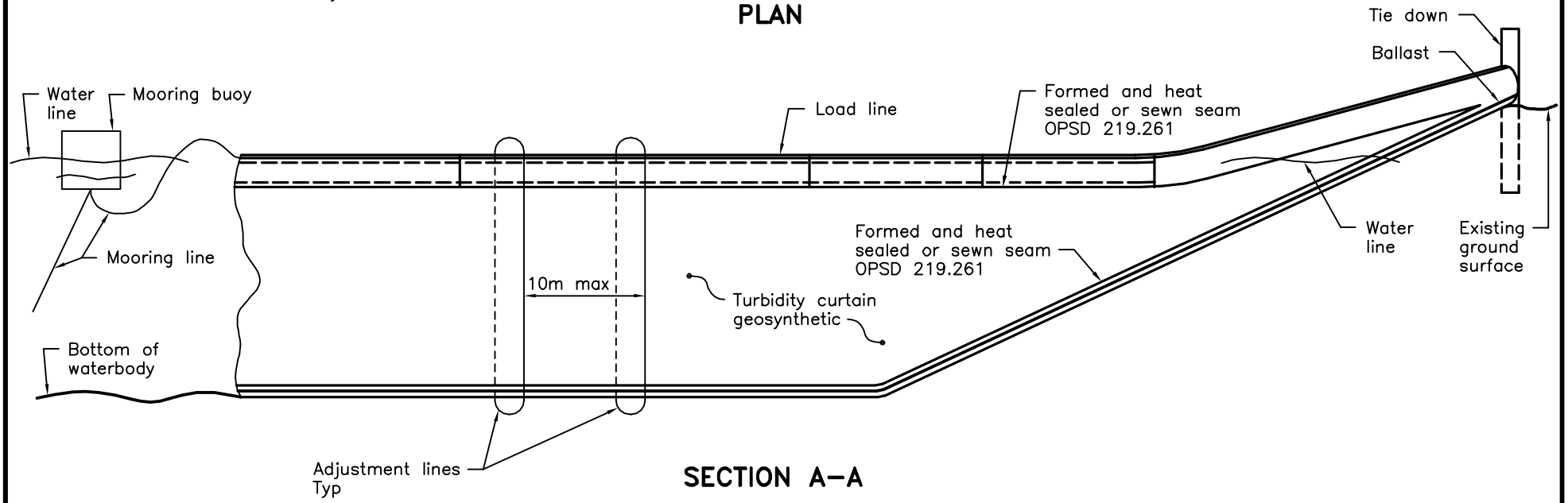
NOTE:

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| SEDIMENT TRAP FOR DEWATERING | | | |
| | OPSD 219.240 | | |




**PLAN**

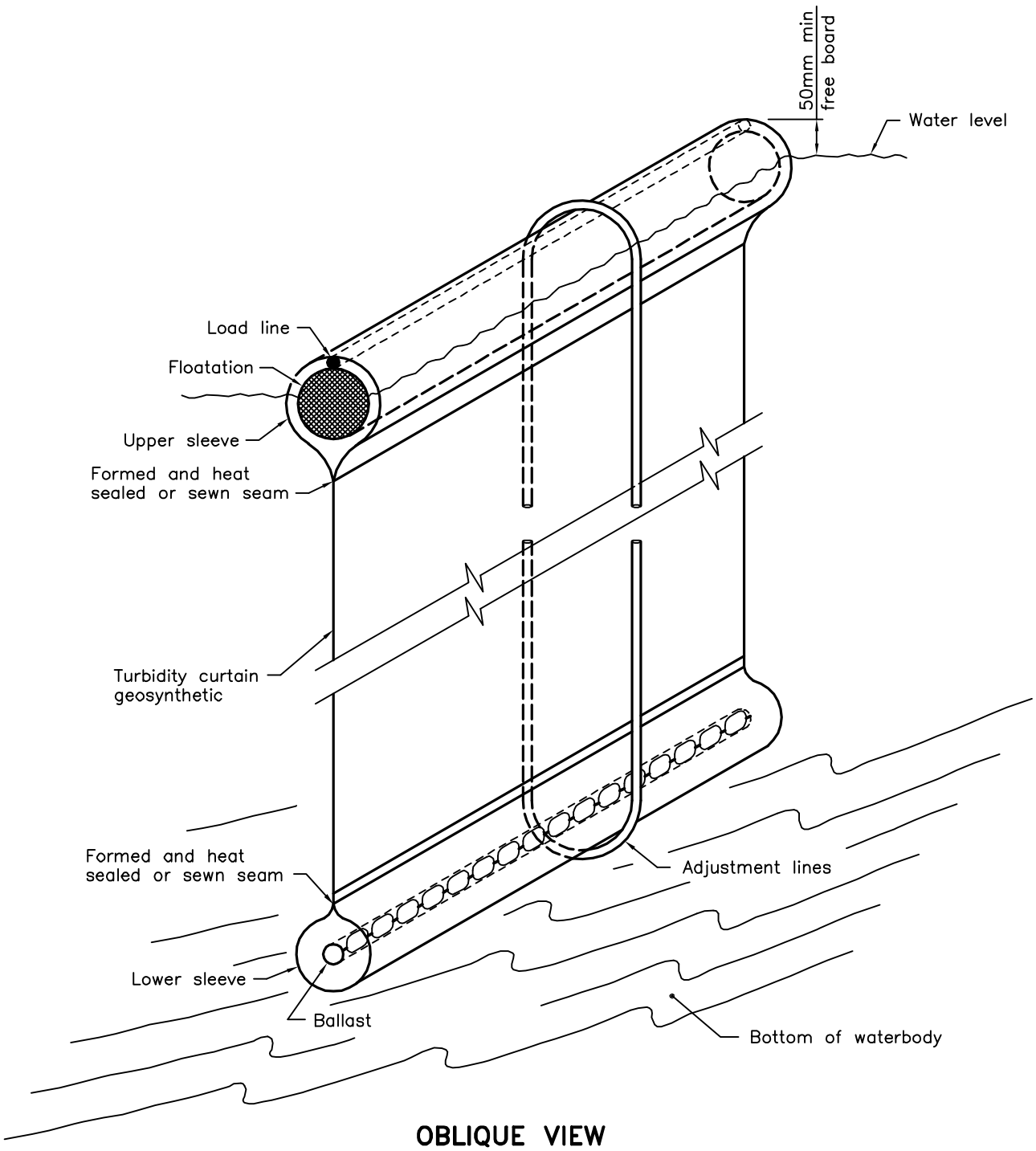



**SECTION A–A**

NOTES:

A All dimensions are in millimeters unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| TURBIDITY CURTAIN | | | |
| | OPSD 219.260 | | |

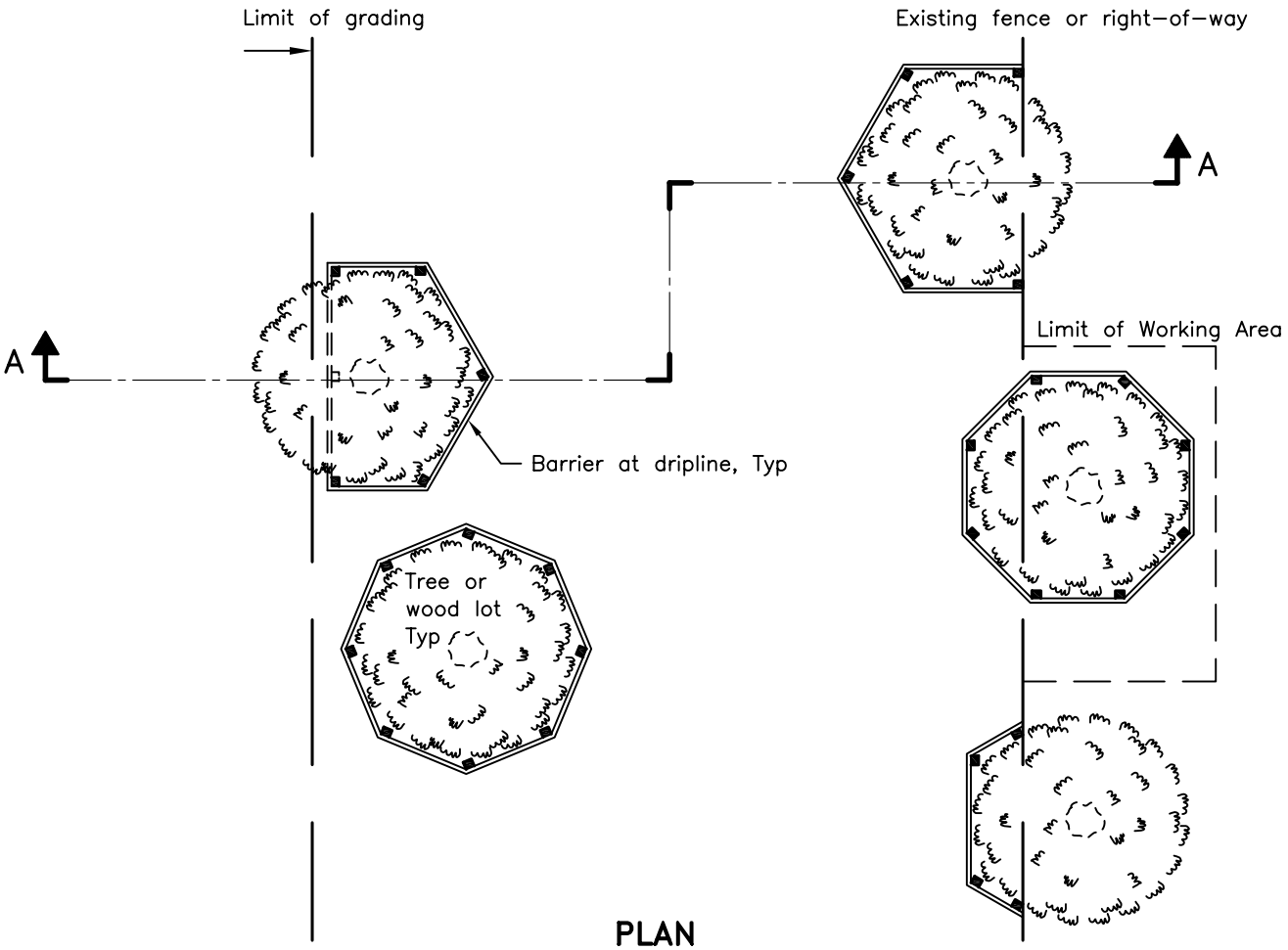



**OBLIQUE VIEW**

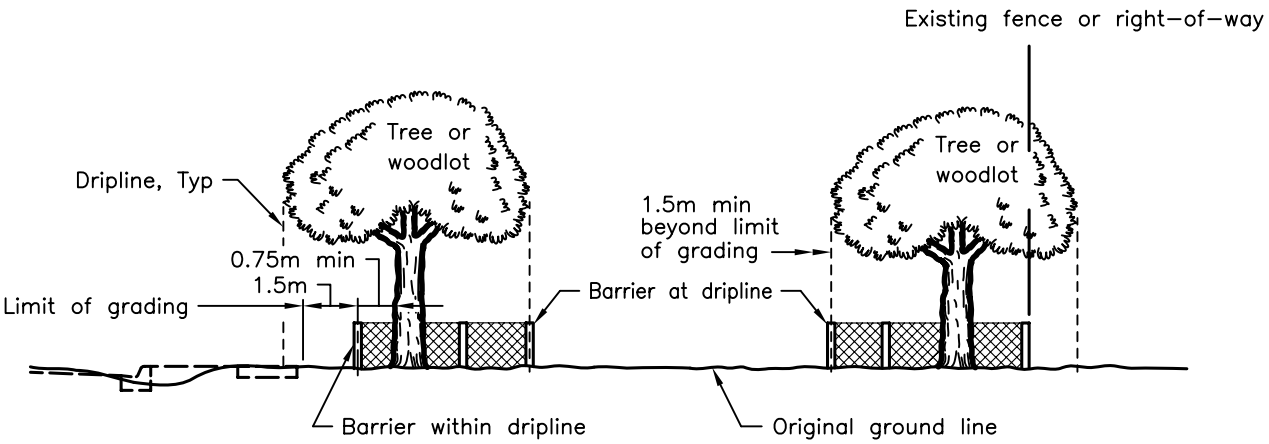
NOTES:

A All dimensions are in millimeters.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **TURBIDITY CURTAIN**<br>SEAM DETAIL | | | |
| | **OPSD 219.261** | | |

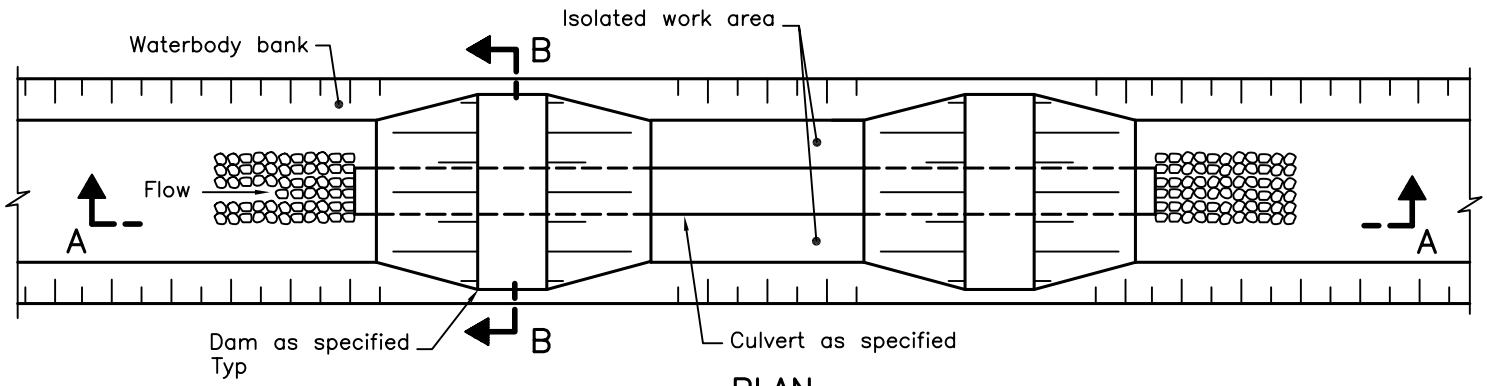



PLAN

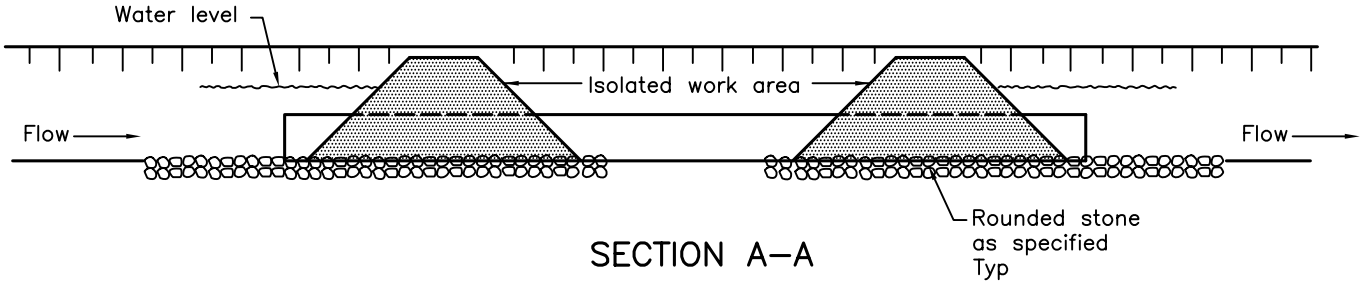



SECTION A–A

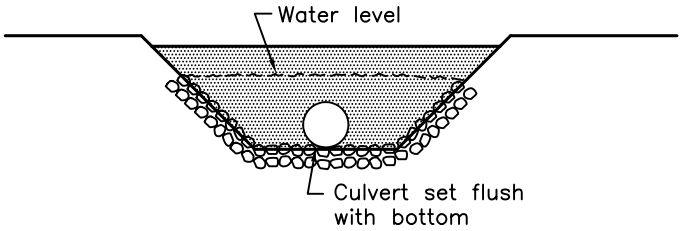
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2007 | Rev | 0 |
|---|---|---|---|
| BARRIER FOR TREE PROTECTION | | | |
| | OPSD 220.010 | | |




PLAN




SECTION A–A




SECTION B–B

NOTE:

A Schematic only.

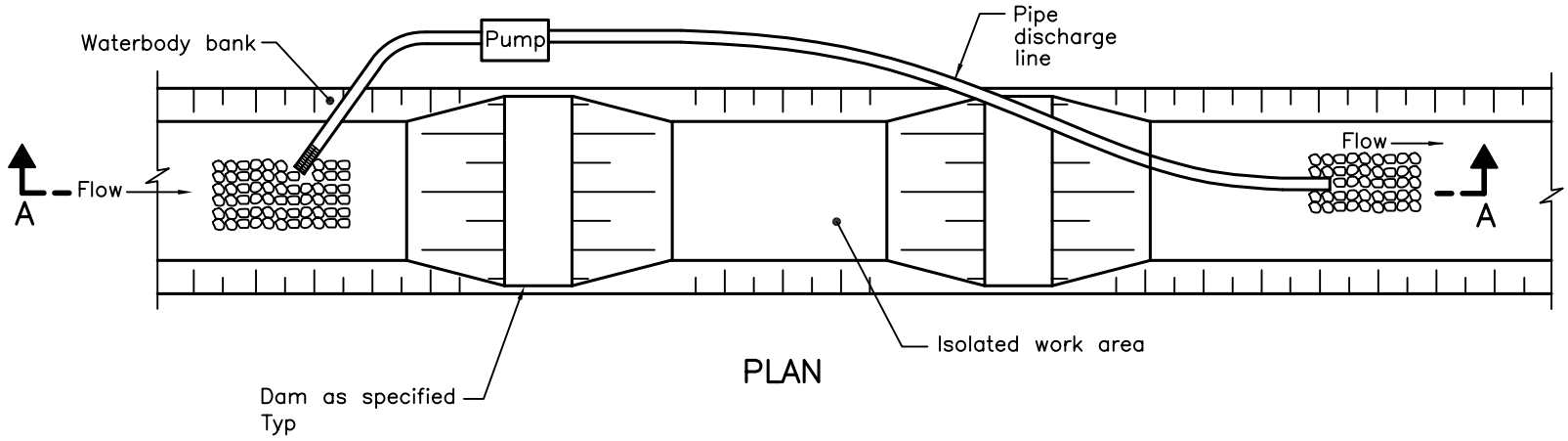
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

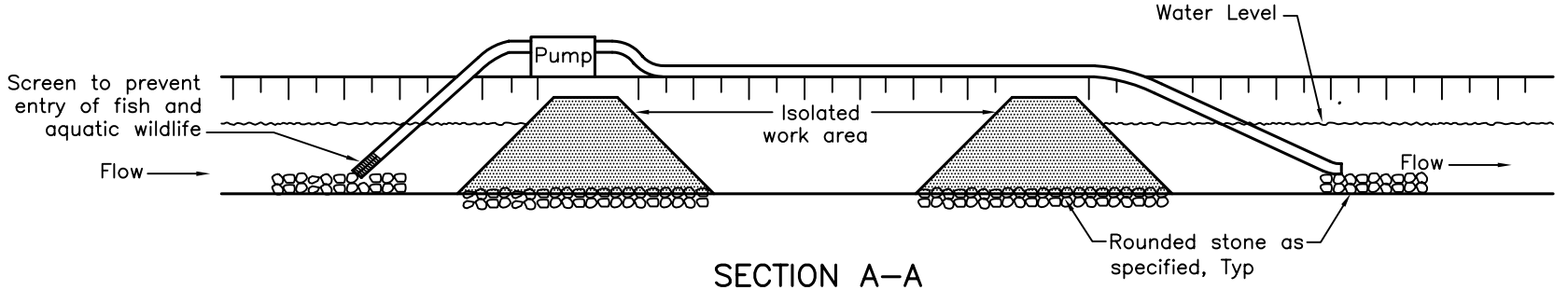
TEMPORARY WATER PASSAGE SYSTEM

# CULVERT IN WATERCOURSE

OPSD – 221.010




PLAN




SECTION A–A

NOTE:
A Schematic only.

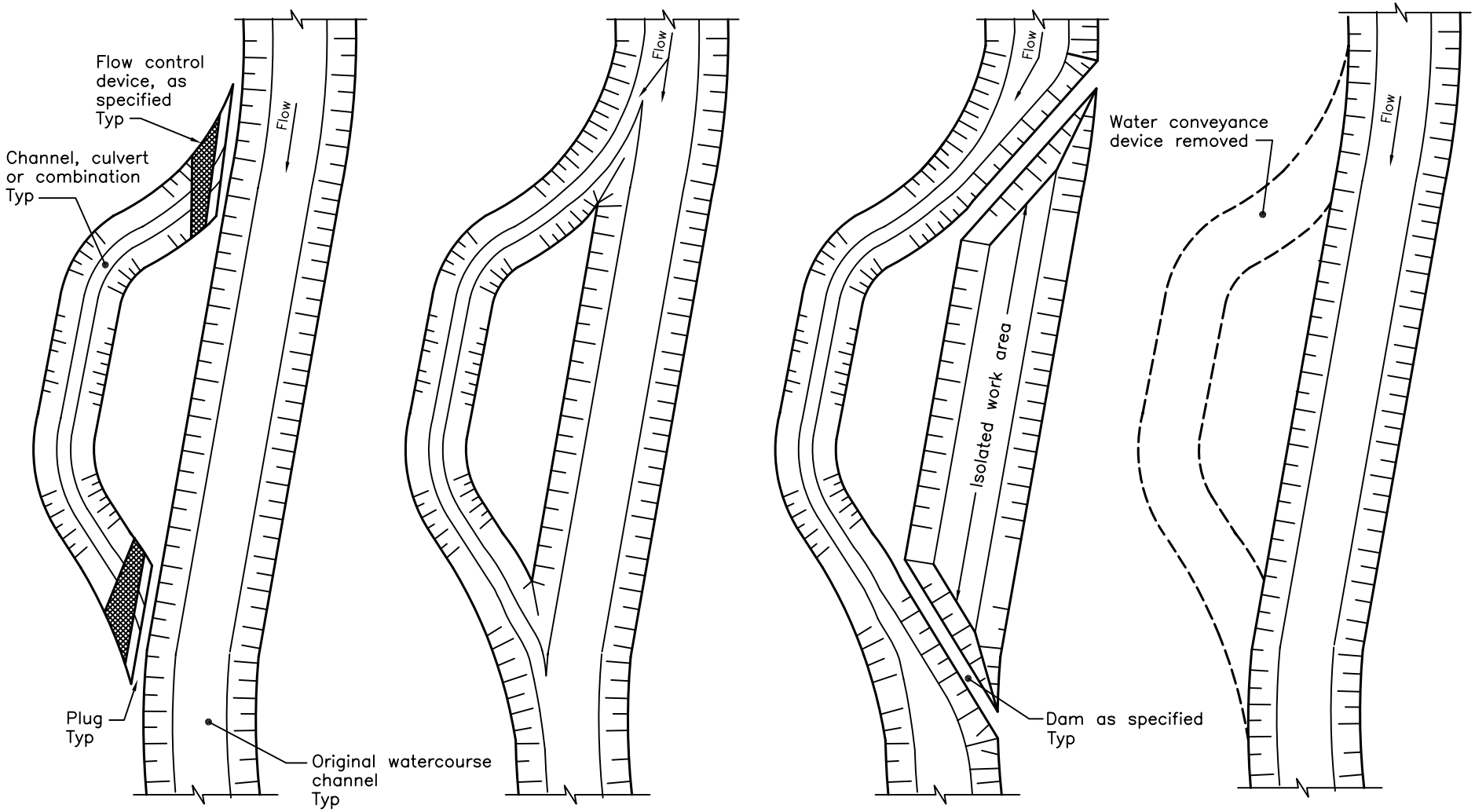
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

TEMPORARY WATER PASSAGE SYSTEM

# PUMPING AND PIPING

OPSD – 221.020




1) WATER CONVEYANCE DEVICE INSTALLED

2) PLUGS REMOVED AND FLOW CONTROL DEVICE OPENED

3) WORK AREA ISOLATED

4) ORIGINAL CHANNEL RESTORED

PLAN VIEWS

NOTES:

A Representative stages only.

B Schematic only.

C Temporary channel lining as specified

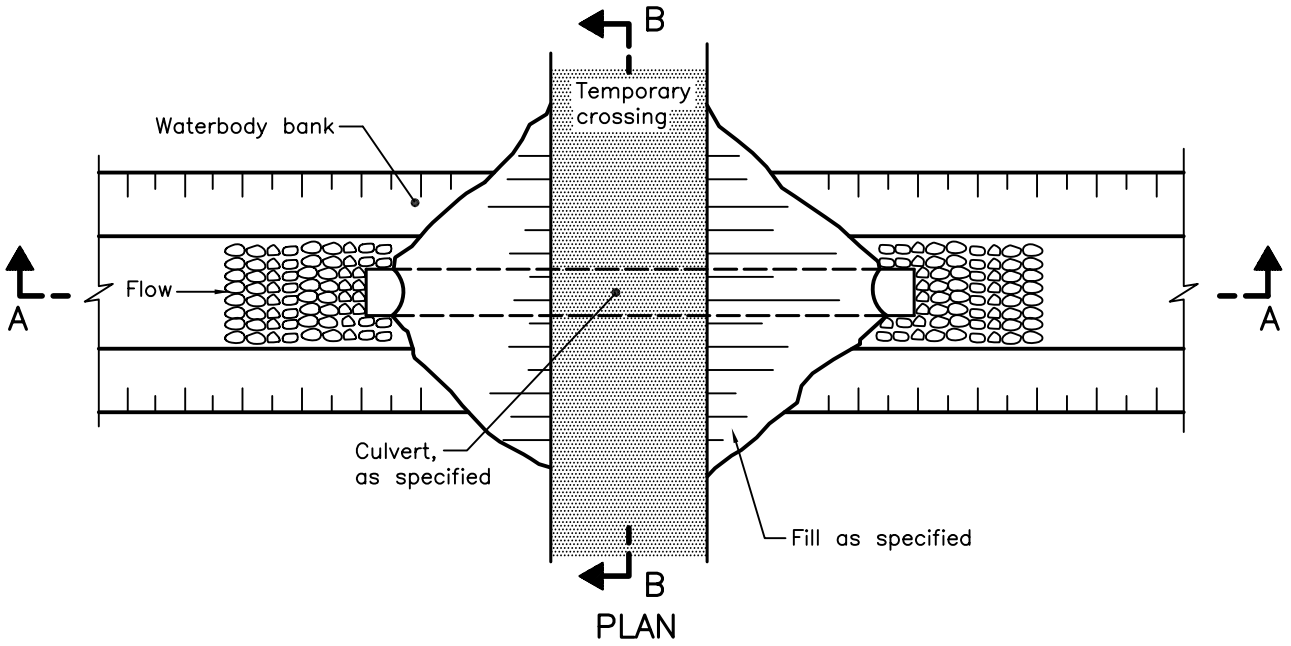
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

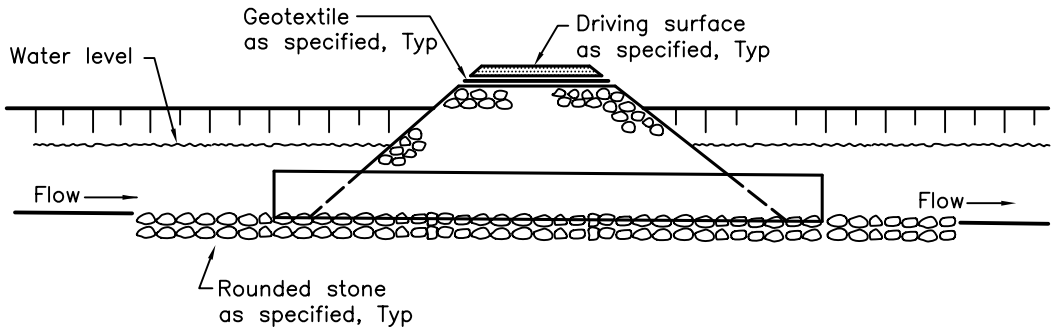
TEMPORARY WATER PASSAGE SYSTEM

# TEMPORARY CHANNEL OR CULVERT OUTSIDE WATERCOURSE

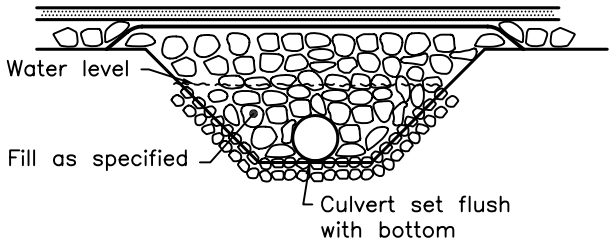
OPSD – 221.030




PLAN




SECTION A–A




SECTION B–B

NOTE:

A Approaches to the temporary crossing shall be clearly marked

B Schematic only.

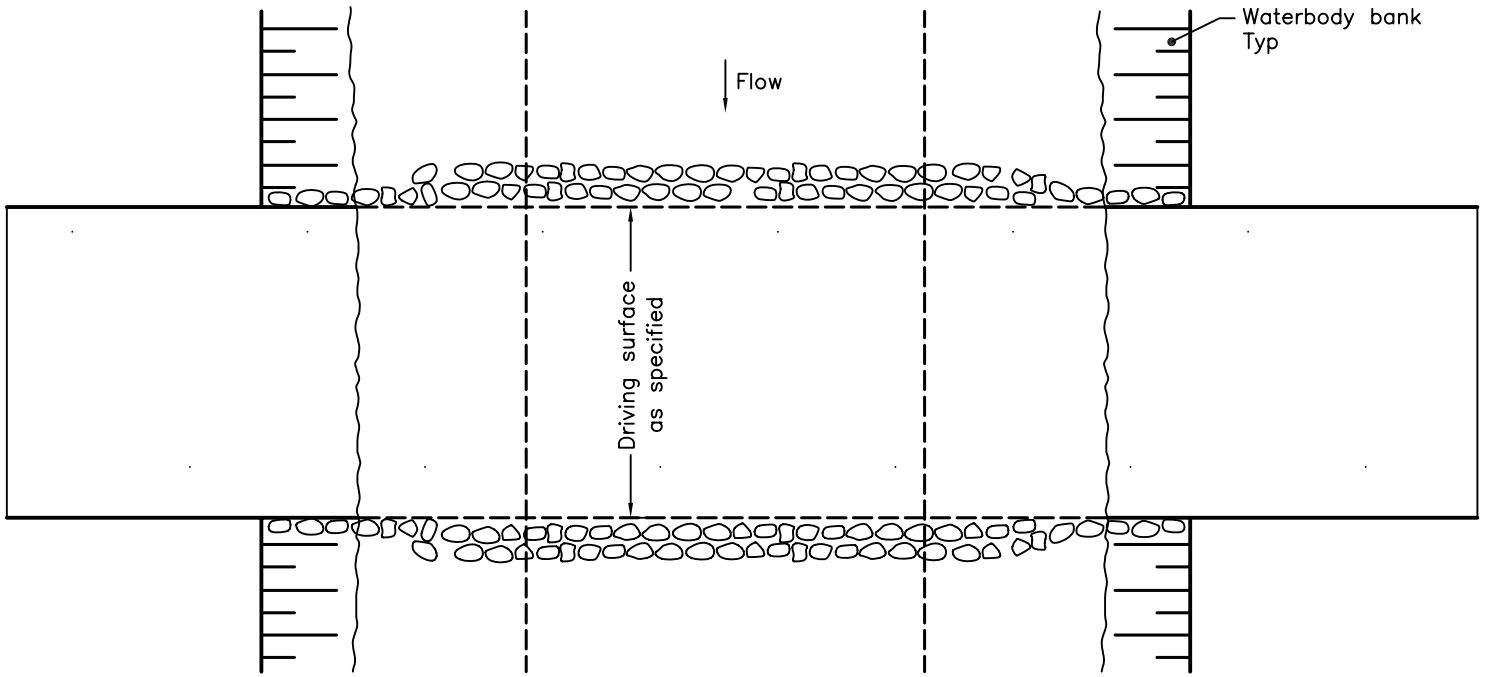
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

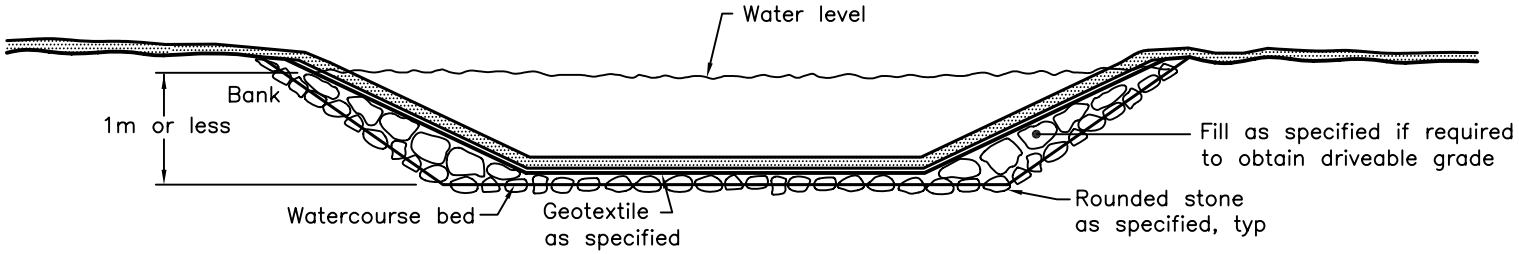
TEMPORARY WATERBODY CROSSING

# FILL AND CULVERT

OPSD – 221.040




PLAN VIEW



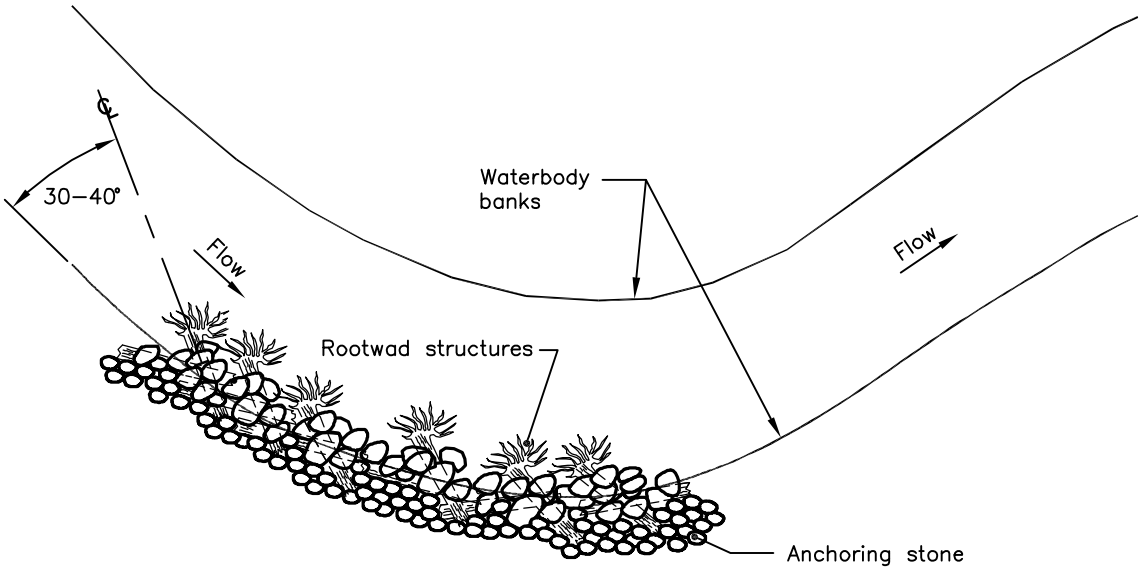

PROFILE VIEW

NOTE:

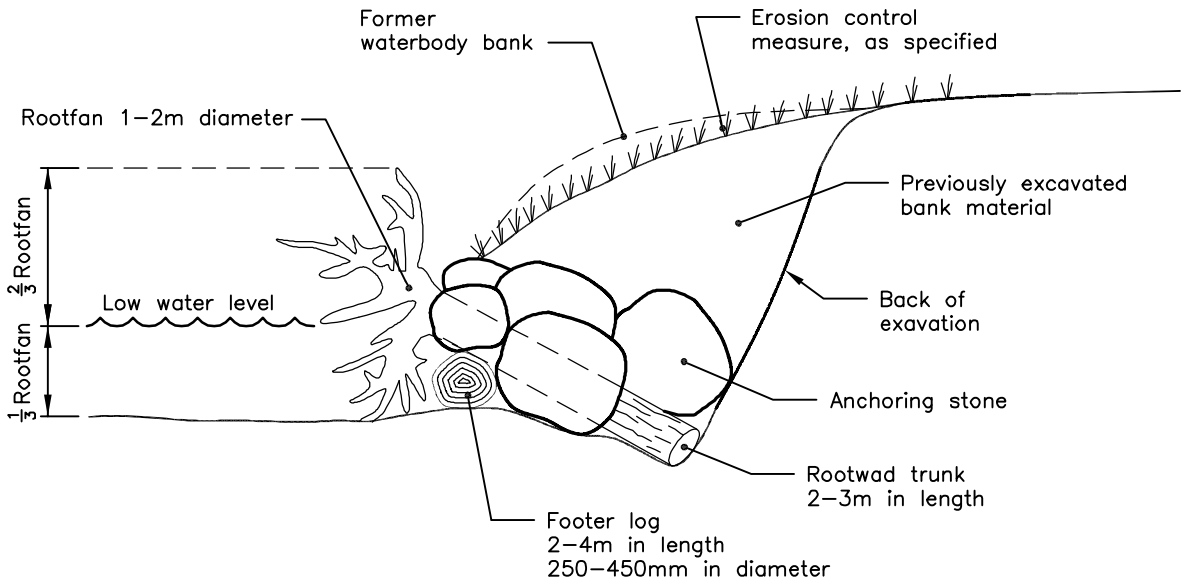
A Approaches to the temporary crossing shall be clearly marked

B Schematic only.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2000 | Rev | 0 |
|---|---|---|---|
| TEMPORARY WATERBODY CROSSING<br>**FORD** | | | |
| | **OPSD – 221.050** | | |




**PLAN**
**LOW WATER LEVEL**

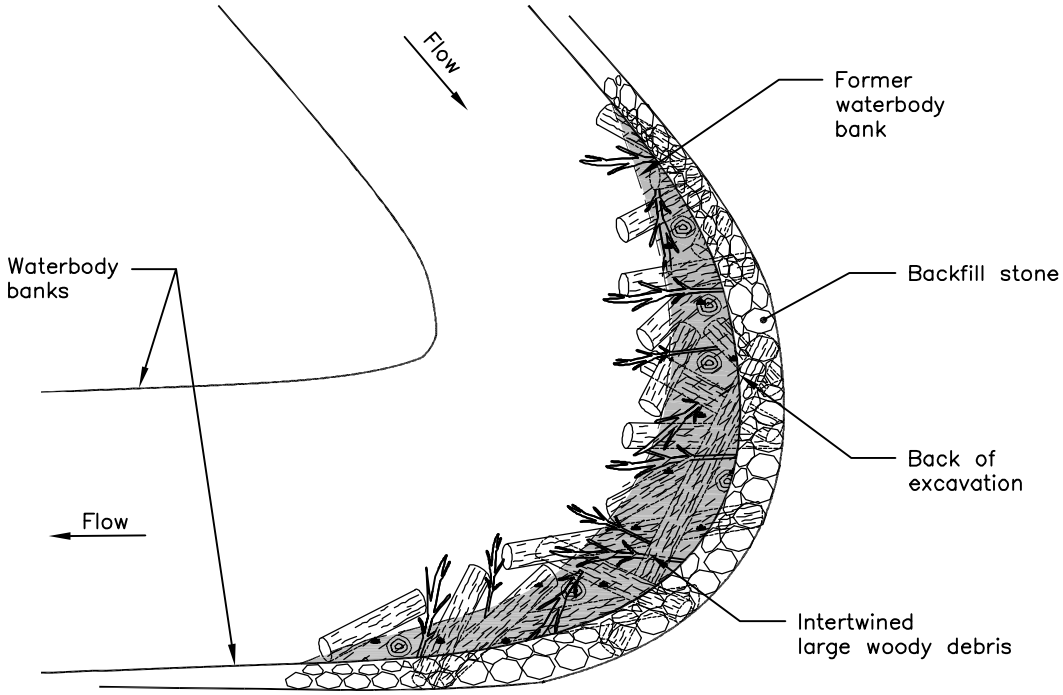



**SECTION**

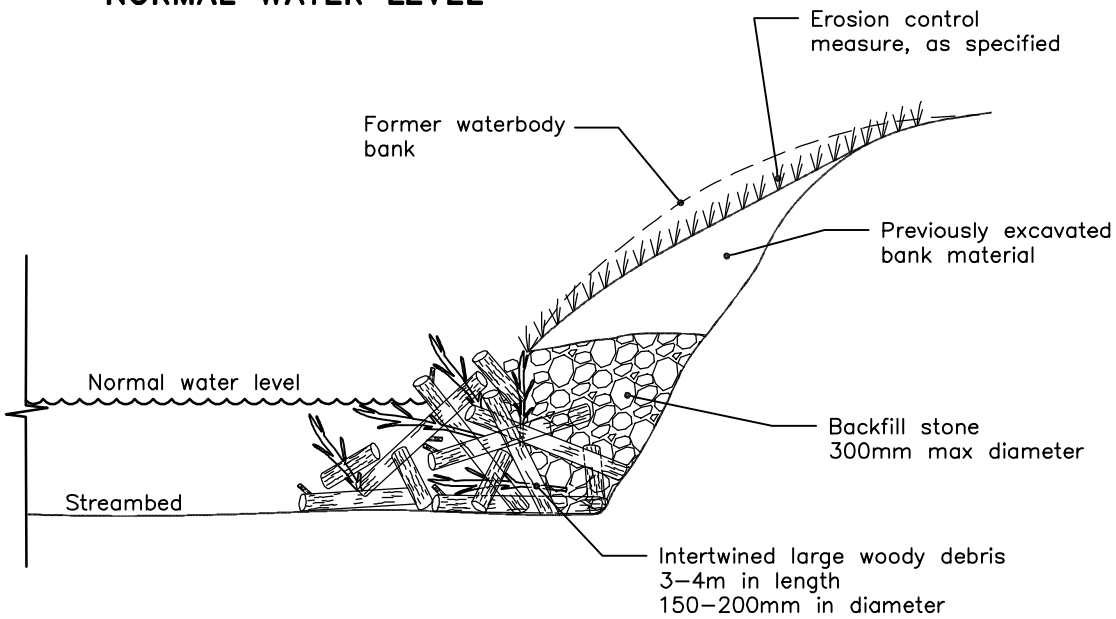
NOTE:

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 1 |
|---|---|---|---|
| ROOTWAD STRUCTURES FOR WATERBODY BANKS | | | |
| | OPSD 222.010 | | |



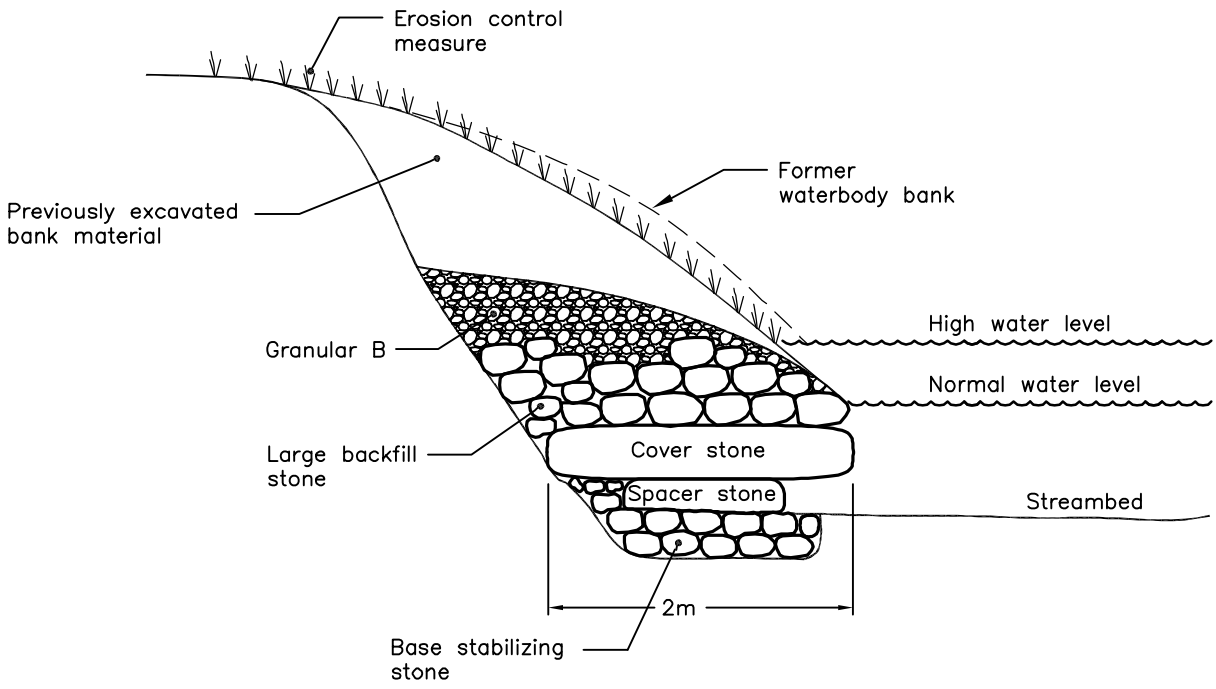

**PLAN**
**NORMAL WATER LEVEL**



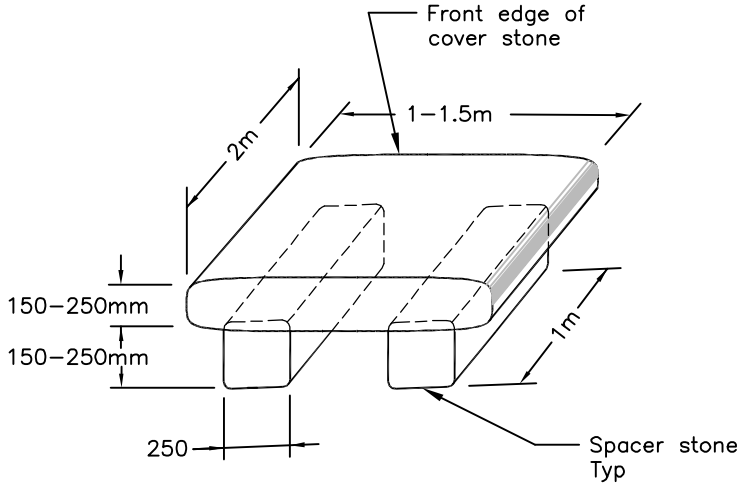

**SECTION**

NOTE:
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| LARGE WOODY DEBRIS FOR WATERBODY BANKS | | | |
| | OPSD 222.020 | | |




**SECTION**



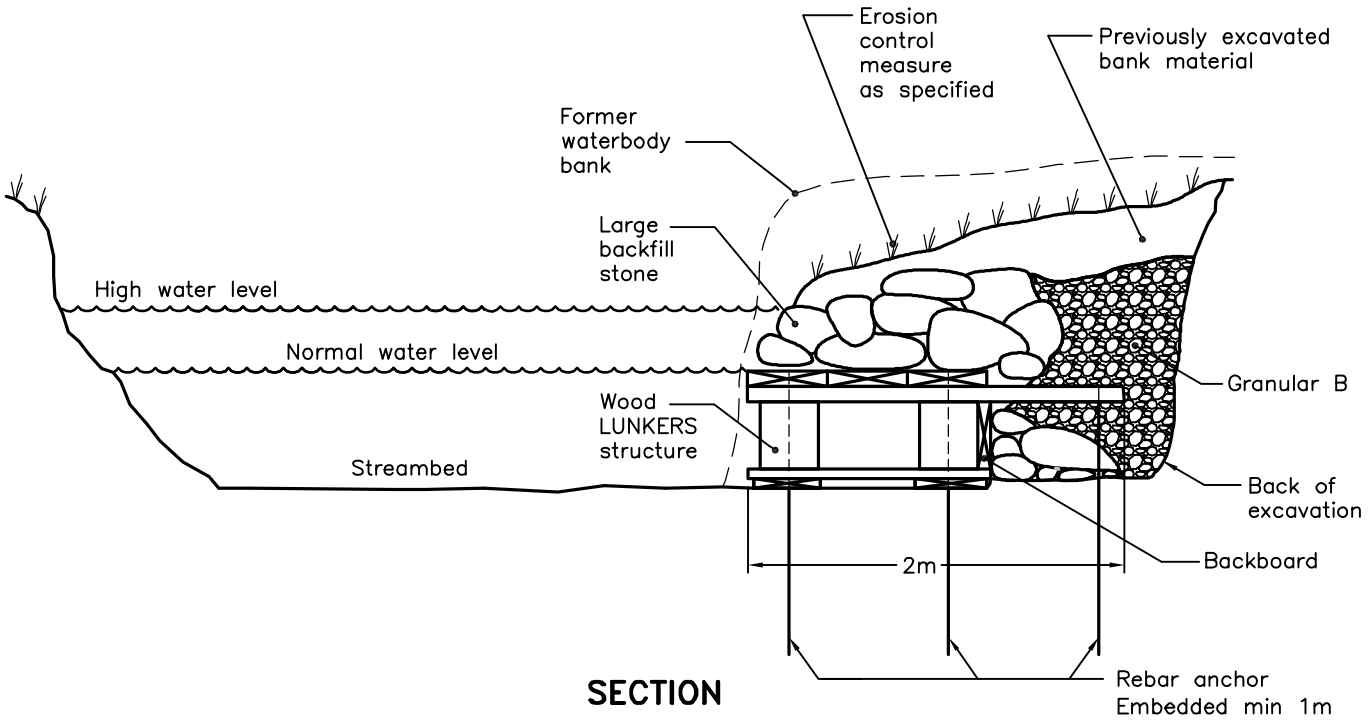

**SCHEMATIC OF COVER STONE AND SPACER STONE SUPPORTS**

NOTES:

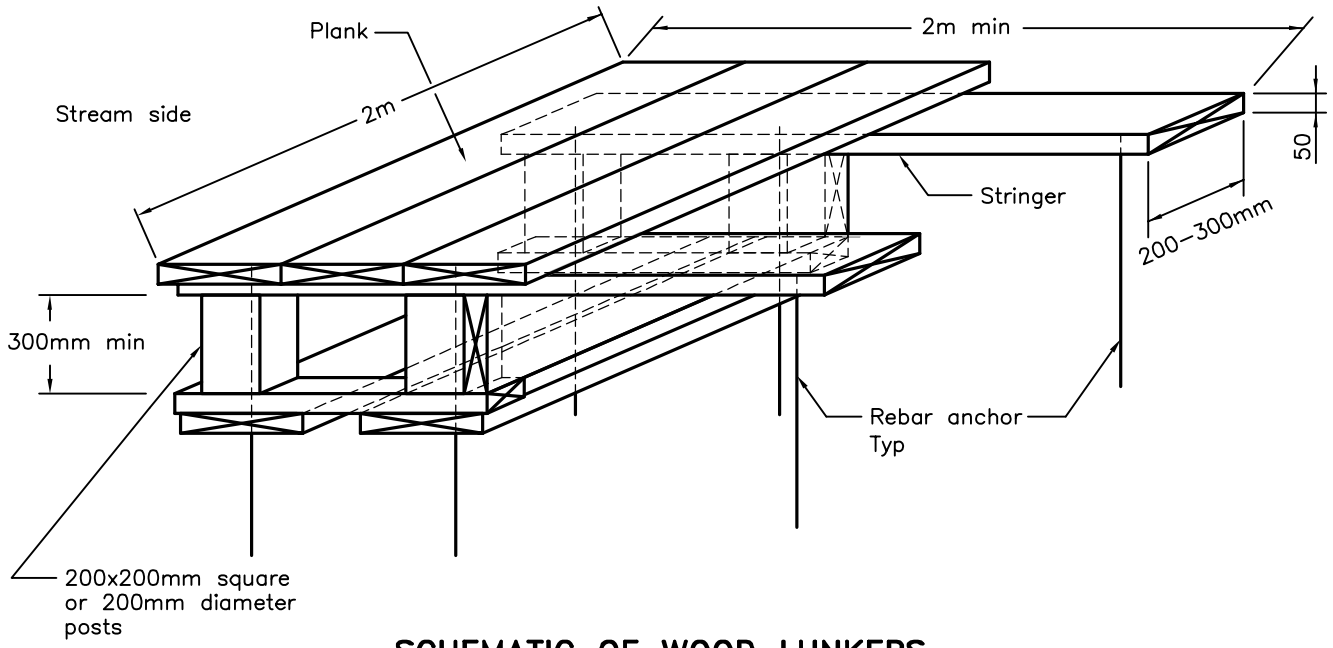
A Sound rock shall be placed so that there is solid contact and no movement.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| STONE LUNKERS | | | |
| | OPSD 222.030 | | |




**SECTION**



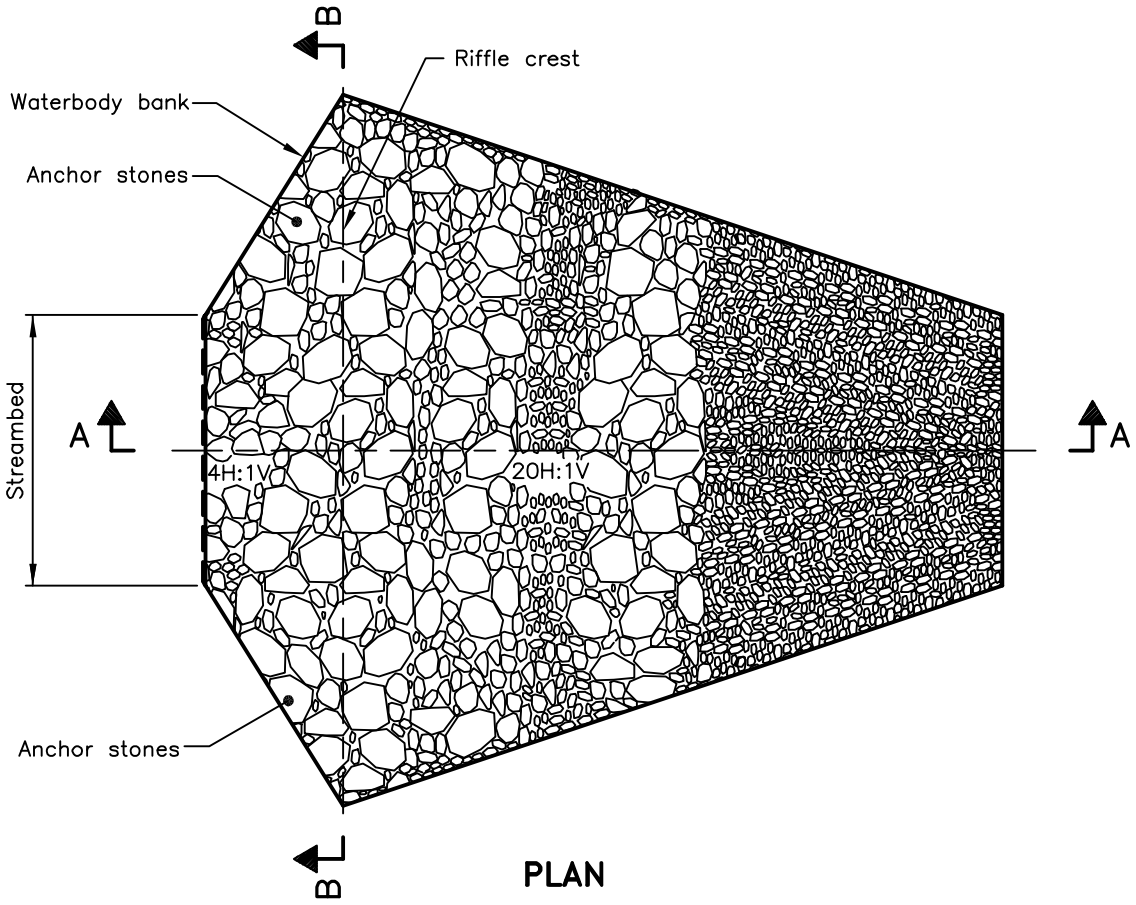

**SCHEMATIC OF WOOD LUNKERS**

NOTES:

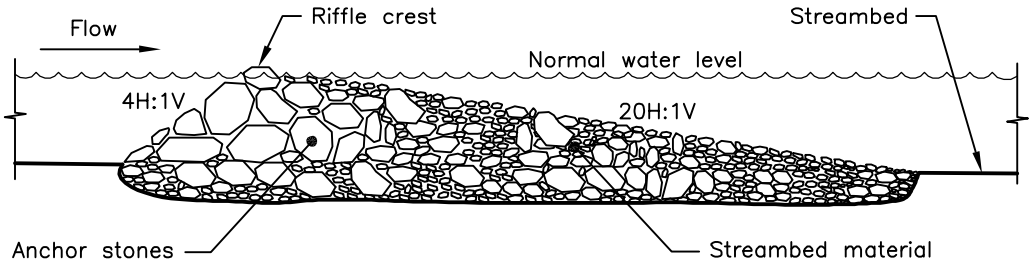
A All lumber sizes are nominal.

B All dimensions are in millimetres unless otherwise shown.

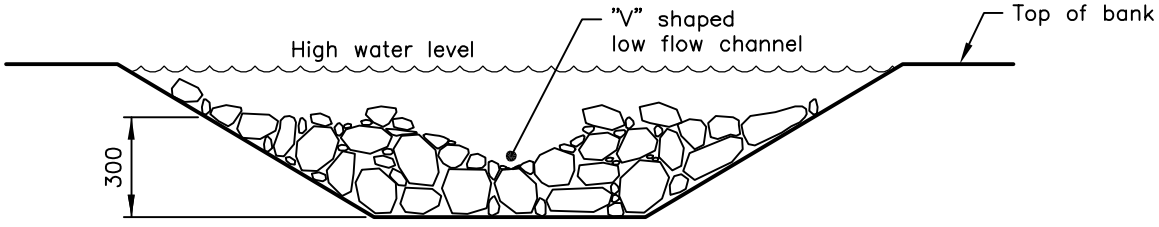
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| WOOD LUNKERS | | | |
| | OPSD 222.040 | | |




PLAN




SECTION A–A

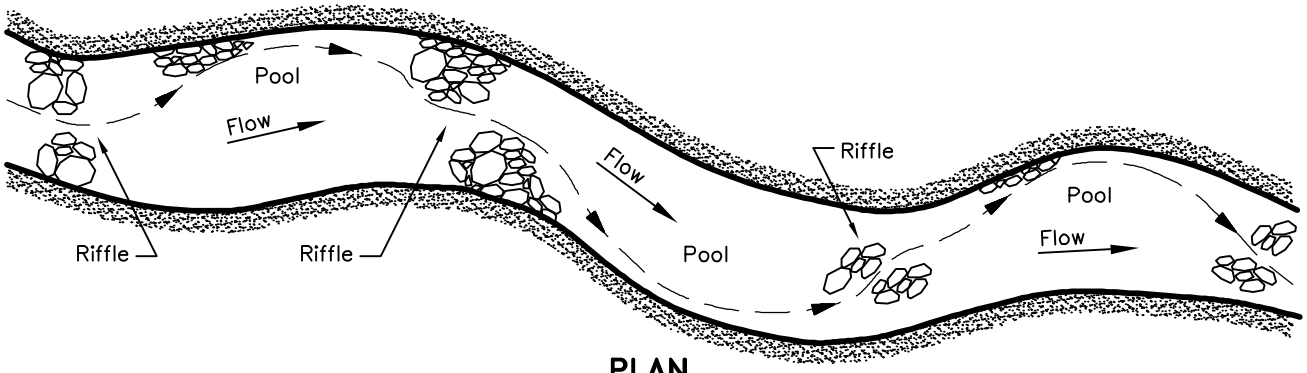



SECTION B–B

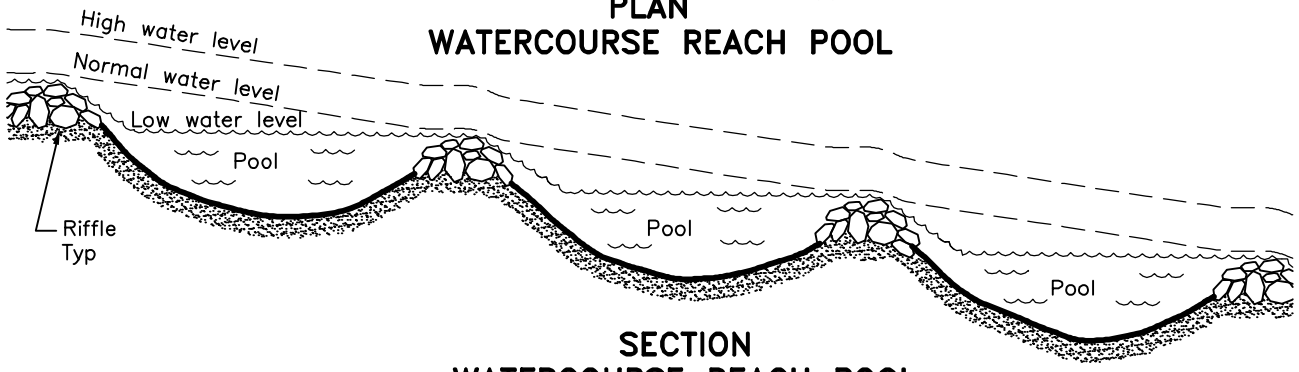
NOTES:

A All dimensions are in millimetres unless otherwise shown.

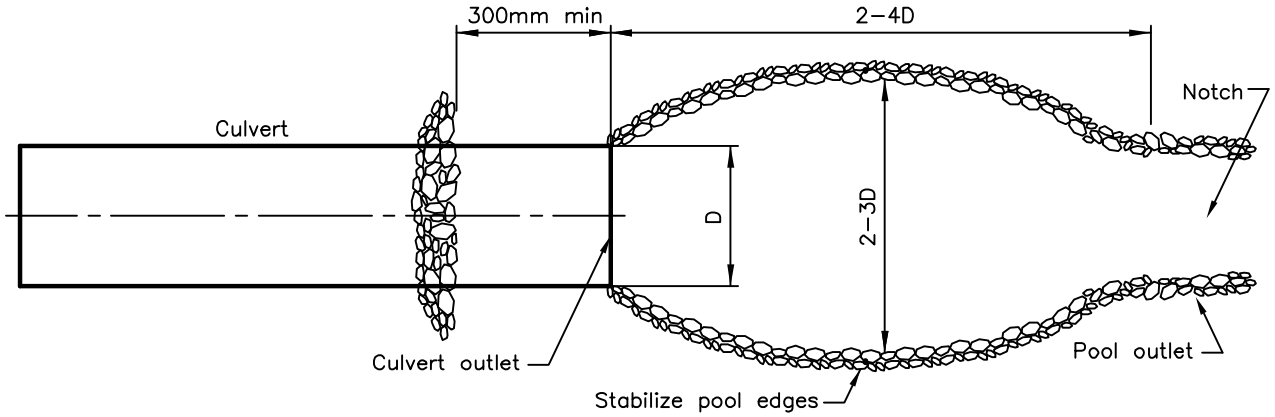
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| RIFFLES ON STREAMBEDS | | | |
| | OPSD 222.050 | | |



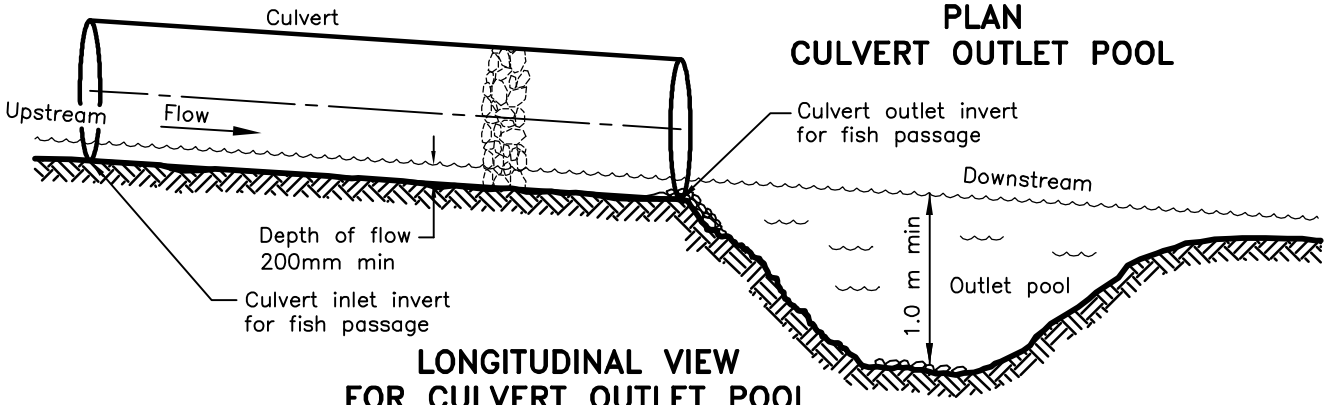

PLAN
WATERCOURSE REACH POOL




SECTION
WATERCOURSE REACH POOL




PLAN
CULVERT OUTLET POOL

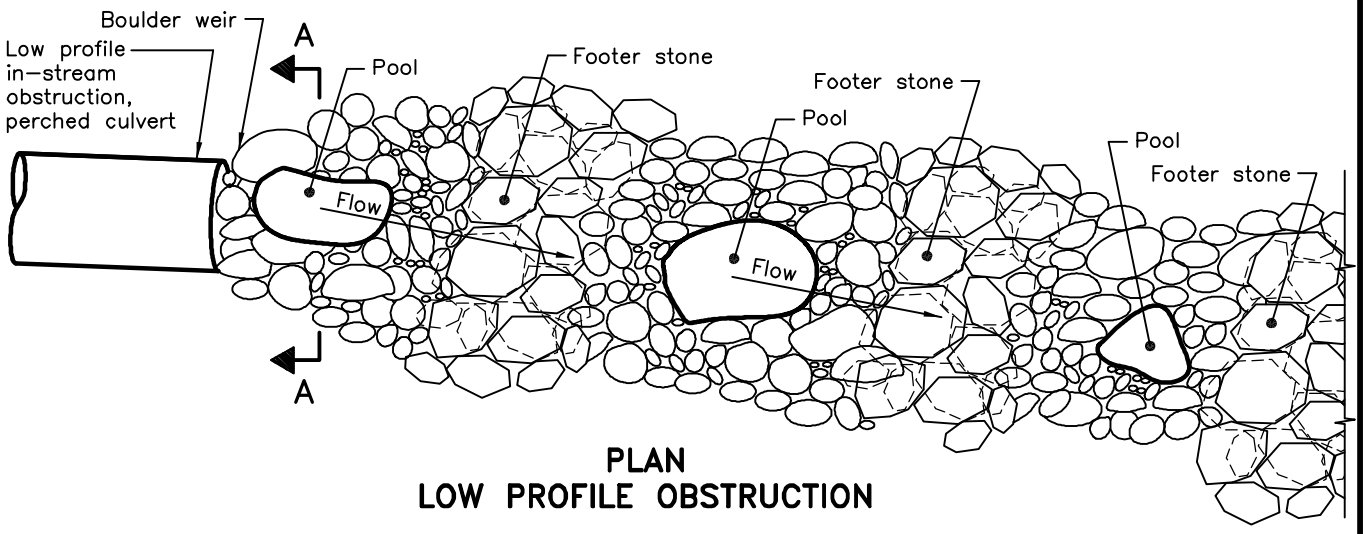



LONGITUDINAL VIEW
FOR CULVERT OUTLET POOL

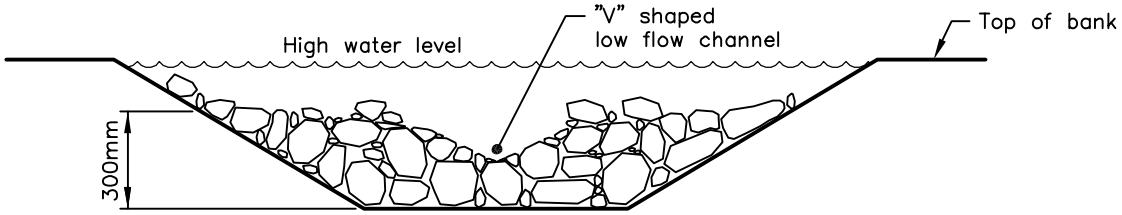
NOTES:

A All dimensions are in millimetres unless otherwise shown.

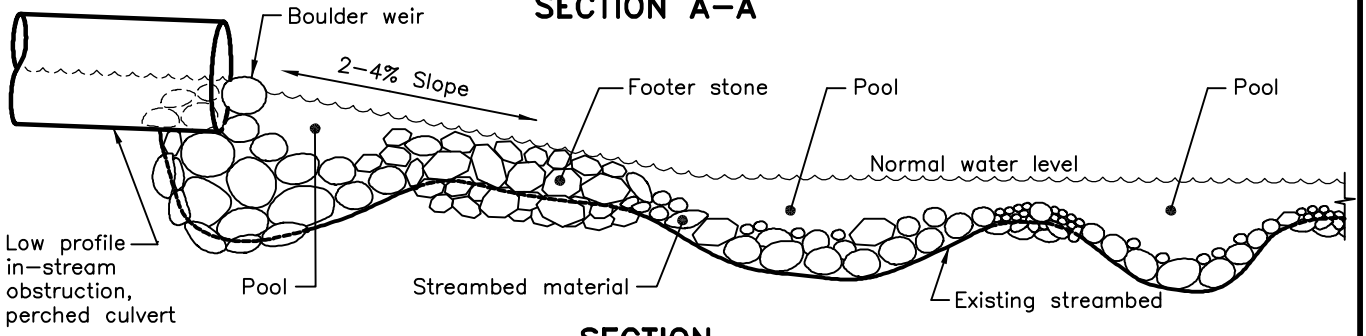
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| POOLS IN STREAMBEDS | | | |
| | OPSD 222.060 | | |



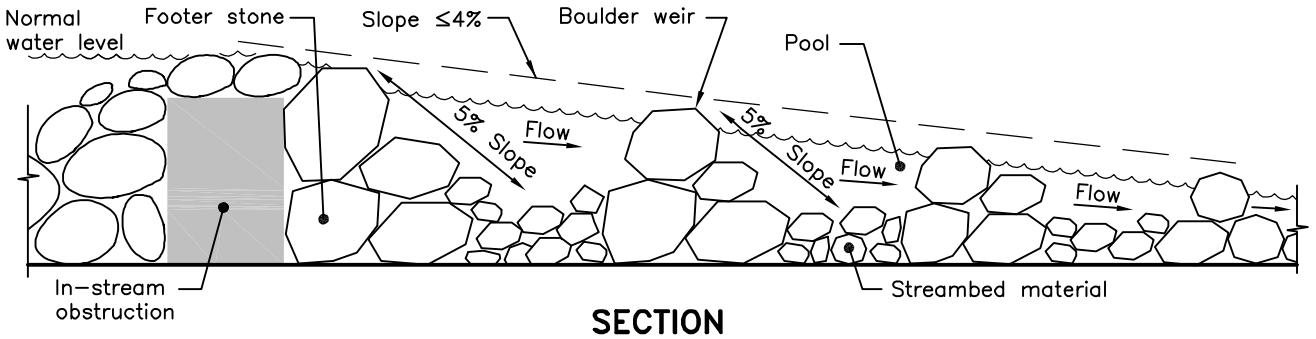

**PLAN**
**LOW PROFILE OBSTRUCTION**




**SECTION A–A**




**SECTION**
**LOW PROFILE OBSTRUCTION**

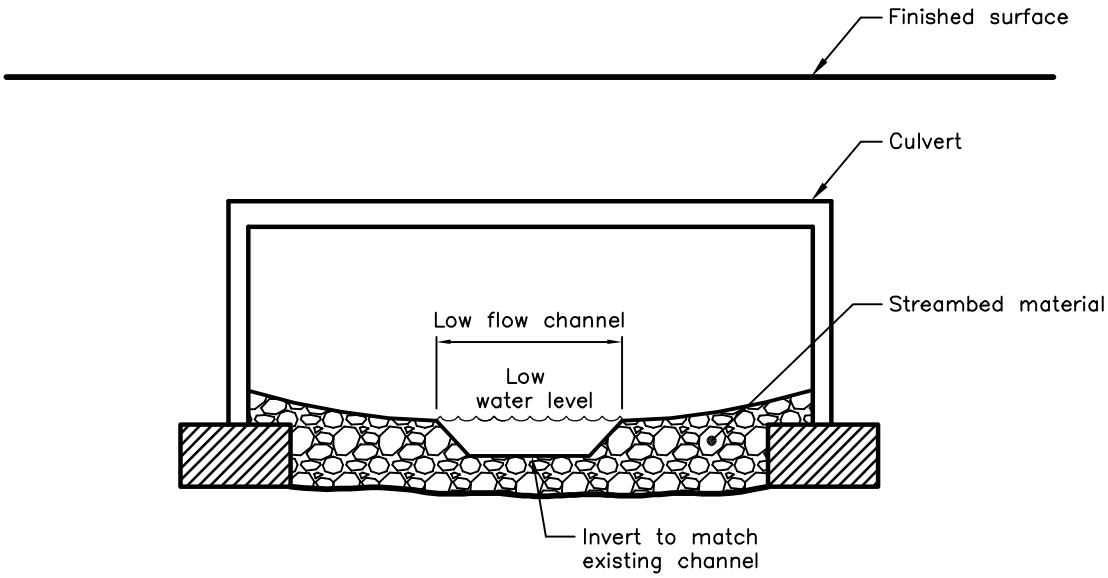



**SECTION**
**HIGH PROFILE OBSTRUCTION**

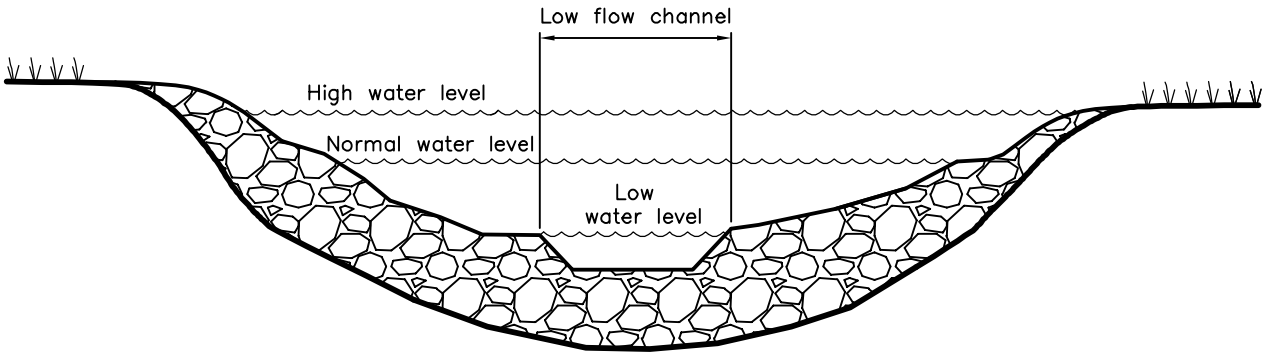
NOTES:

A A low flow channel shall extend the length of the rocky ramp and have a slope of ≤4%.
B The channel side slopes on the rocky ramp shall be ≤3%.
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| **ROCKY RAMPS ON STREAMBEDS** | | | |
| | **OPSD 222.070** | | |

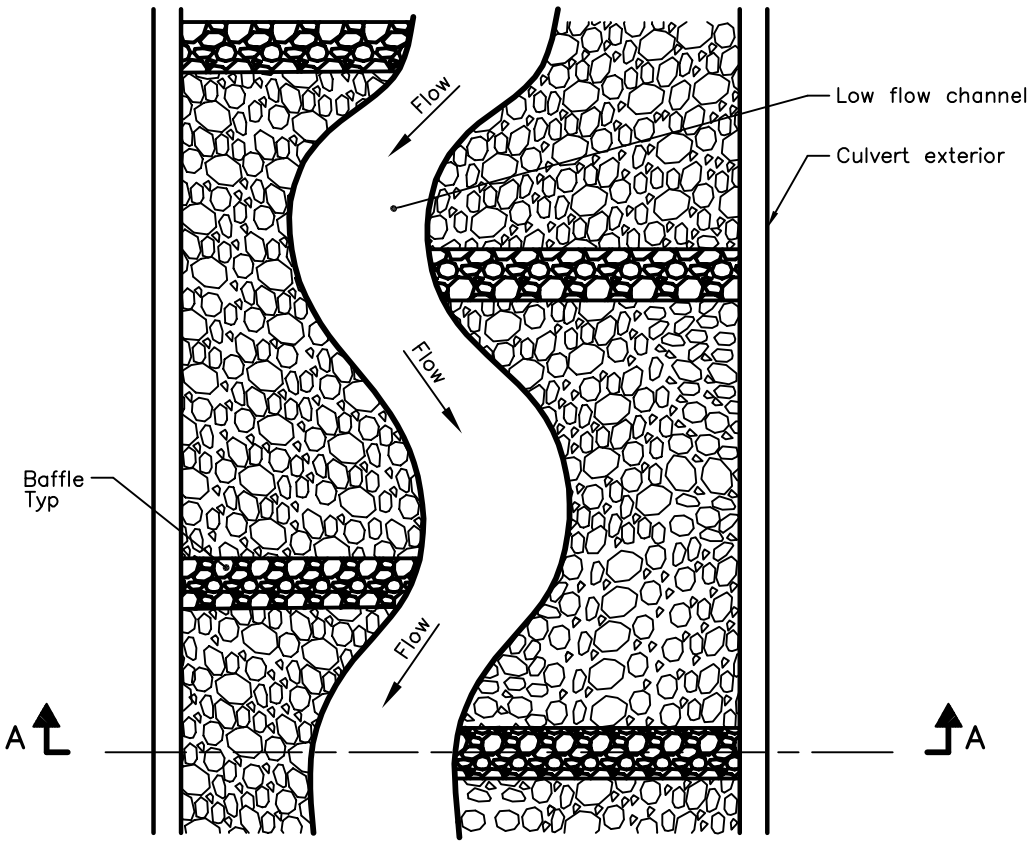



**SECTION**
**LOW FLOW CHANNEL INSIDE OF CULVERT**

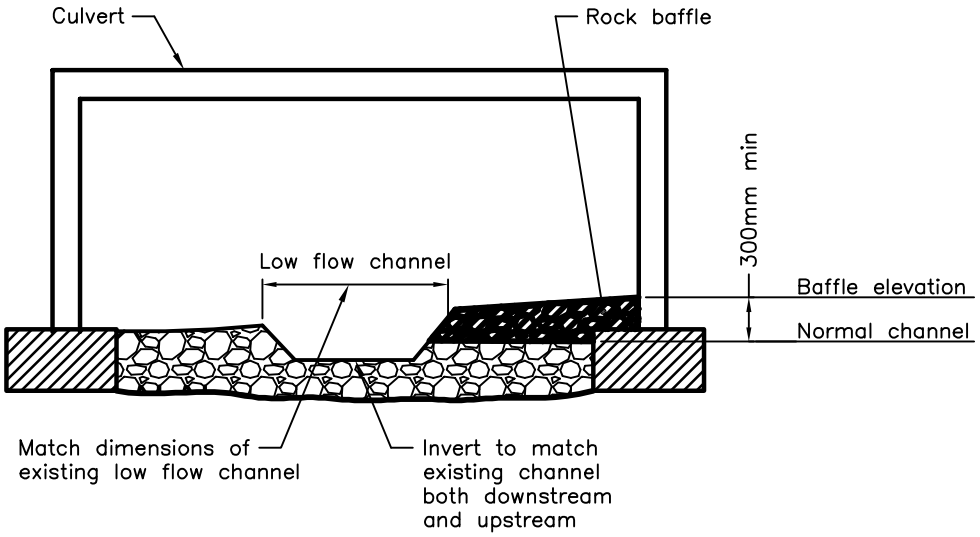



**SECTION**
**LOW FLOW CHANNEL**

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| LOW FLOW CHANNEL | | | |
| | OPSD 222.080 | | |




**PLAN**

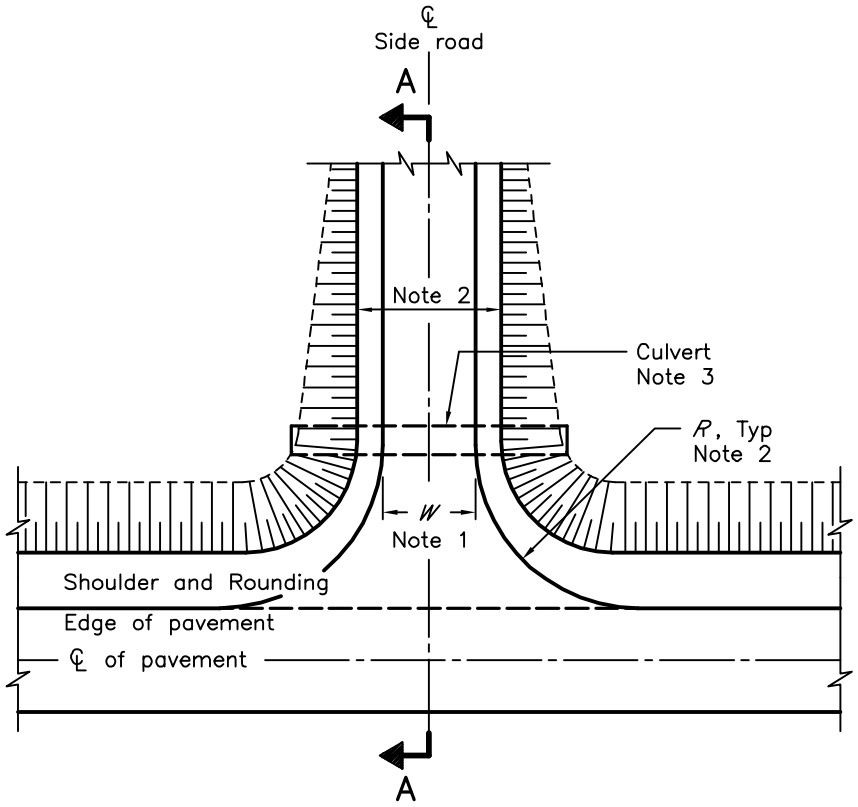



**SECTIONAL A–A**

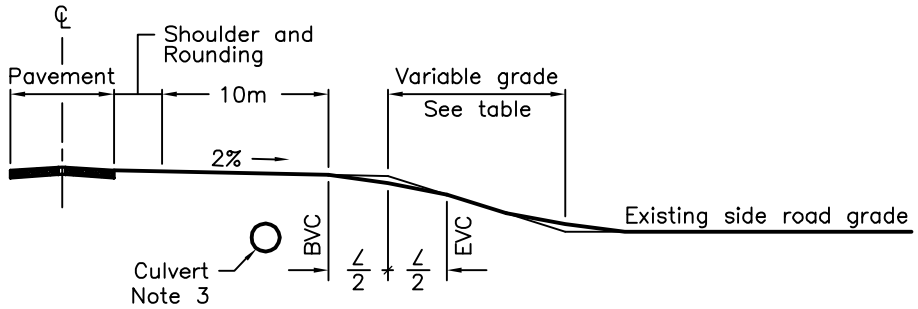
NOTES:

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| BAFFLES IN A CULVERT | | | |
| | OPSD 222.090 | | |




**PLAN**




**SECTION A–A**

| GRADE TABLE | |
|---|---|
| Downgrade % | ℓ m |
| 3 | 4 |
| 4 | 8 |
| 5 | 12 |
| 6 | 16 |
| 7 | 20 |
| 8 | 24 |
| 9 | 28 |
| Max 10 | 32 |

NOTES:

1 When curb and gutter is specified, *W* shall be 8.5m minimum.
Taper to existing pavement width at 1:25 along each pavement edge.

2 Side road radii and pavement and shoulder widths shall be as specified.

3 Culvert type, dimensions, and location shall be as specified.

A All dimensions are in millimetres unless otherwise shown.

LEGEND:

ℓ – Length of vertical curve
*R* – Side road radius
*W* – Pavement width

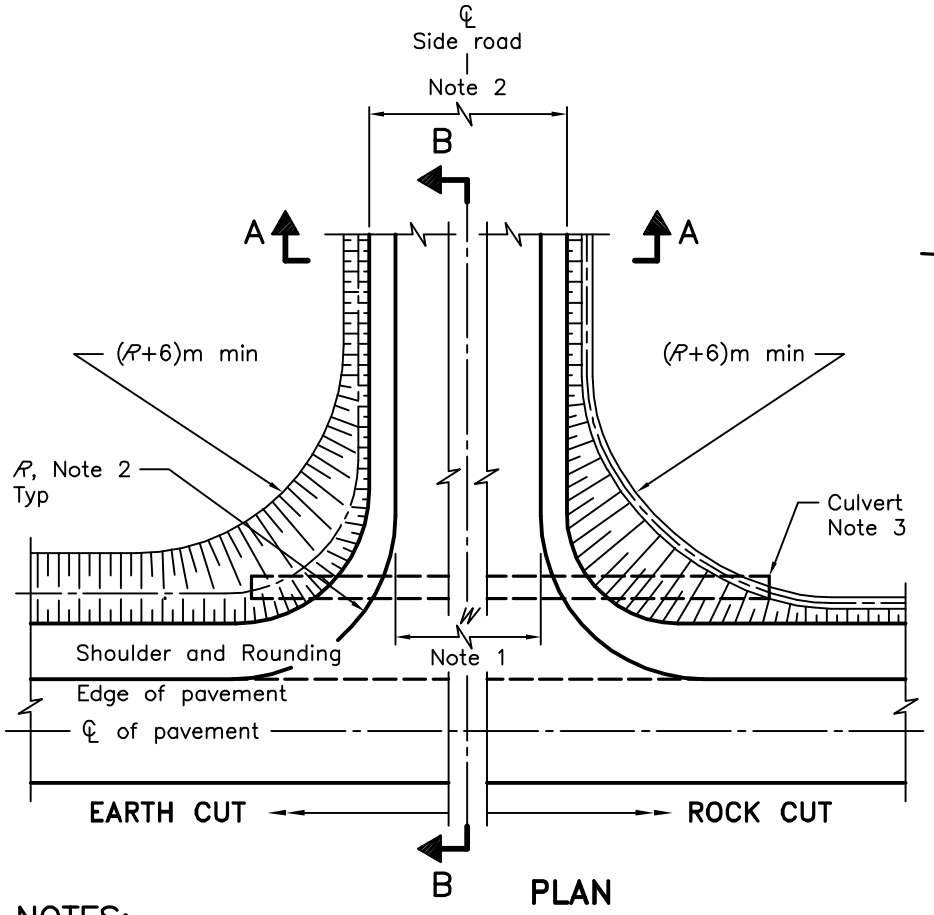
ONTARIO PROVINCIAL STANDARD DRAWING

# SIDE ROAD INTERSECTION

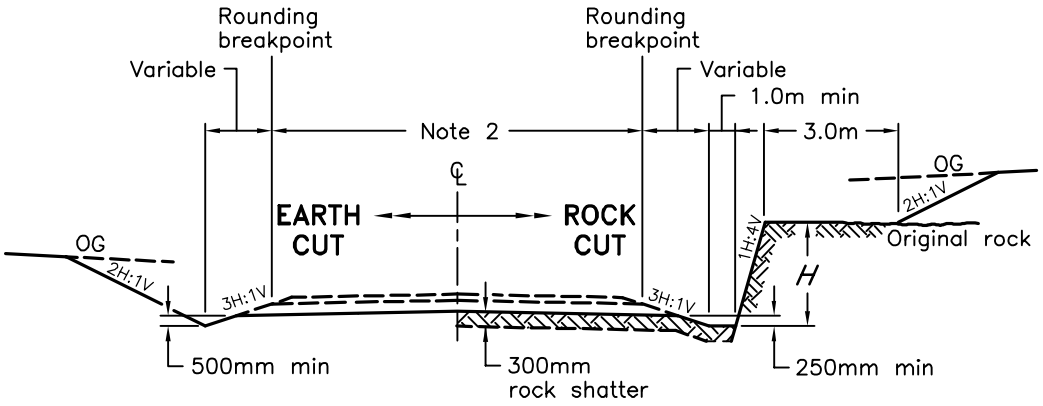
FILL

Nov 2011 | Rev 2

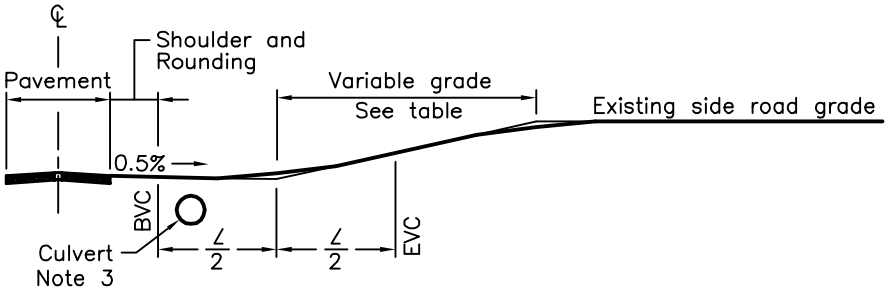
OPSD 300.010




PLAN

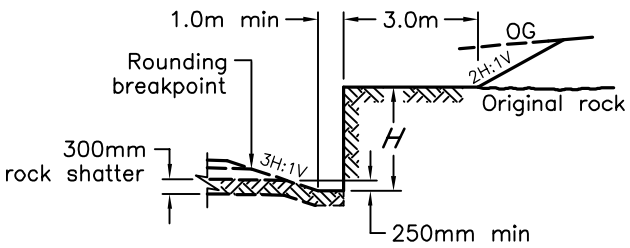



SECTION A–A




SECTION B–B

| GRADE TABLE | |
|---|---|
| Upgrade % | L m |
| 1 | 6 |
| 2 | 10 |
| 3 | 14 |
| 4 | 18 |
| 5 | 22 |
| 6 | 26 |
| 7 | 30 |
| 8 | 34 |
| 9 | 38 |
| Max 10 | 42 |




ALTERNATIVE ROCK CUT DETAIL
when specified

NOTES:

1 When curb and gutter is specified, *W* shall be 8.5m minimum. Taper to existing pavement width at 1:25 along each pavement edge.

2 Side road radii and pavement and shoulder widths shall be as specified.

3 Culvert type, dimensions, and location shall be as specified.

A All dimensions are in millimetres unless otherwise shown.

LEGEND:

*H* – Height of rock face
*L* – Length of vertical curve
*R* – Side road radius
*W* – Pavement width

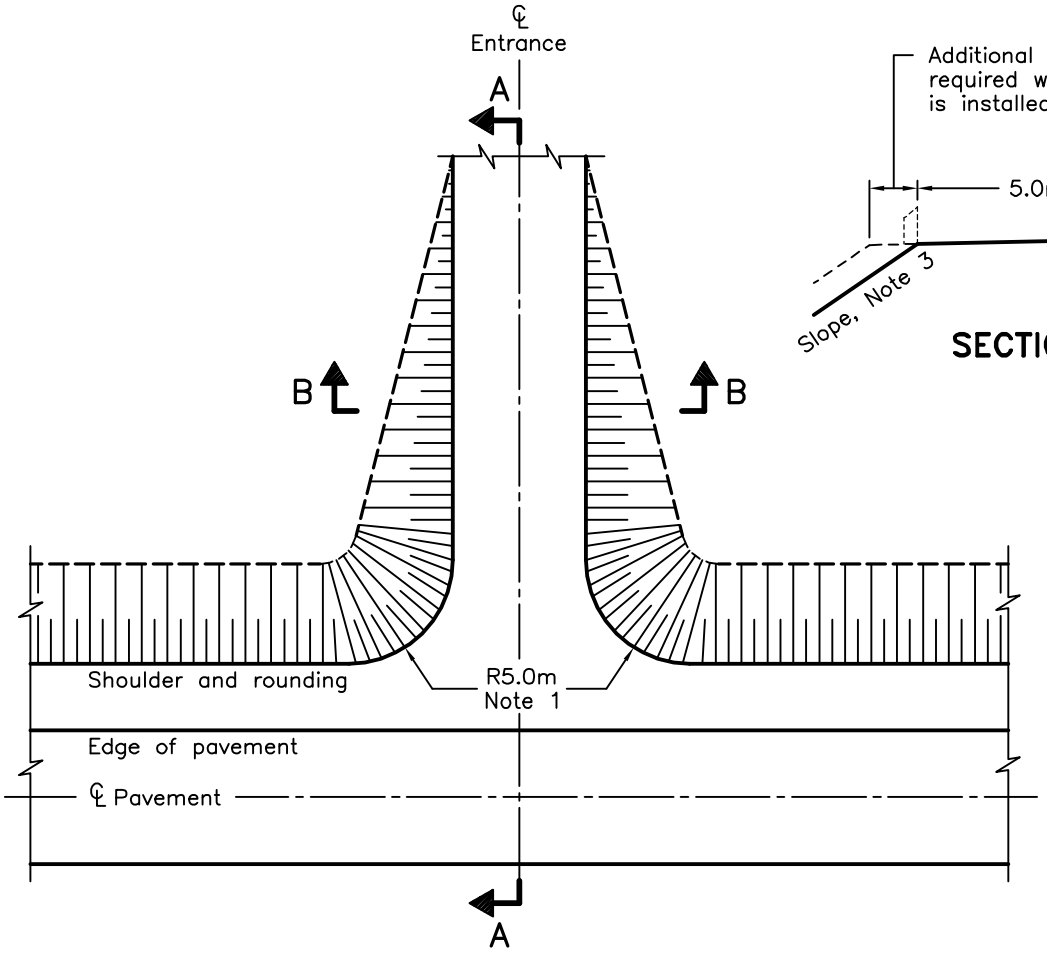
ONTARIO PROVINCIAL STANDARD DRAWING

# SIDE ROAD INTERSECTION

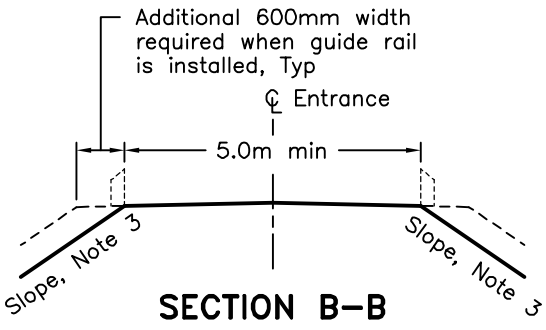
CUT

Nov 2011 | Rev 2

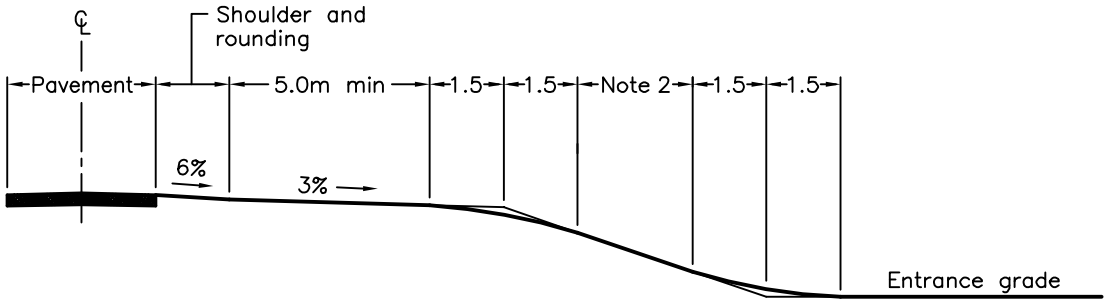
OPSD 300.020




PLAN




SECTION B–B




SECTION A–A

NOTES:

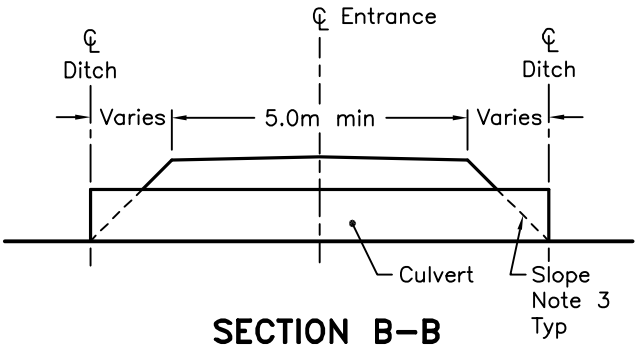
1 Radius shall be 8.0m when entrance is used for farm equipment.

2 Maximum gradient: 6% for residential entrances and 10% for farm and field entrances.

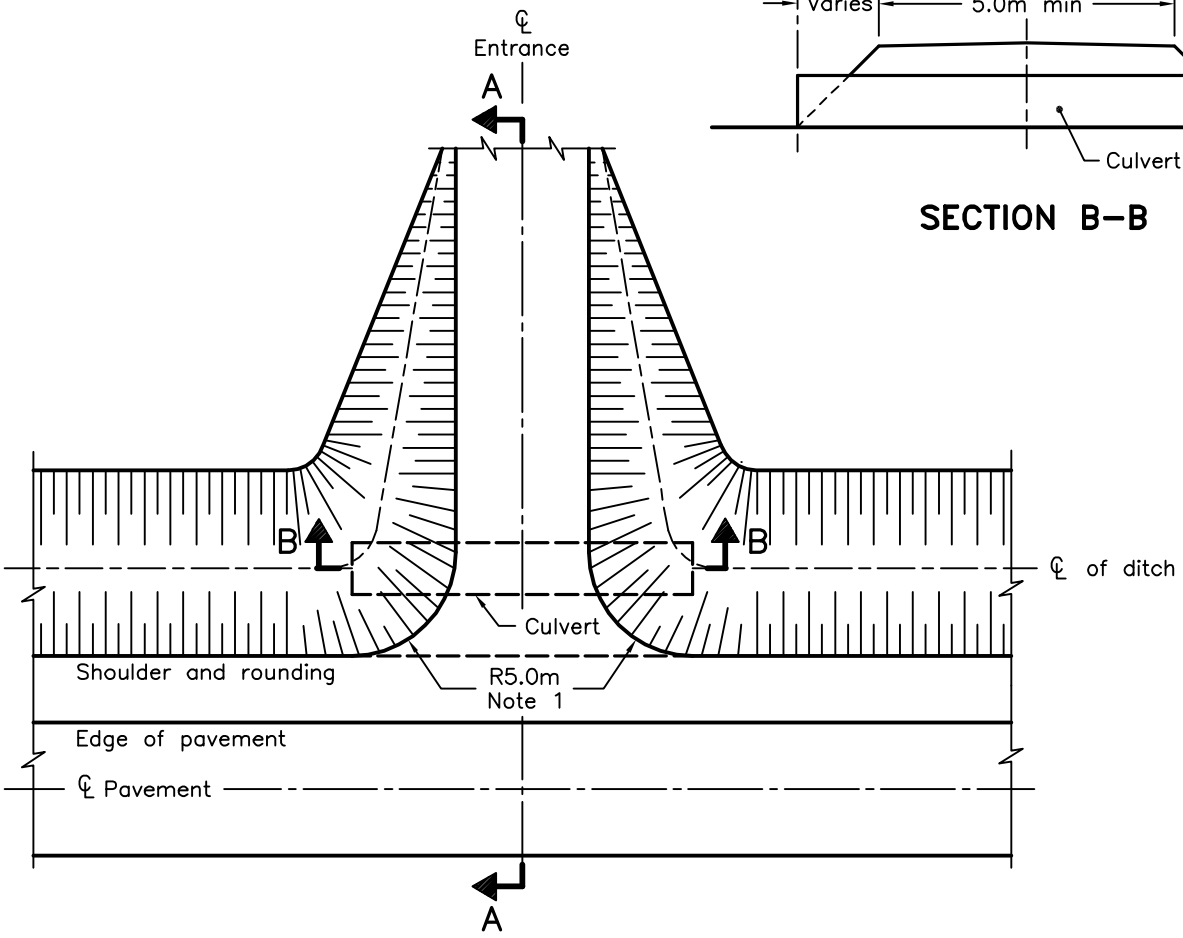
3 Slope shall be 3H:1V or flatter when specified.

A All dimensions are in metres unless otherwise shown.

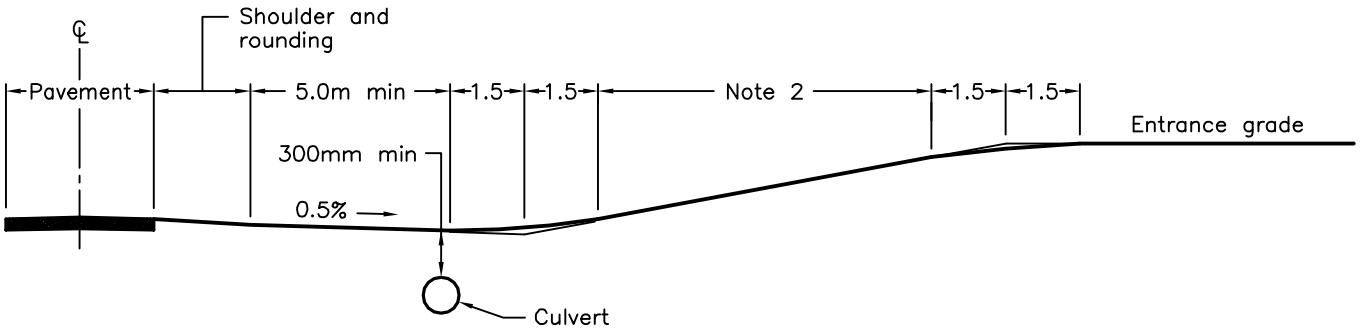
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| RURAL ENTRANCES TO ROADS ON FILL | | | |
| | OPSD 301.010 | | |




**SECTION B–B**




**PLAN**

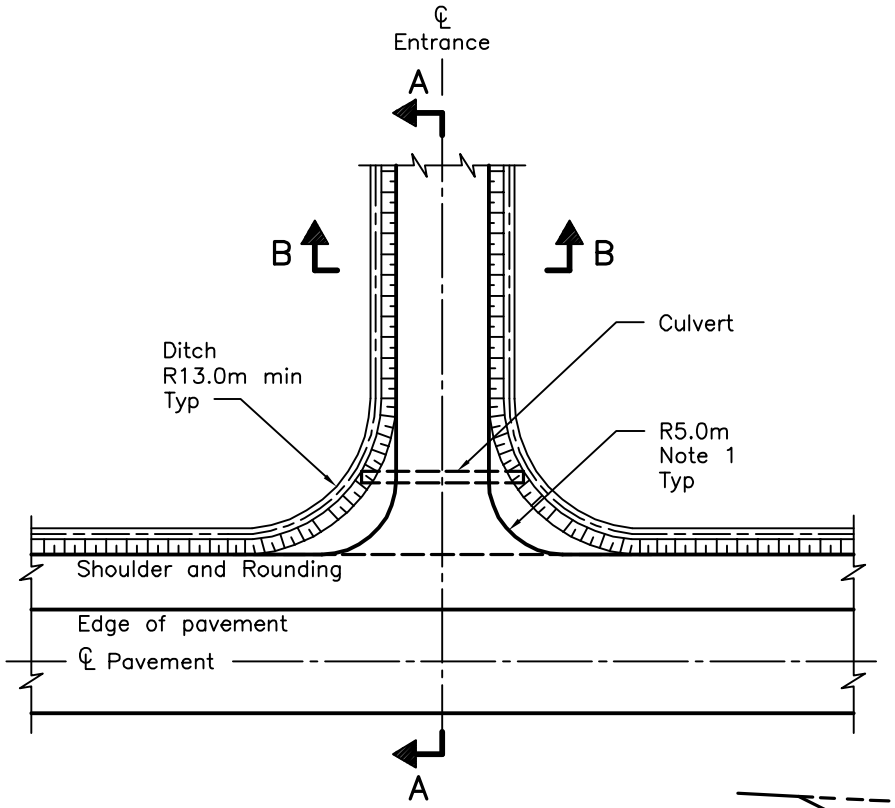



**SECTION A–A**

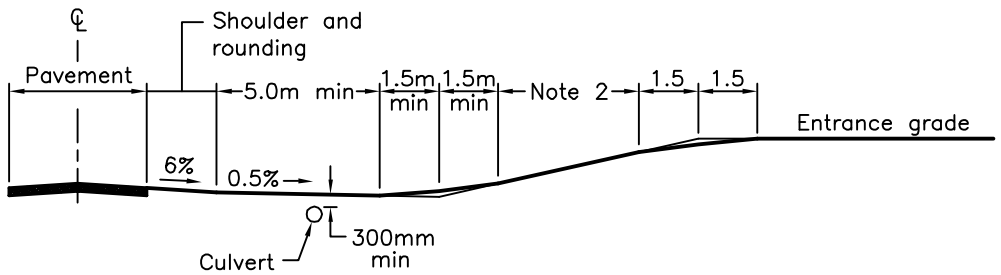
NOTES:

1 Radius shall be 8.0m when entrance is used for farm equipment.
2 Maximum gradient: 6% for residential entrances and 10% for farm and field entrances.
3 Slope shall be 3H:1V or flatter when specified.
A All dimensions are in metres unless otherwise shown.

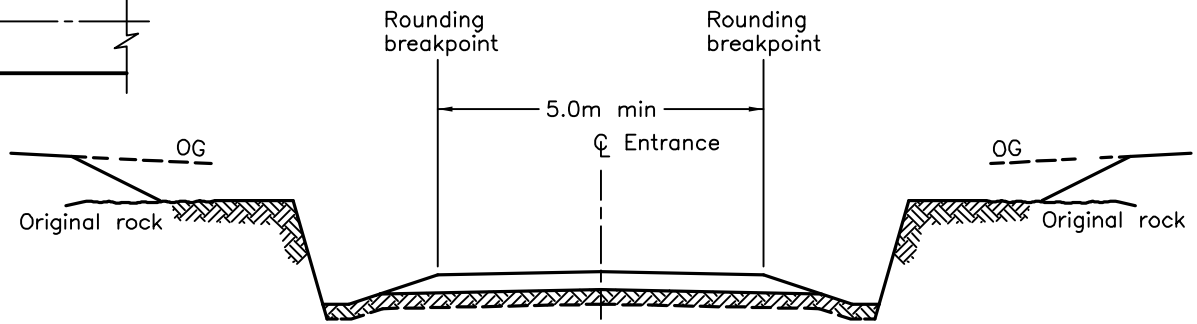
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| **RURAL ENTRANCES TO ROADS IN EARTH CUT** | | | |
| | | | **OPSD 301.020** |




PLAN




SECTION A–A




SECTION B–B
Note 3

NOTES:

1 Radius shall be 8.0m when entrance is used for farm equipment.

2 Maximum gradient: 6% for residential entrances, and 10% for farm and field entrances.

3 For rock grading details see OPSD 201.010.

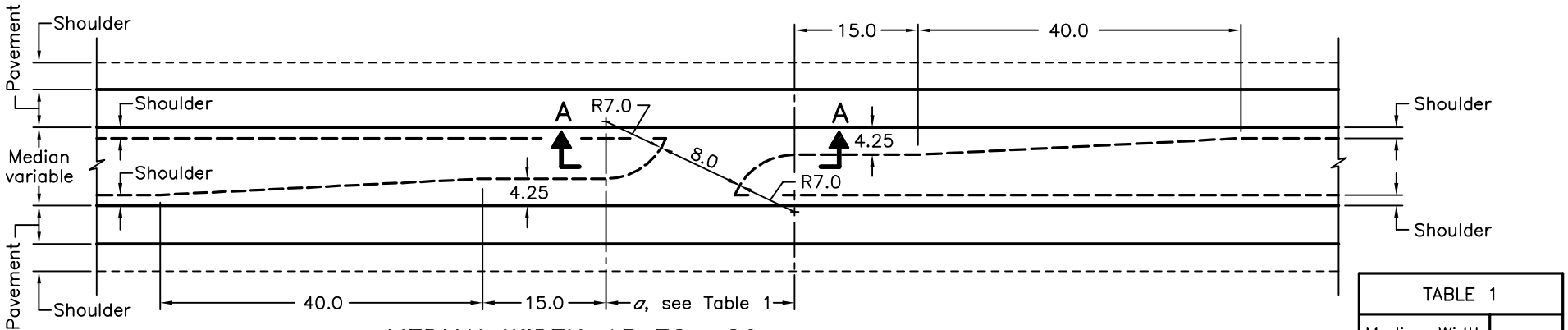
A All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# RURAL ENTRANCE
# ROCK CUT

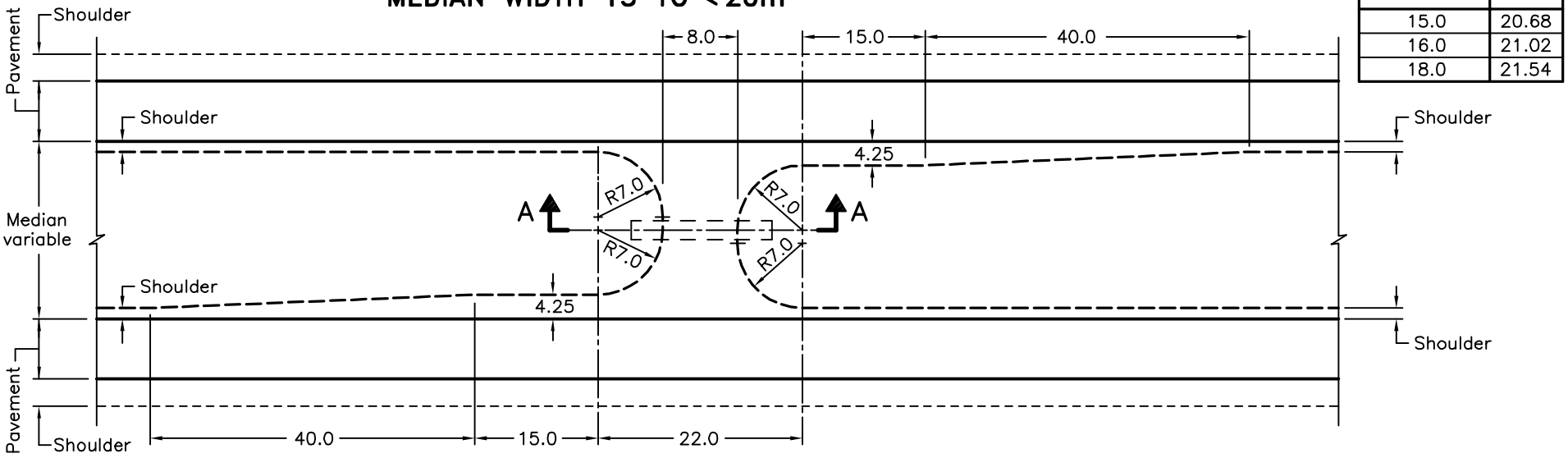
Nov 2010 | Rev 2

OPSD 301.030




**MEDIAN WIDTH 15 TO < 20m**

| TABLE 1 | |
|---|---|
| Median Width | *a* |
| 15.0 | 20.68 |
| 16.0 | 21.02 |
| 18.0 | 21.54 |



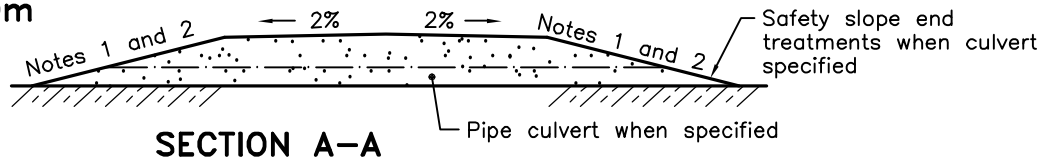

**MEDIAN WIDTH ≥ 20m**

NOTES:

1 Slope shall be 10H:1V without a culvert.
2 Slope shall be 6H:1V with a culvert.

A No signs, guide rails, etc., are to be placed within the turning arc.

B All dimensions are in metres unless otherwise shown.




**SECTION A–A**

ONTARIO PROVINCIAL STANDARD DRAWING

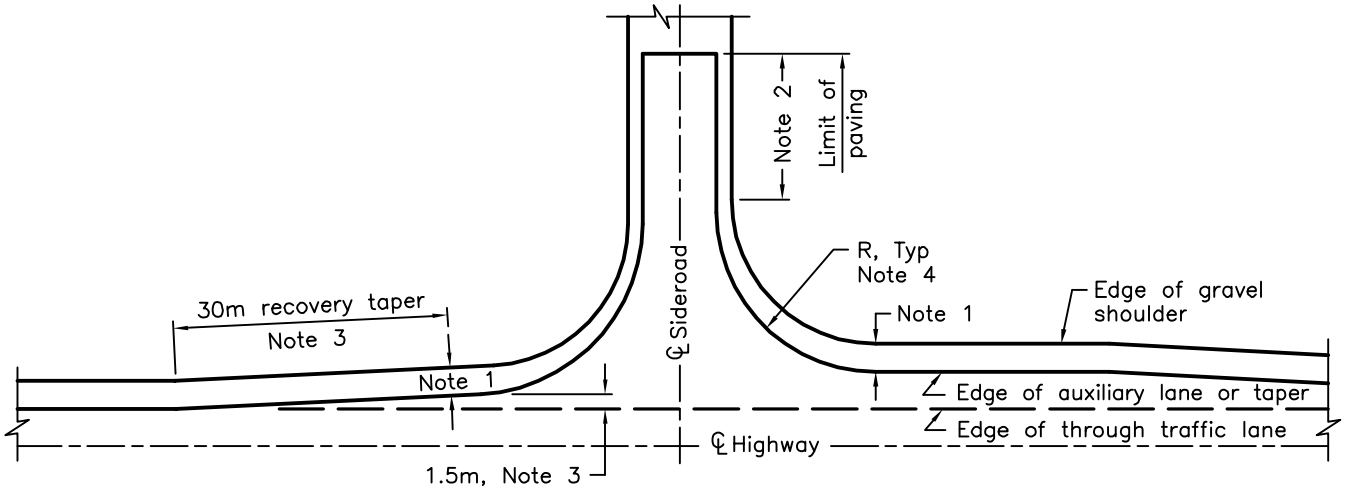
# MEDIAN CROSSOVERS

FOR SERVICE AND EMERGENCY VEHICLES

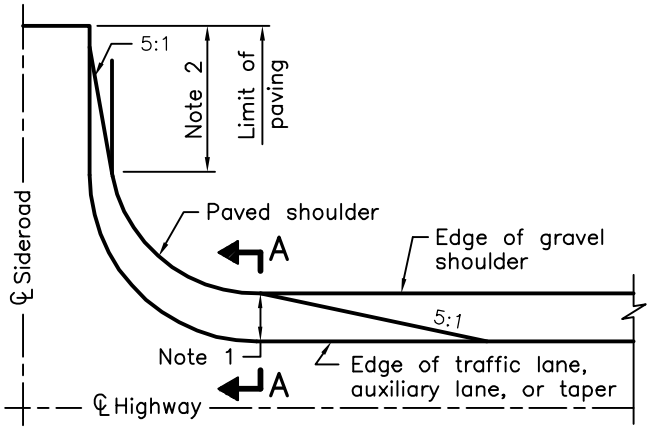
Nov 2015 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

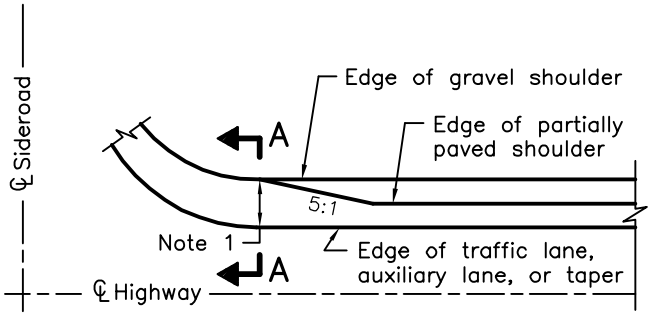
OPSD 302.010




## PLAN A, AUXILIARY LANE OR TAPER – GRAVEL SHOULDER

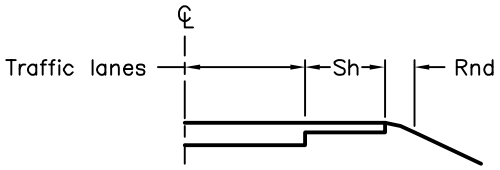



PAVED SHOULDER RADIUS WITH GRAVEL SHOULDER ON HIGHWAY

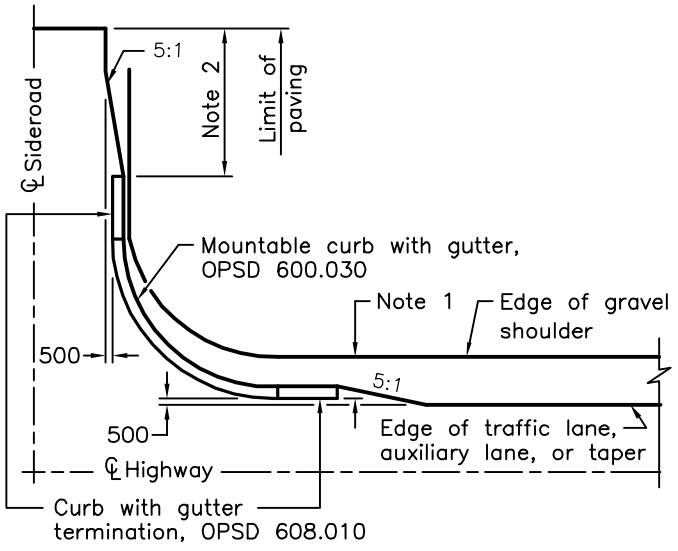



PAVED SHOULDER RADIUS WITH PARTIALLY PAVED SHOULDER ON HIGHWAY

## PLAN B, PAVED SHOULDER OR PARTIALLY PAVED SHOULDER




## SECTION A–A




## PLAN C, CURB AND GUTTER

NOTES:

1 Highway shoulder width tapers to sideroad shoulder width over length of radius.

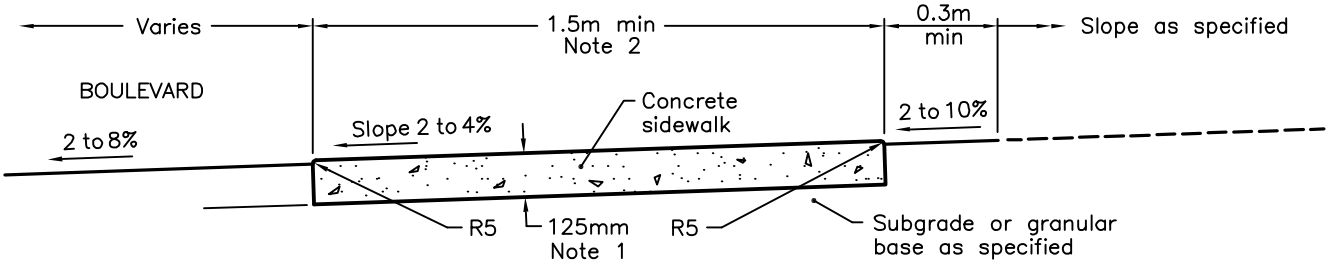
2 For gravel sideroad, distance shall be 15.0m.

3 Recovery taper is required when traffic lanes include auxiliary lane or taper.

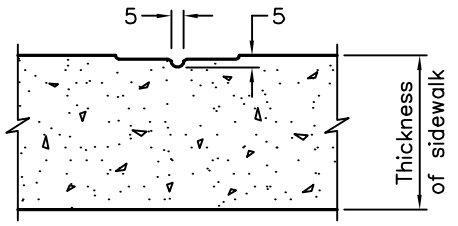
4 Sideroad radii as specified.

A All dimensions are in millimetres unless otherwise shown.

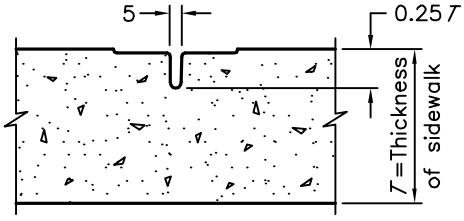
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| # SHOULDER TREATMENT SIDEROAD INTERSECTIONS | | | |
| | | | OPSD 304.010 |



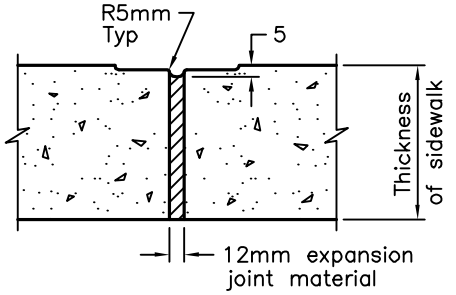

**TYPICAL SECTION**



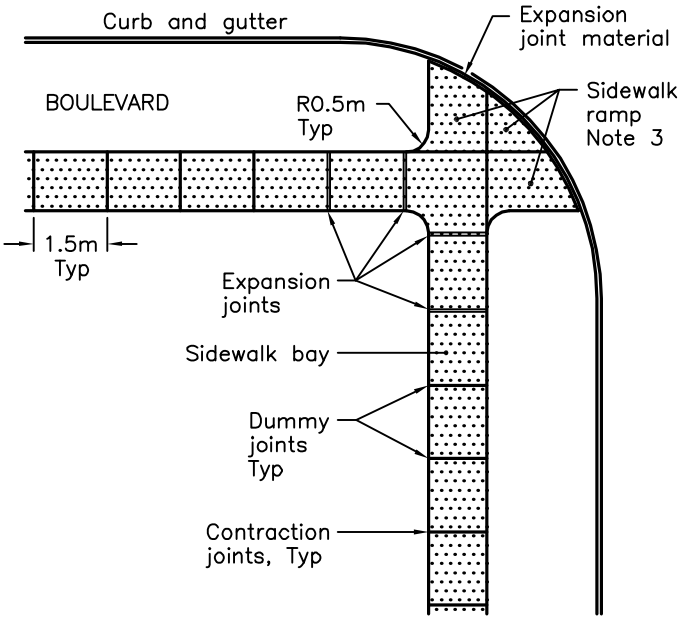

**DUMMY JOINT (OPTIONAL)**




**CONTRACTION JOINT**




**EXPANSION JOINT**




**JOINT LAYOUT**

NOTES:

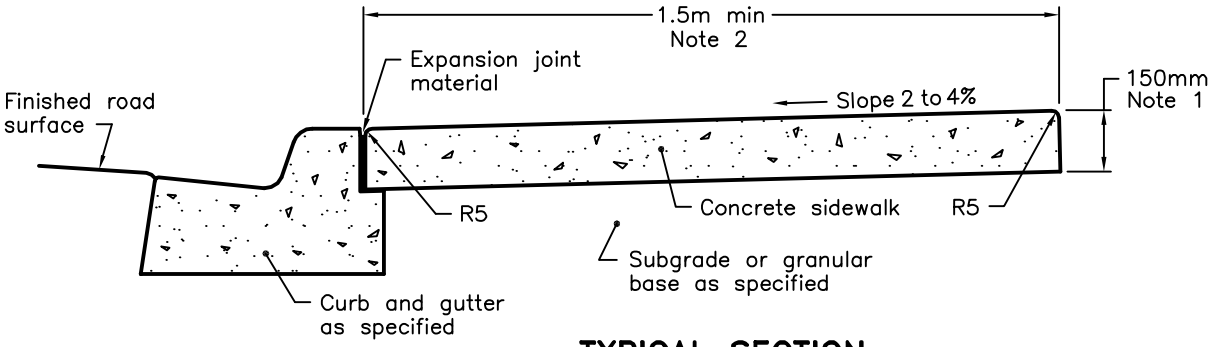
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.

2 Sidewalk width shall be wider when specified.

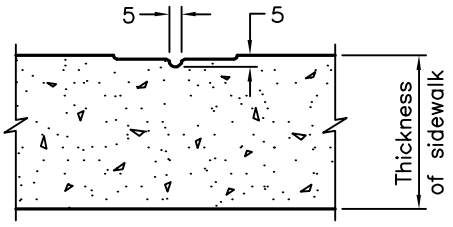
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.

A All dimensions are in millimetres unless otherwise shown.

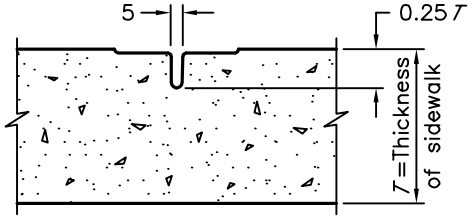
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **CONCRETE SIDEWALK** | | | |
| | **OPSD 310.010** | | |



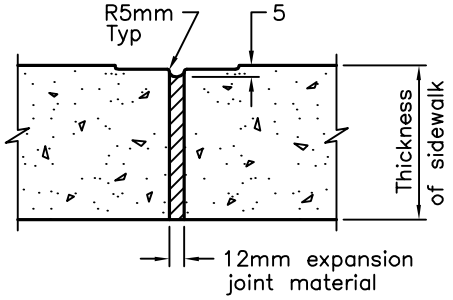

**TYPICAL SECTION**



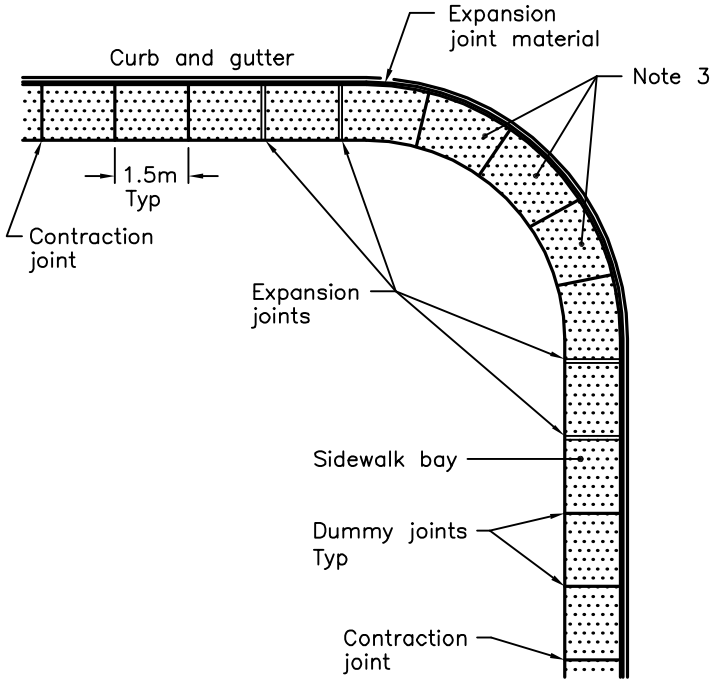

**DUMMY JOINT**




**CONTRACTION JOINT**




**EXPANSION JOINT**




**JOINT LAYOUT**

NOTES:

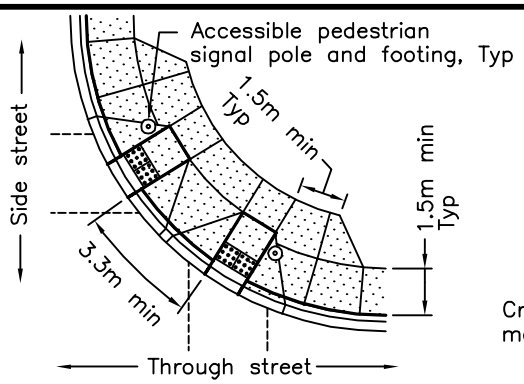
1 At commercial and industrial driveways, the thickness shall be 200mm.

2 Sidewalk width shall be wider when specified.

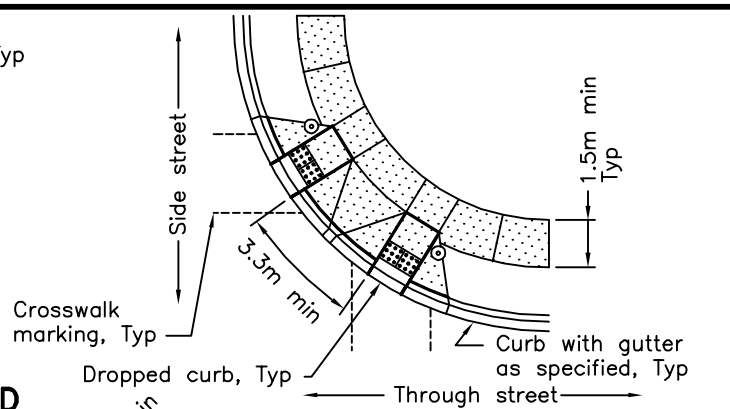
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.

A All dimensions are in millimetres unless otherwise shown.

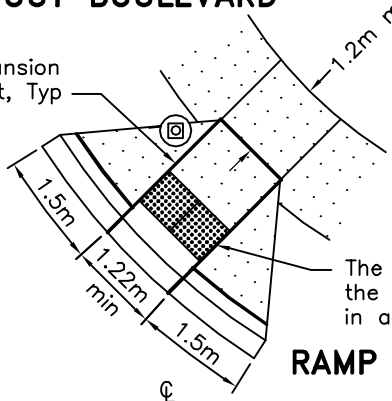
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **CONCRETE SIDEWALK ADJACENT TO CURB AND GUTTER** | | | |
| | | | **OPSD 310.020** |




## DOUBLE RAMP WITHOUT BOULEVARD

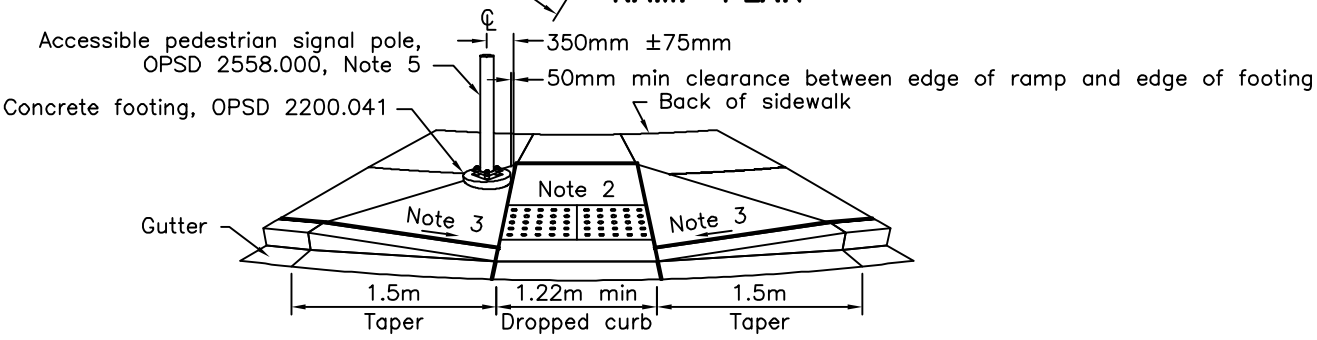



## DOUBLE RAMP WITH BOULEVARD

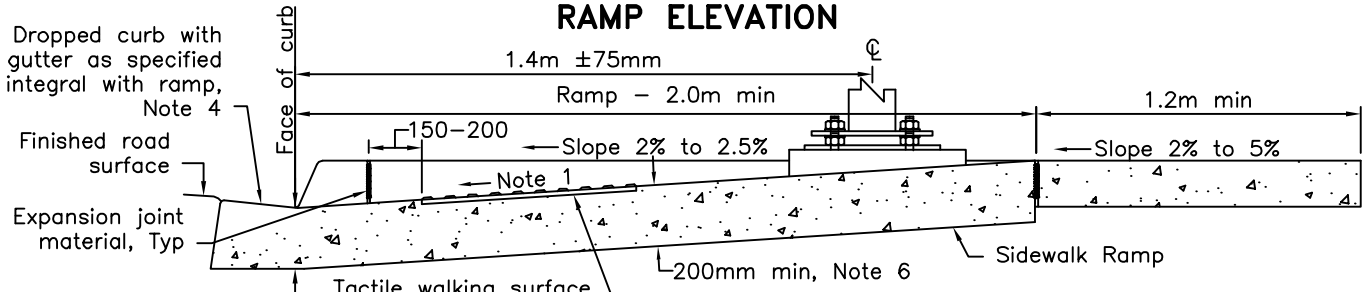



The plates shall extend the entire width of the sidewalk ramp at a minimum length of 610mm, in accordance with OPSD 310.039

## RAMP PLAN




## RAMP ELEVATION



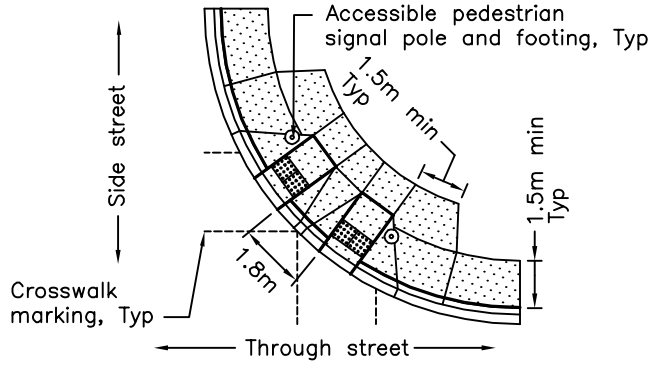

## RAMP SECTION

NOTES:

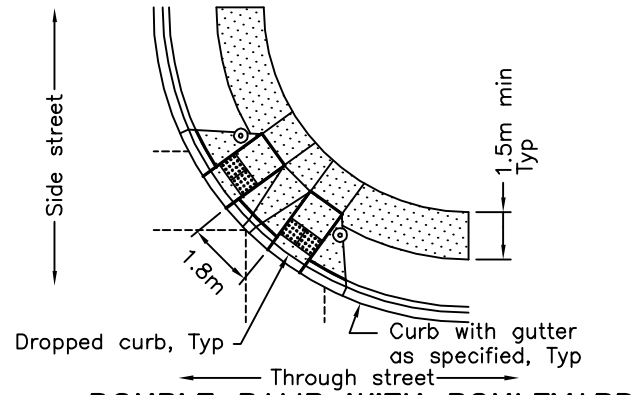
1 Slope of ramp shall not exceed 8%.
2 Cross slope of ramp shall not exceed 2% in either direction.
3 Cross slope of flared side of ramp shall not exceed 8%.
4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter.
5 Accessible pedestrian signal to have tactile arrow that aligns with direction of crosswalk.
6 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.

A Where only one crosswalk is present at an intersection, only one curb ramp is required.
B All dimensions are in millimetres unless otherwise shown.

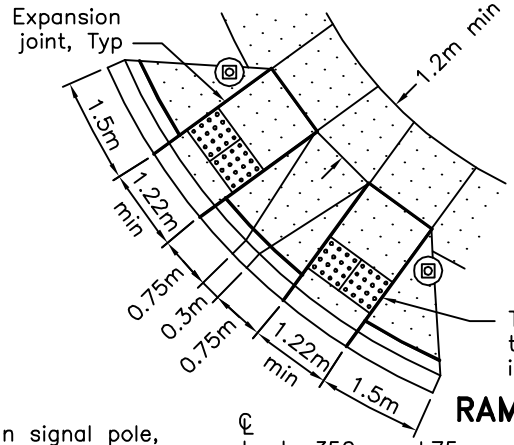
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| # CONCRETE SIDEWALK RAMPS AT SIGNALIZED INTERSECTIONS | | | |
| | OPSD 310.030 | | |



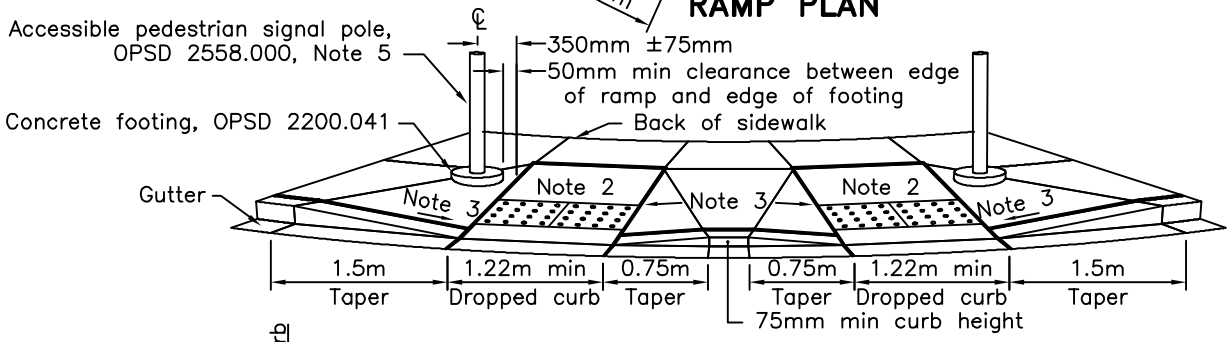

## DOUBLE RAMP WITHOUT BOULEVARD



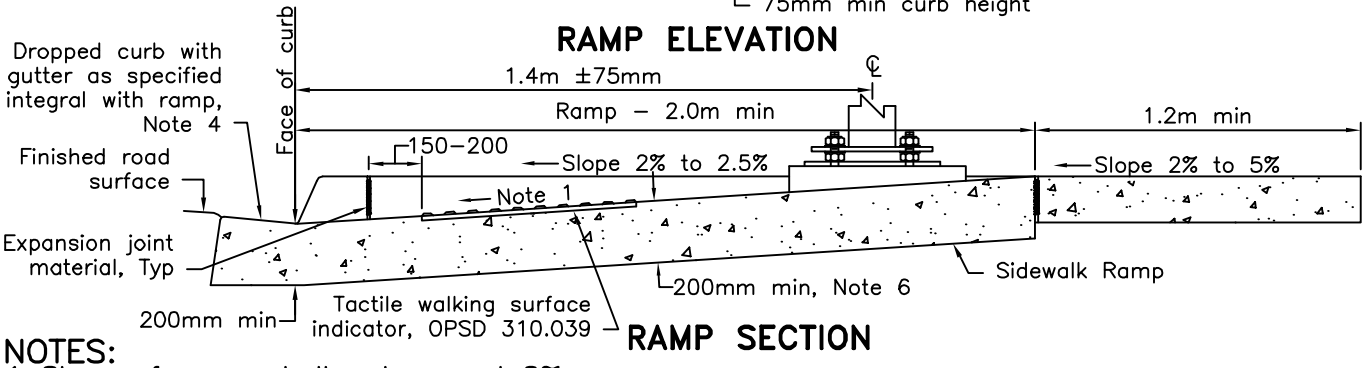

## DOUBLE RAMP WITH BOULEVARD




## RAMP PLAN




## RAMP ELEVATION



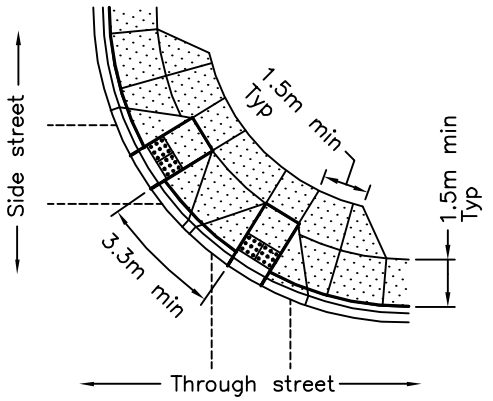

## RAMP SECTION

NOTES:

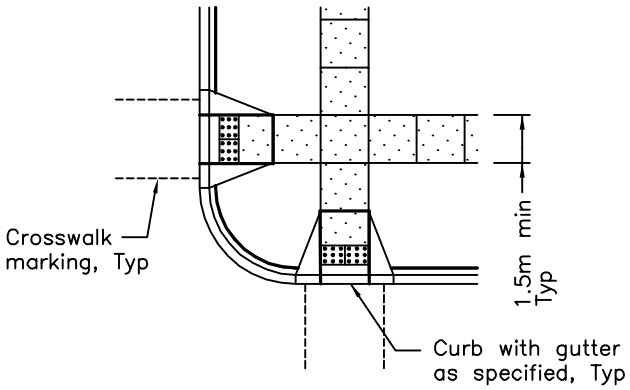
1 Slope of ramp shall not exceed 8%.
2 Cross slope of ramp shall not exceed 2% in either direction.
3 Cross slope of flared side of ramp shall not exceed 8%.
4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
5 Accessible pedestrian signal to have tactile arrow that aligns with direction of crosswalk.
6 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.

A All dimensions are in millimetres unless otherwise shown.

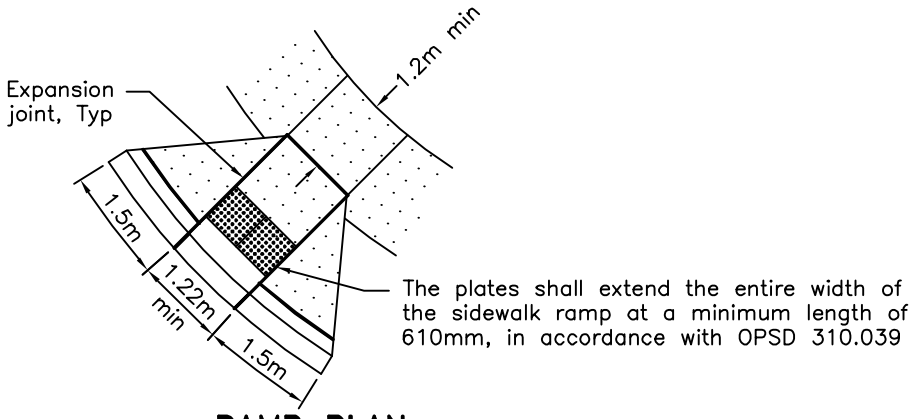
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| # CONCRETE SIDEWALK RAMPS AT SIGNALIZED INTERSECTIONS WITH INTERSECTING CROSSWALKS | | | |
| | OPSD 310.031 | | |



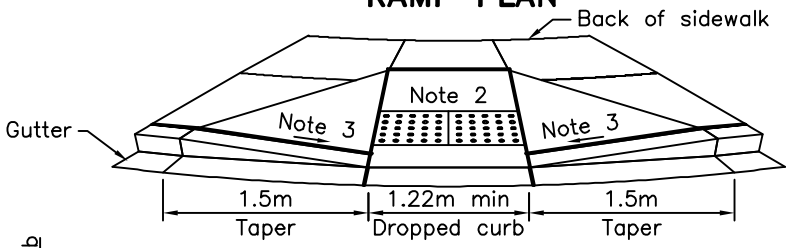

**DOUBLE RAMP WITHOUT BOULEVARD**



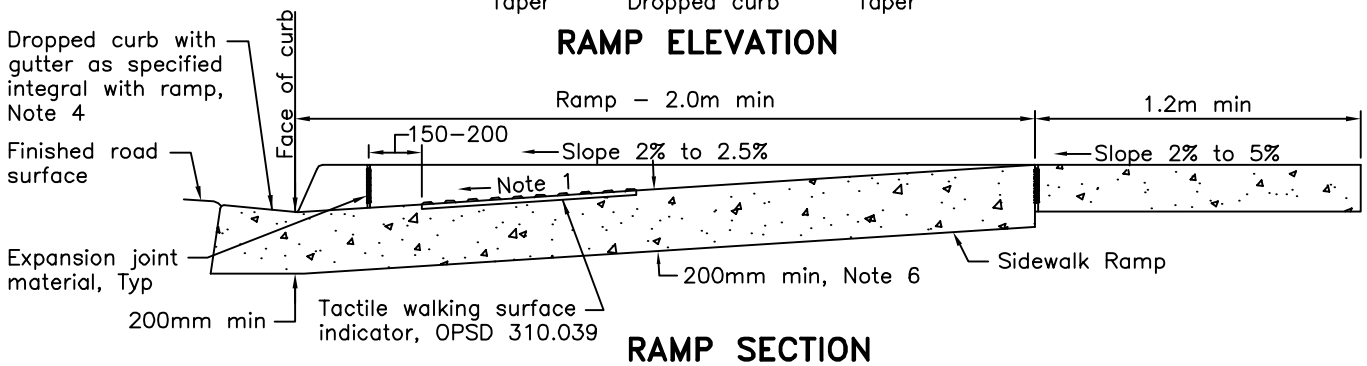

**RAMPS WITH BOULEVARD**




**RAMP PLAN**




**RAMP ELEVATION**

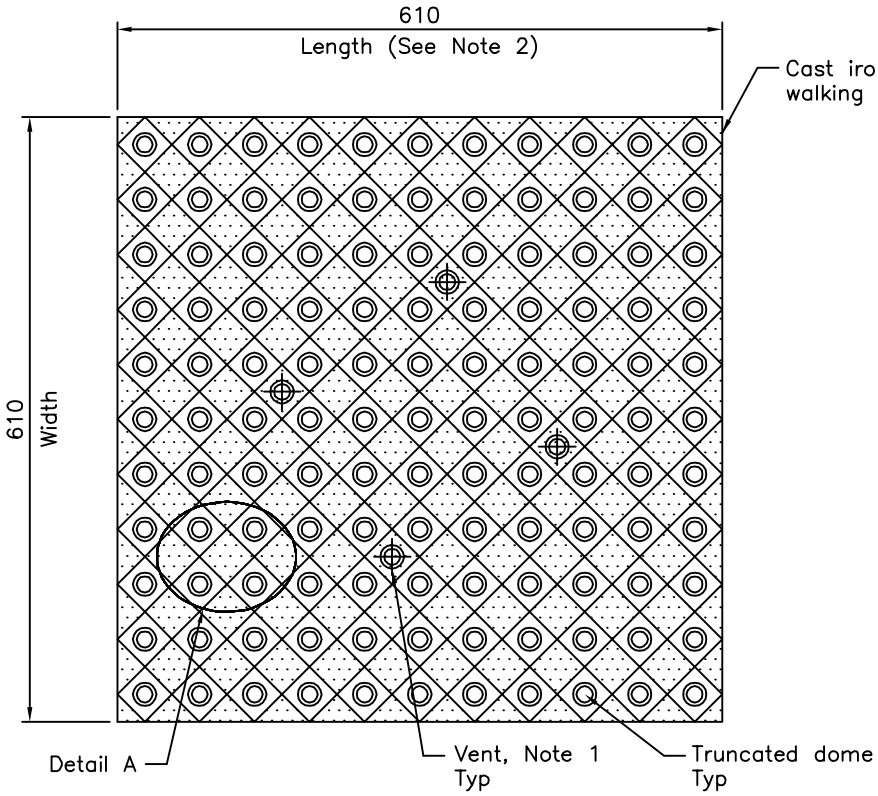



**RAMP SECTION**

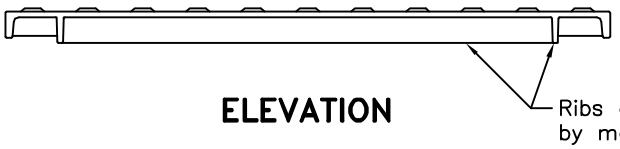
NOTES:

1 Slope of ramp shall not exceed 8%.
2 Cross slope of ramp shall not exceed 2% in either direction.
3 Cross slope of flared side of ramp shall not exceed 8%.
4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
5 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.
A All dimensions are in millimetres unless otherwise shown.

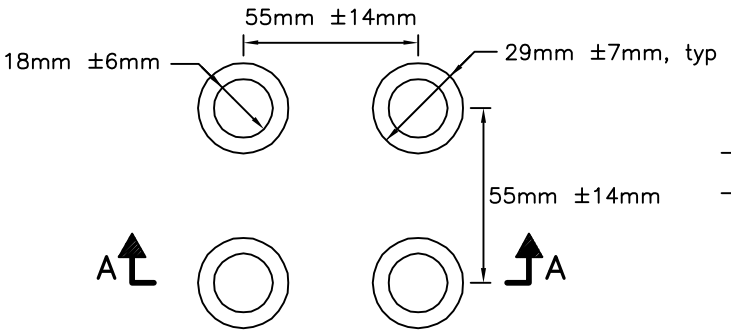
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| **CONCRETE SIDEWALK RAMPS AT UNSIGNALIZED INTERSECTIONS** | | | |
| | **OPSD 310.033** | | |



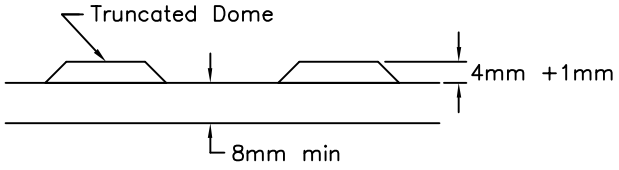

**PLAN**




**ELEVATION**




**DETAIL A**
**TRUNCATED DOMES PLAN**

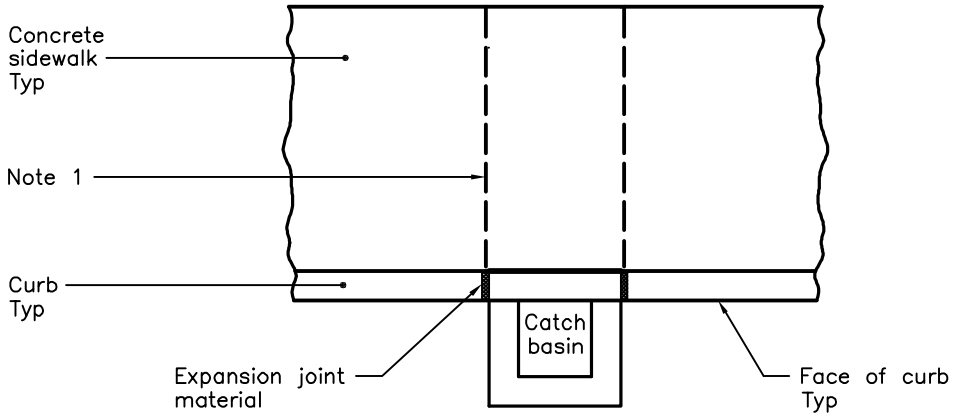



**SECTION A–A**

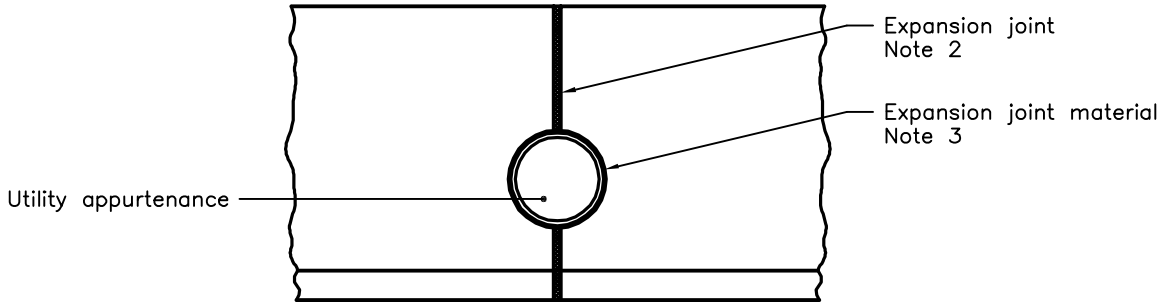
NOTES:

1 Vents shall be as specified by the manufacturer.
2 Length of plate may be increased to suit the curb depression width.
A Adjacent cast iron plates shall be permanently connected using a locking mechanism and any hardware shall be hot dipped galvanized.
B All dimensions are in millimetres unless otherwise shown.

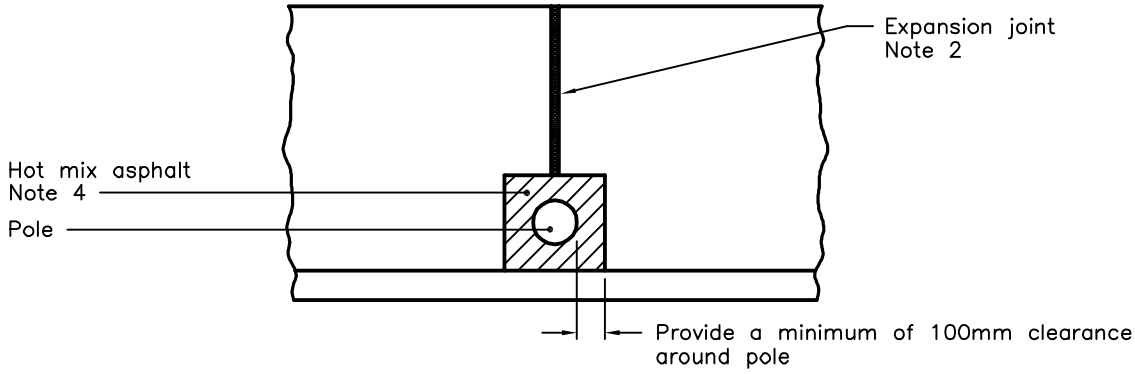
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| **CONCRETE SIDEWALK RAMPS TACTILE WALKING SURFACE INDICATORS COMPONENT** | | | |
| | **OPSD 310.039** | | |




## CATCH BASIN




## UTILITY APPURTENANCE




## UTILITY POLE

NOTES:

1 Expansion joint through sidewalk is required when curb and gutter is poured integral with sidewalk.

2 Adjust joints to coincide with centre of utility, with minimum slab length of 1m.

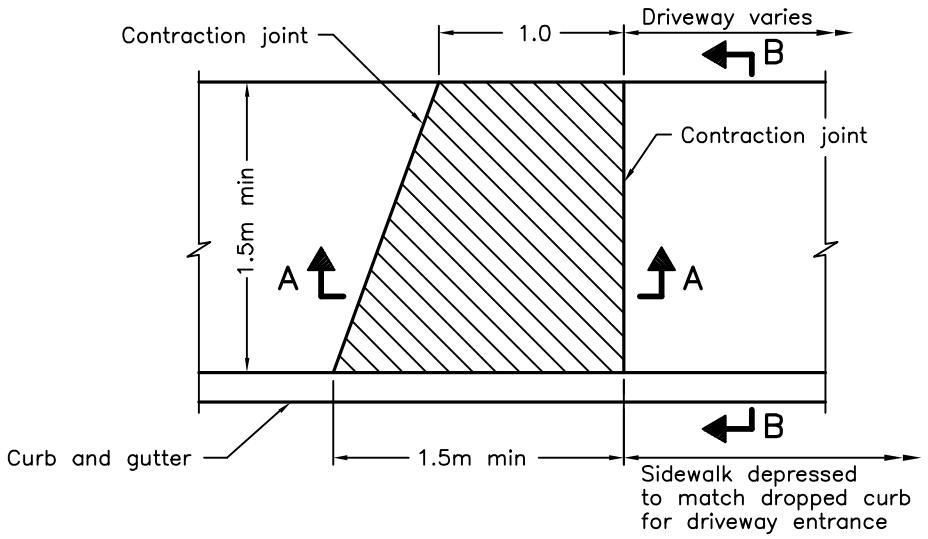
3 Expansion joint material shall be placed around Utility appurtenance flush with concrete surface.

4 For concrete alternative use expansion joint material around boxout.

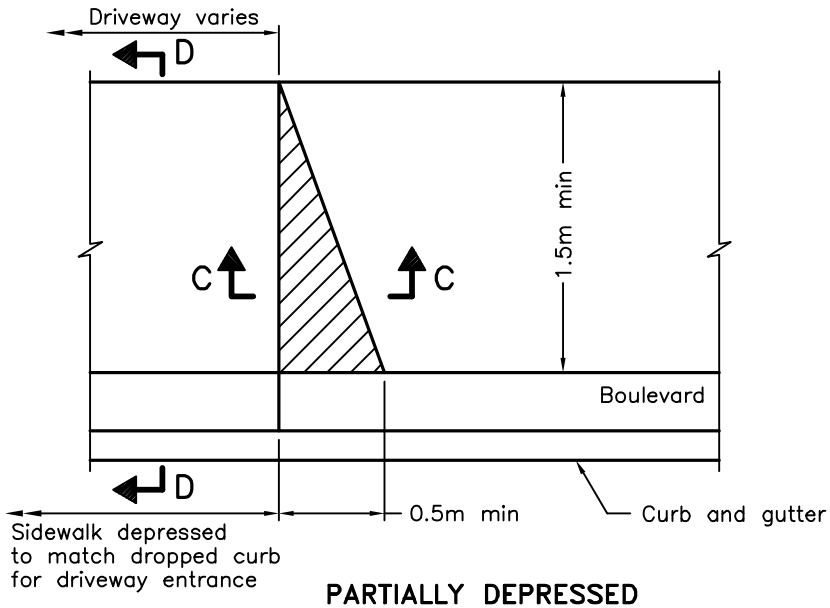
A For expansion joint detail, see OPSD 310.010.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **UTILITY ISOLATION IN CONCRETE SIDEWALKS** | | | |
| | **OPSD 310.040** | | |

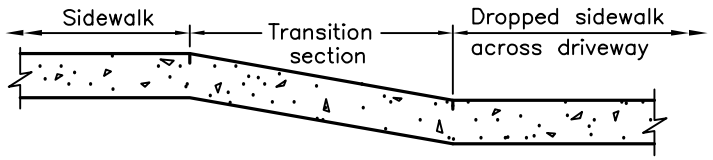



FULLY DEPRESSED

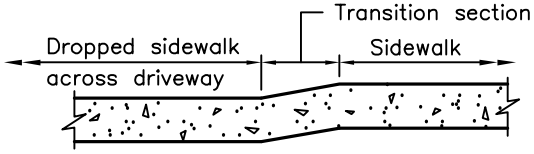



PARTIALLY DEPRESSED

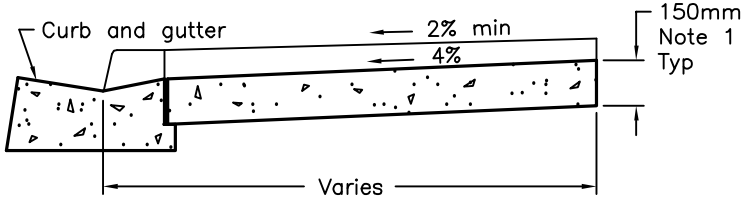
PLAN



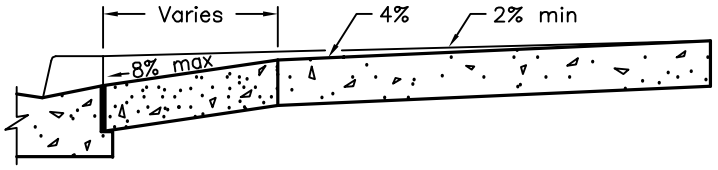

SIDEWALK WITHOUT BOULEVARD
SECTION A–A




SIDEWALK WITH BOULEVARD
SECTION C–C




SECTION B–B




SECTION D–D

NOTES:

1 At commercial and industrial driveways, the thickness shall be 200mm.

A For contraction joint detail, see OPSD 310.010.

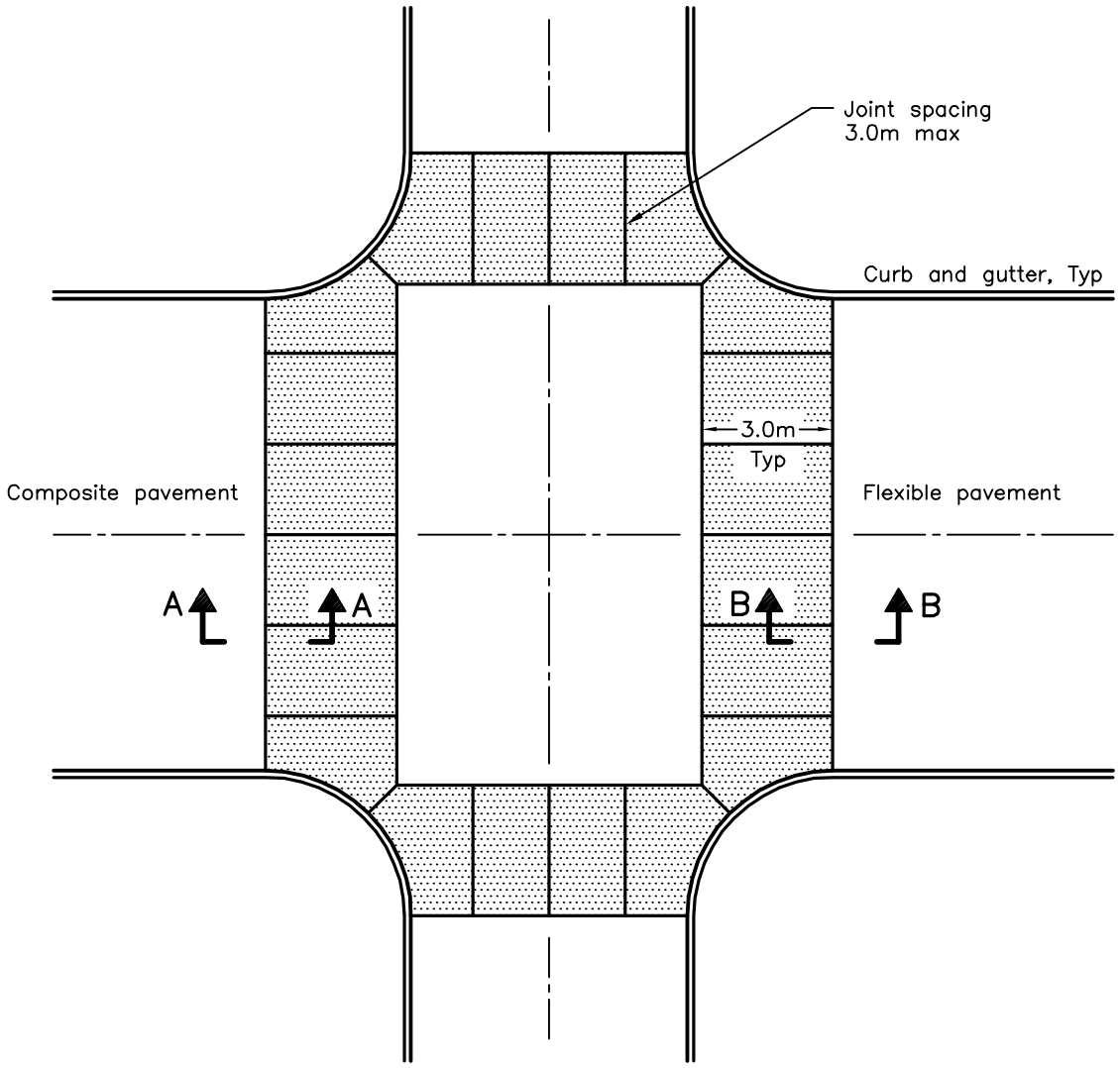
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

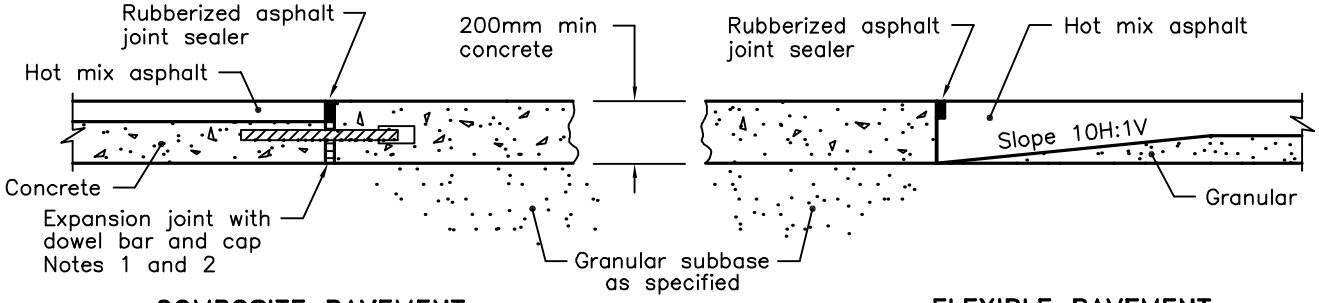
# CONCRETE SIDEWALK DRIVEWAY ENTRANCE DETAILS

Nov 2015 | Rev 2

OPSD 310.050




**PLAN**




**COMPOSITE PAVEMENT**
**SECTION A–A**

**FLEXIBLE PAVEMENT**
**SECTION B–B**

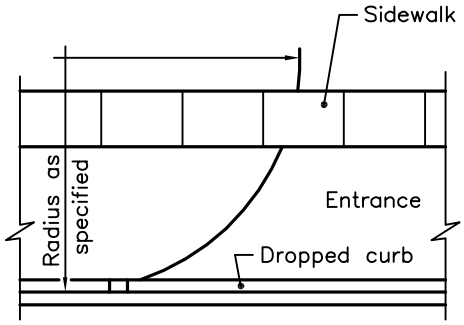
NOTES:

1 For expansion joint detail, see OPSD 552.020.

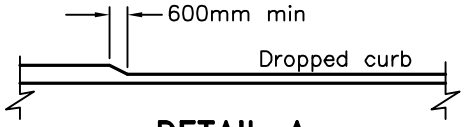
2 Dowel bar with cap shall be installed at 300mm centres.

A All dimensions are in millimetres unless otherwise shown.

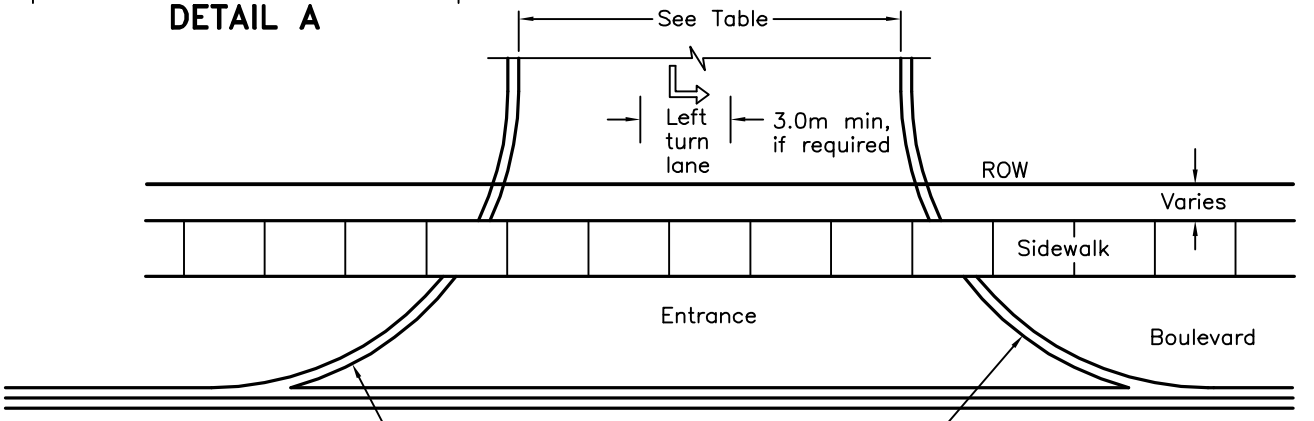
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| JOINT DETAIL FOR CONCRETE PEDESTRIAN CROSSWALK AT SIGNALIZED AND ALL–WAY STOP CONTROLLED INTERSECTIONS | | | |
| | OPSD 310.060 | | |



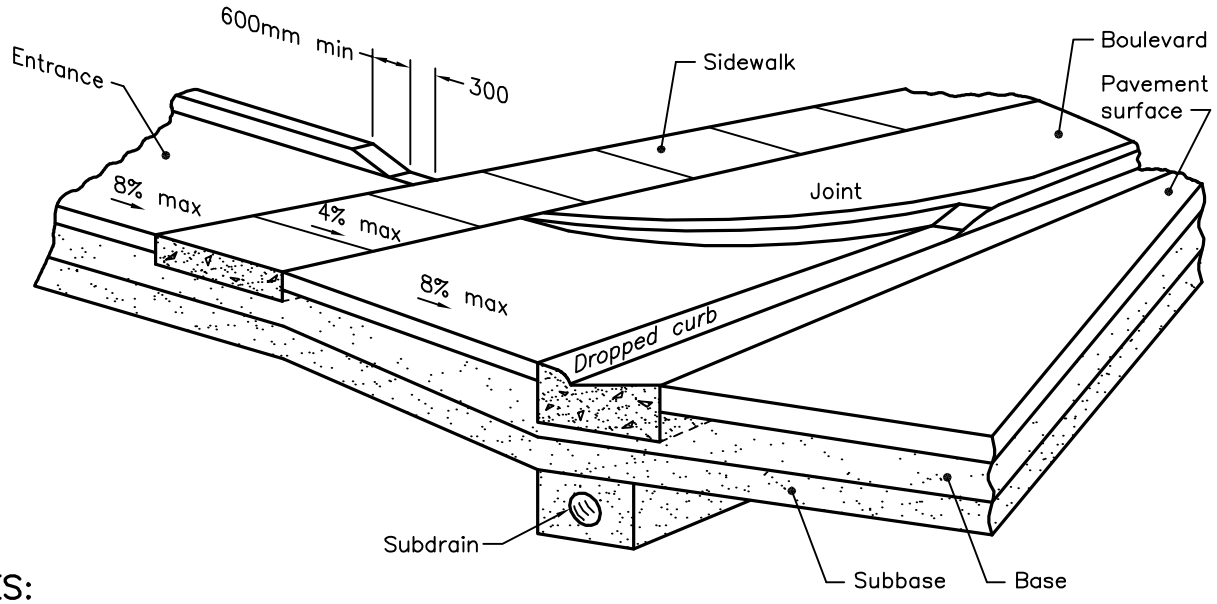

| DRIVEWAY DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| LAND USE | WIDTH m | | | | RADIUS m | |
| | One–Way | | Two–Way | | | |
| | min | max | min | max | min | max |
| Light Industrial, Commercial, and Apartment | 4.5 | 7.5 | 7.2 | 12.0 | 4.5 | 12.0 |
| Heavy Industrial | 5.0 | 9.0 | 9.0 | 15.0 | 9.0 | 15.0 |




**DETAIL A**



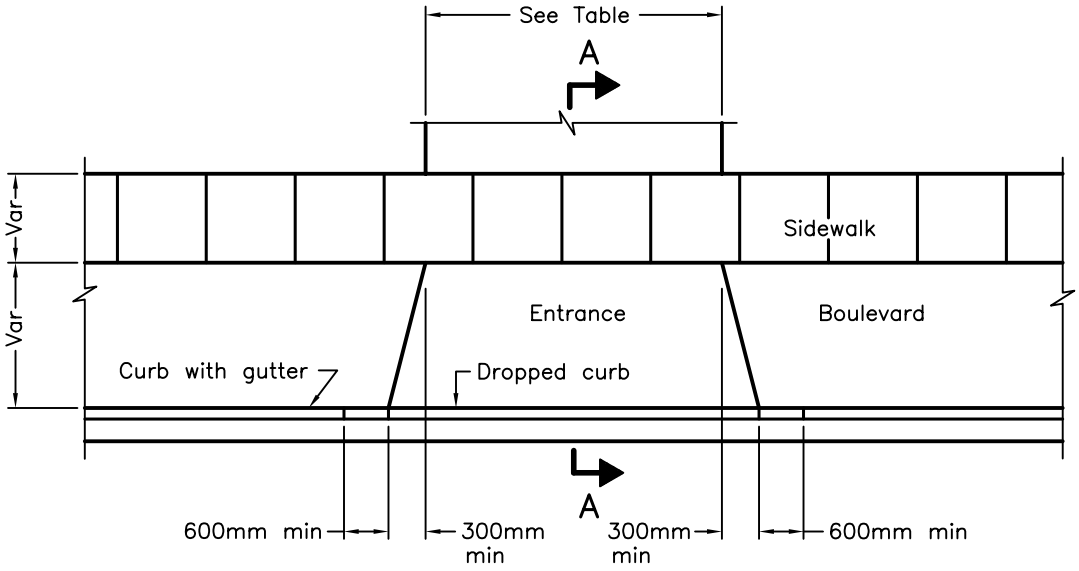

**PLAN**



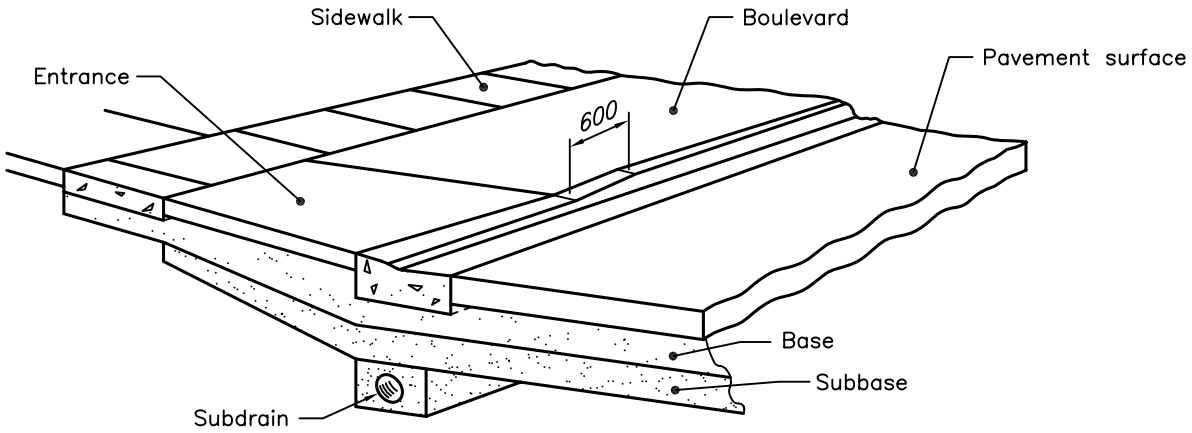

NOTES:

A All dimensions are in millimetres unless otherwise shown.

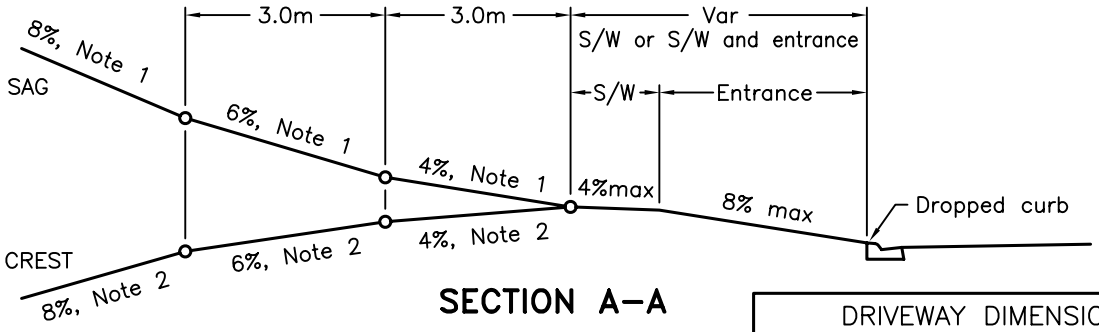
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| **URBAN INDUSTRIAL, COMMERCIAL, AND APARTMENT ENTRANCES** | | | |
| | **OPSD 350.010** | | |




**PLAN**




**ISOMETRIC VIEW**




**SECTION A–A**

| DRIVEWAY DIMENSIONS | | | | |
|---|---|---|---|---|
| LAND USE | WIDTH m | | | |
| | Single | | Double | |
| | min | max | min | max |
| Residential | 3.0 | 4.3 | 6.0 | 7.3 |

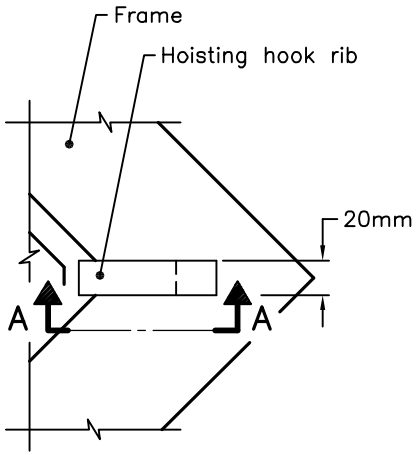
NOTES:

1 Maximum upgrade shall be 10%.

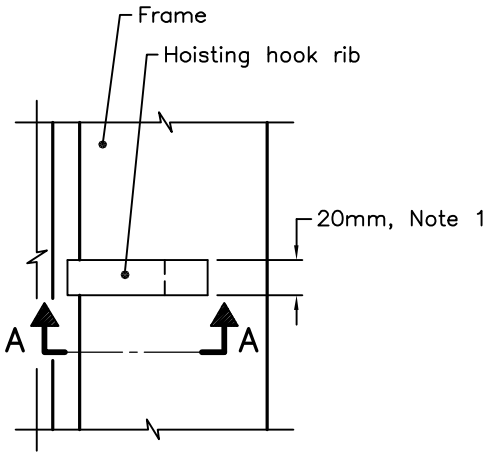
2 Maximum downgrade shall be 8%.

A All dimensions are in millimetres unless otherwise shown.

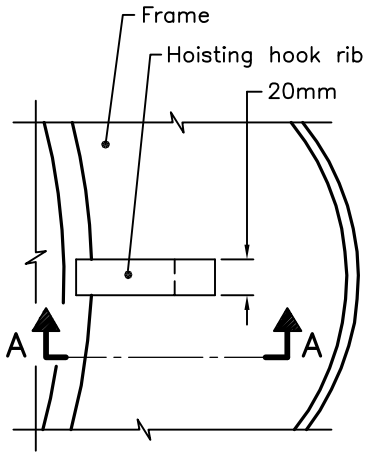
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| URBAN RESIDENTIAL ENTRANCE | | | |
| | OPSD 351.010 | | |



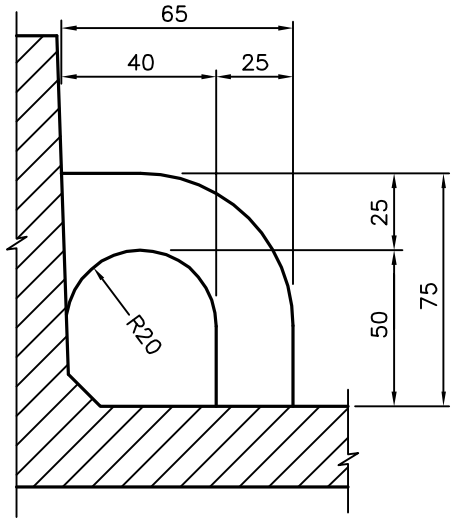

**SQUARE FRAME PLAN**
**SQUARE CORNER**




**SQUARE FRAME PLAN**
**MID–SECTION**




**SQUARE FRAME PLAN**
**ROUND CORNER**




**SECTION A–A**

NOTES:

1 For OPSD 402.030, the hoisting hook rib thickness shall be 29mm.

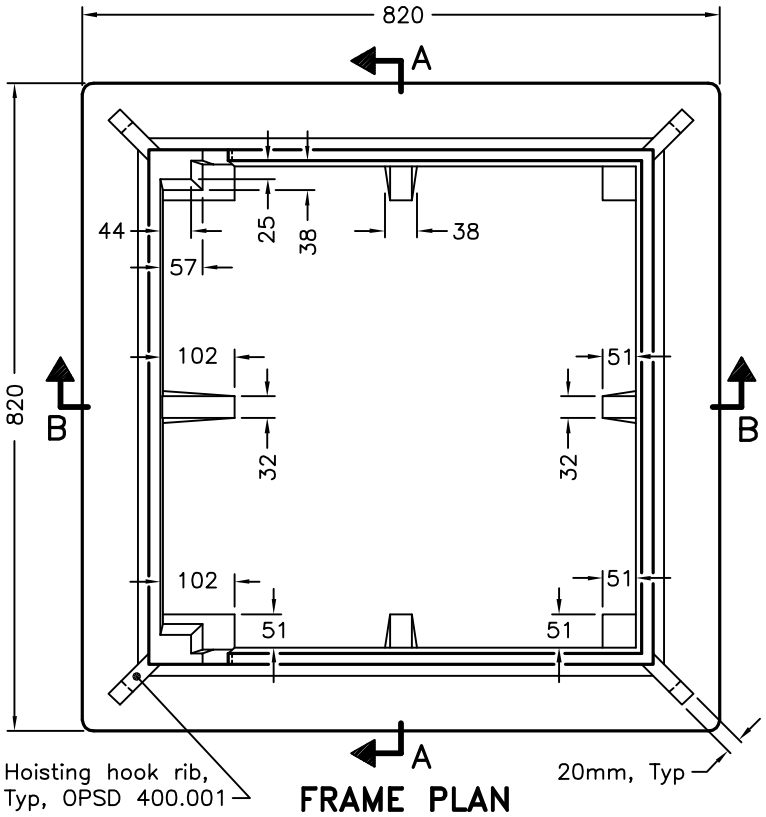
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

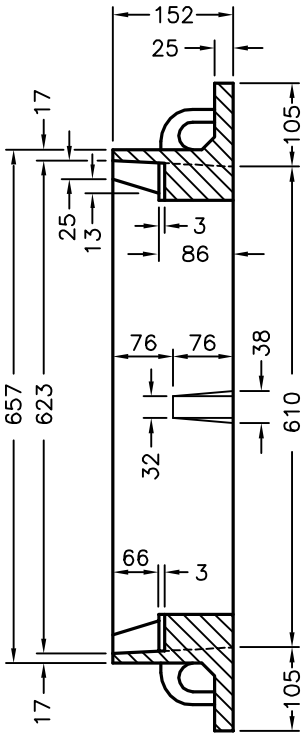
# HOISTING HOOK RIB FOR CAST IRON FRAMES FOR CATCH BASINS, MAINTENANCE HOLES, AND VALVE CHAMBERS

| Nov 2013 | Rev | 1 |
|---|---|---|

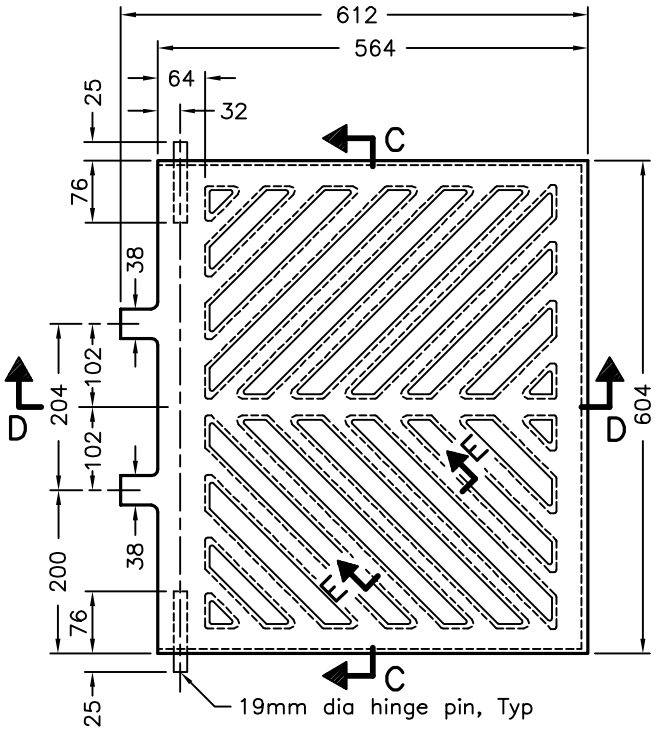
OPSD 400.001



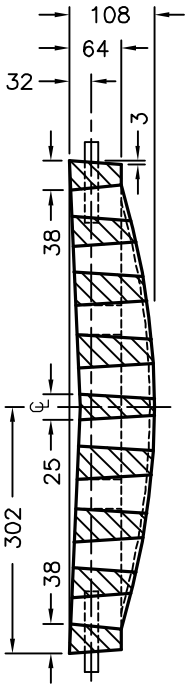

FRAME PLAN



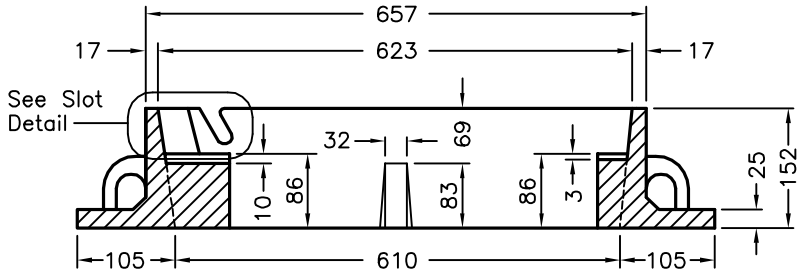

SECTION A–A



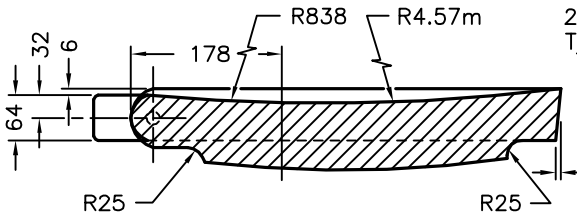

GRATE PLAN



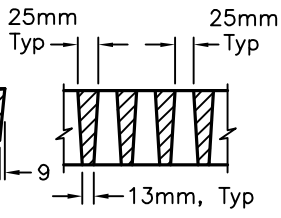

SECTION C–C



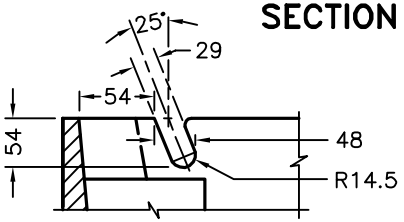

SECTION B–B




SECTION D–D




SECTION E–E




SLOT DETAIL

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.

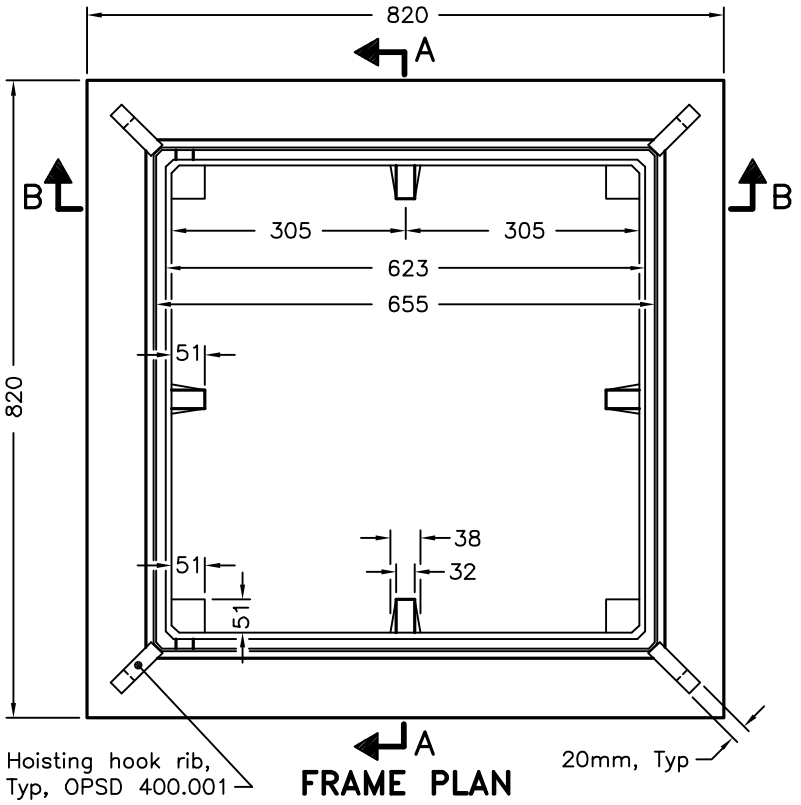
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

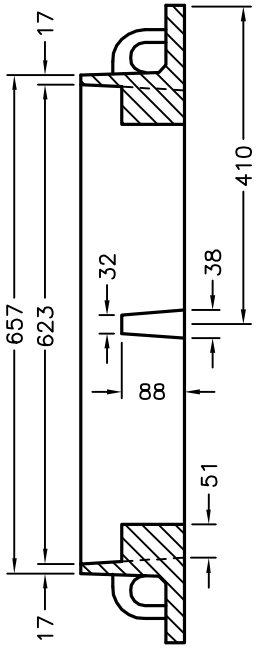
# CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE DISHED GRATE FOR CATCH BASINS, HERRING BONE OPENINGS

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

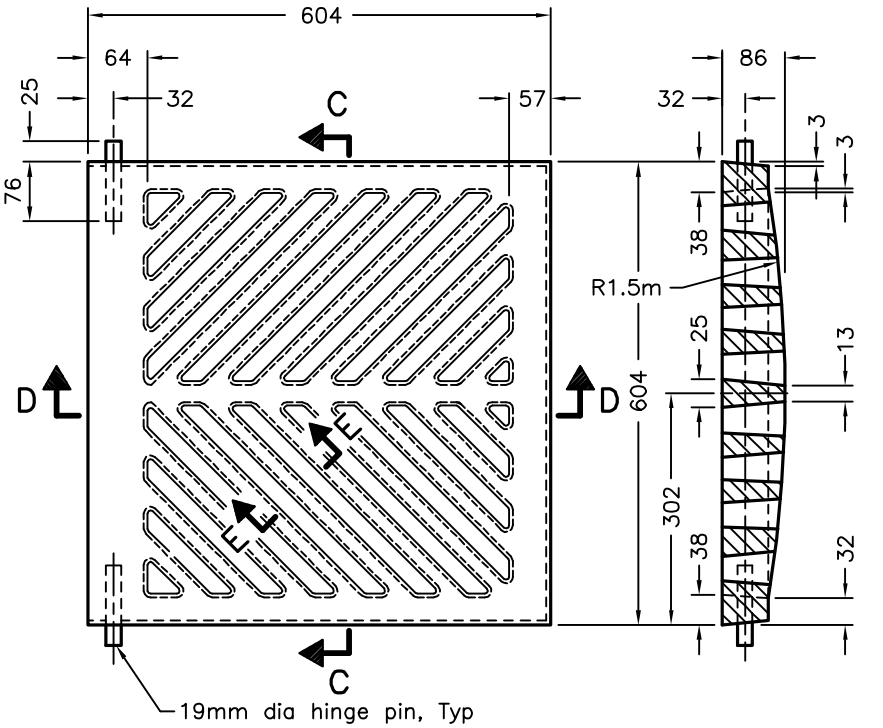
OPSD 400.010




FRAME PLAN

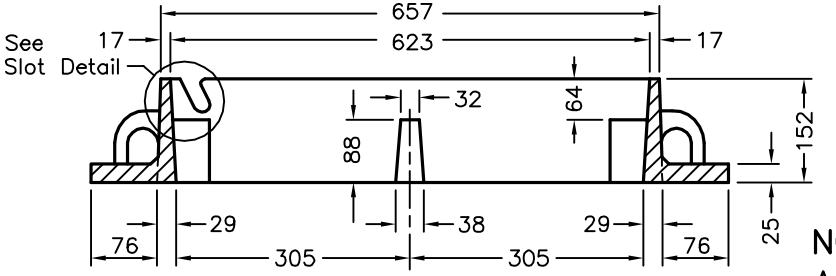



SECTION A–A

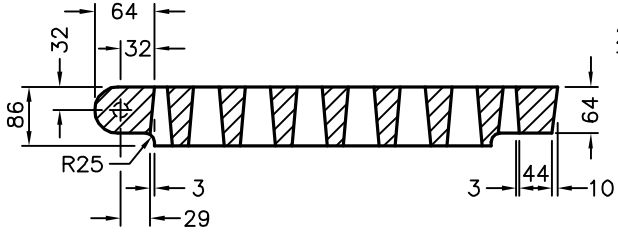



GRATE PLAN

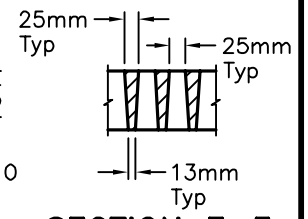
SECTION C–C



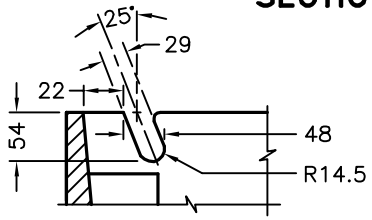

SECTION B–B




SECTION D–D




SECTION E–E




SLOT DETAIL

NOTES:

A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.

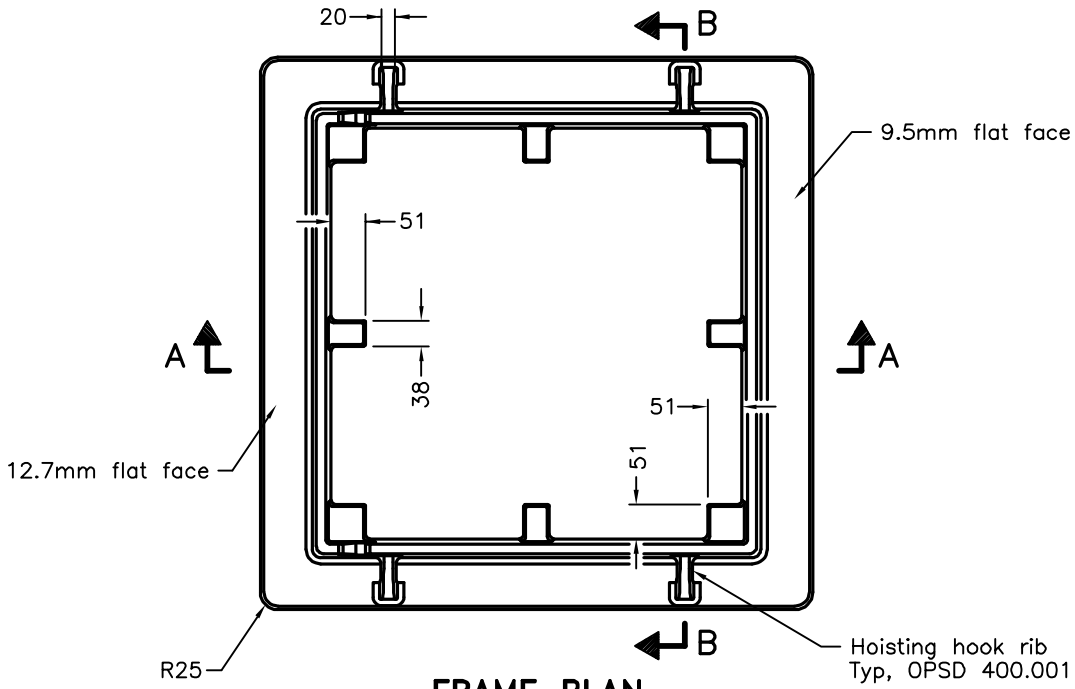
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

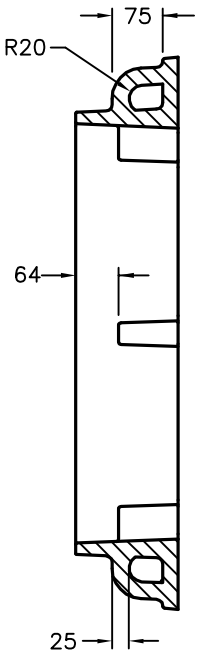
# CAST IRON, SQUARE FRAME WITH SQUARE FLAT GRATE FOR CATCH BASINS, HERRING BONE OPENINGS

Nov 2013 | Rev 2

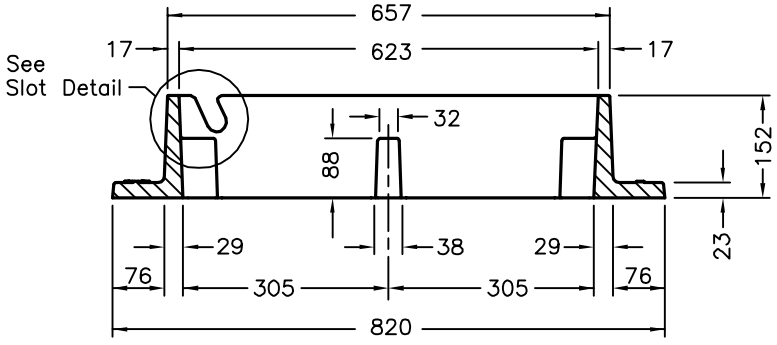
OPSD 400.020



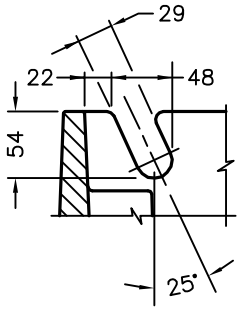

FRAME PLAN




SECTION B–B




SECTION A–A



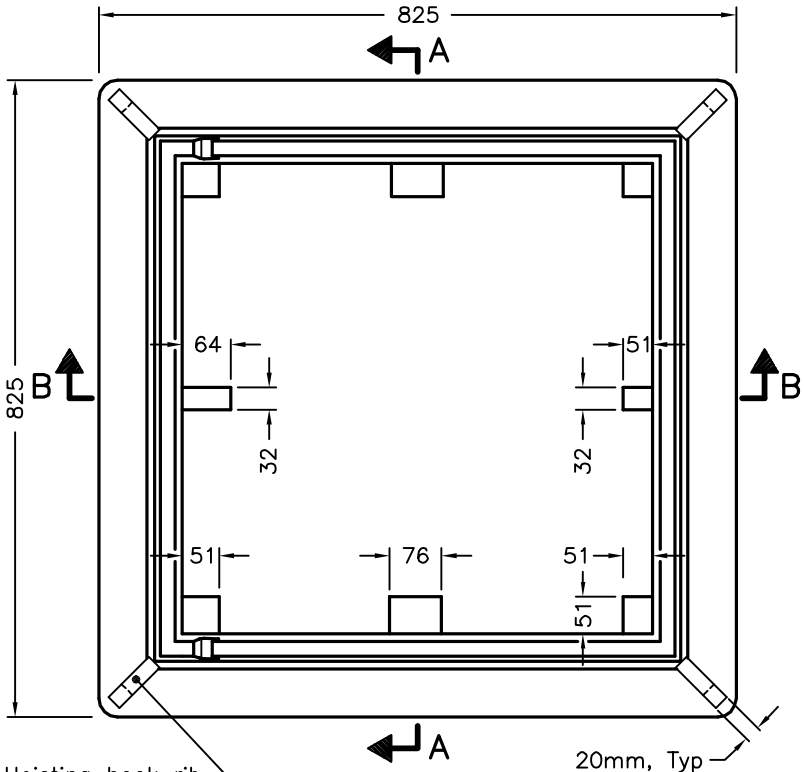

SLOT DETAIL

NOTES:

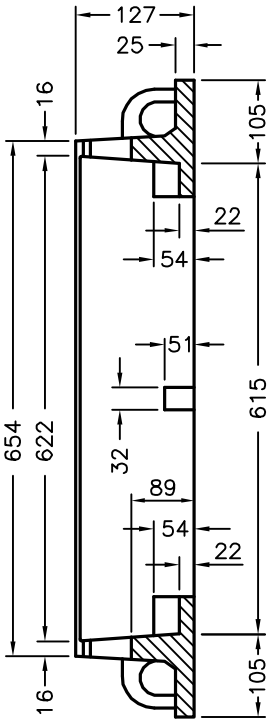
A This OPSD shall be read in conjunction with OPSD 400.090.

B All dimensions are in millimetres unless otherwise shown.

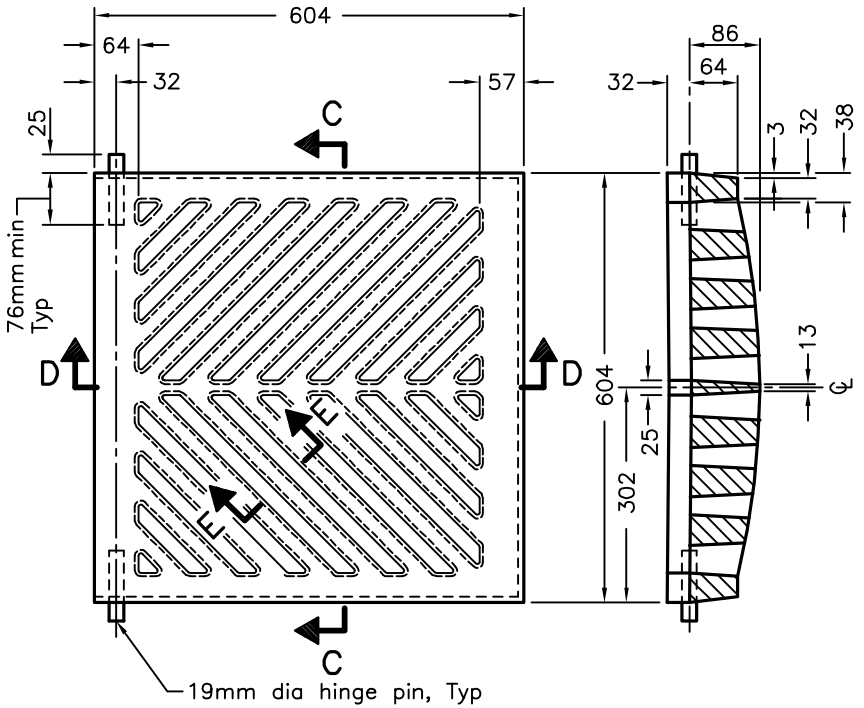
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| CAST IRON, SQUARE FRAME FOR CURB INLET OVERFLOW | | | |
| | OPSD 400.021 | | |




FRAME PLAN

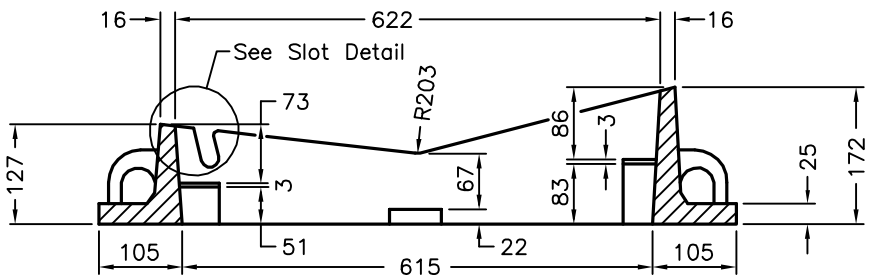



SECTION A–A

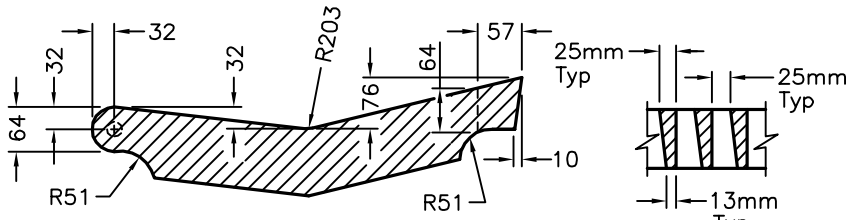



GRATE PLAN

SECTION C–C

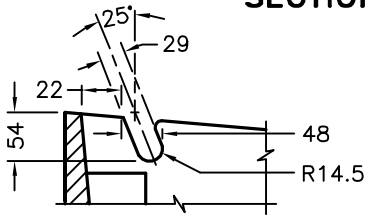



SECTION B–B




SECTION D–D

SECTION E–E




SLOT DETAIL

NOTE:

A This OPSD shall be read in conjunction with OPSD 610.010.

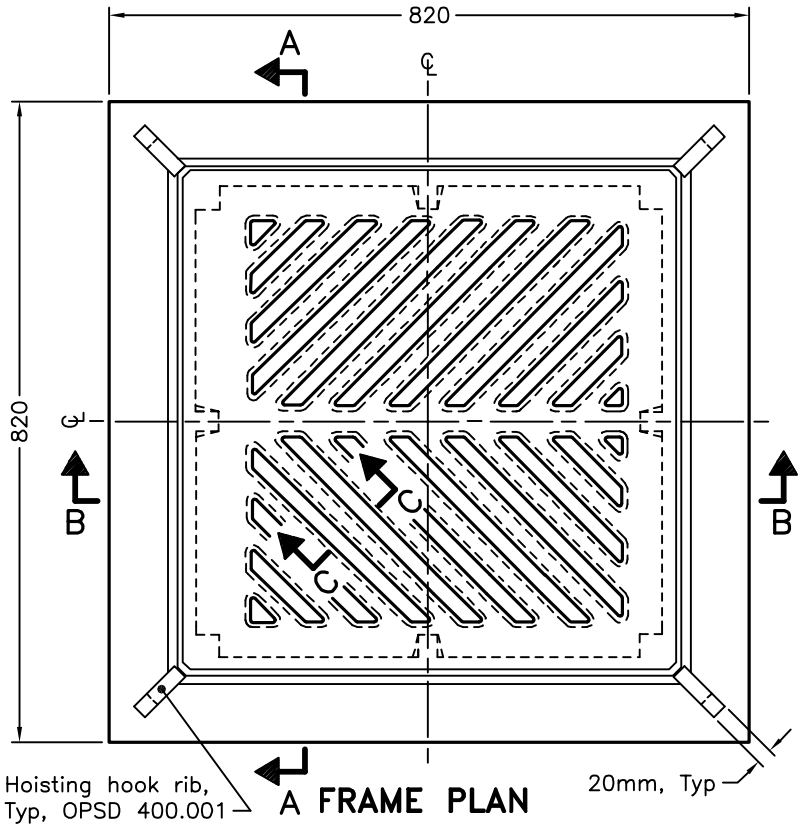
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

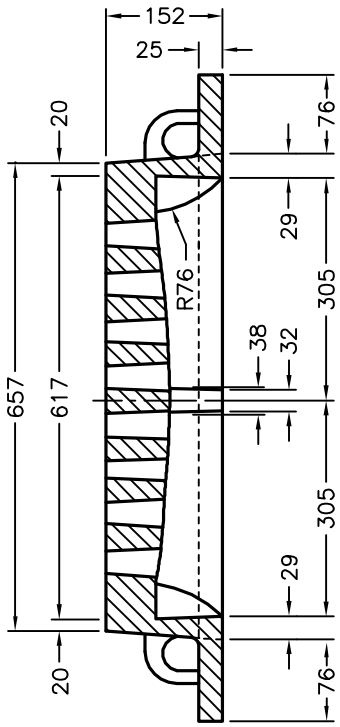
# CAST IRON, SQUARE FRAME WITH SQUARE V GRATE FOR CATCH BASINS, HERRING BONE OPENINGS

Nov 2013 | Rev 2

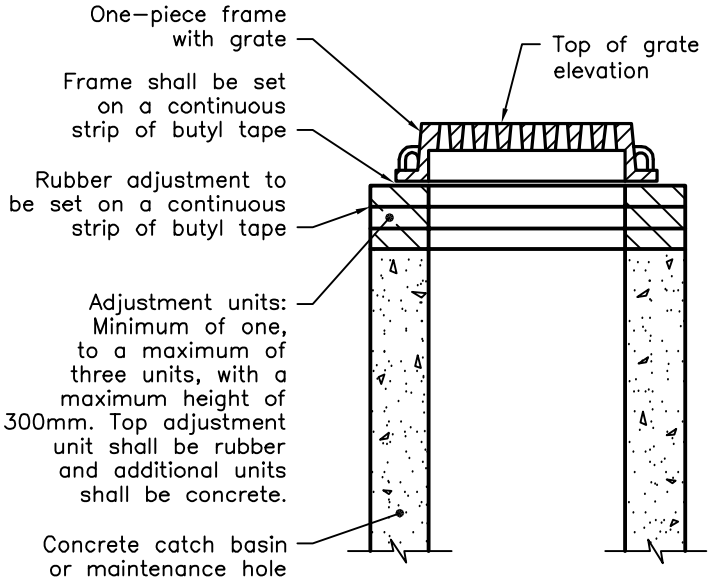
OPSD 400.030



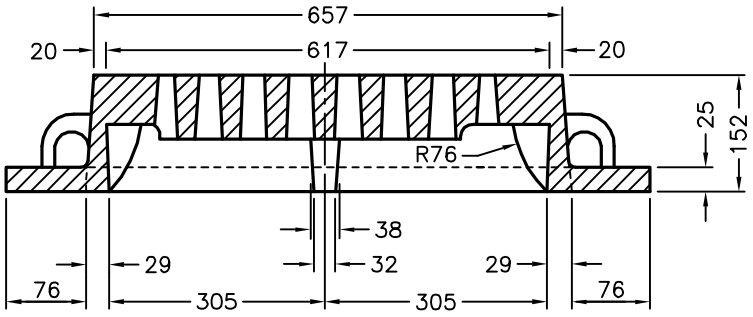

A FRAME PLAN



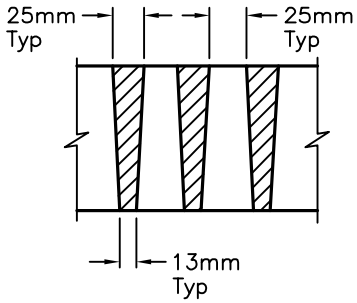

SECTION A–A




INSTALLATION




SECTION B–B




SECTION C–C

NOTE:
A All dimensions are in millimetres unless otherwise shown.

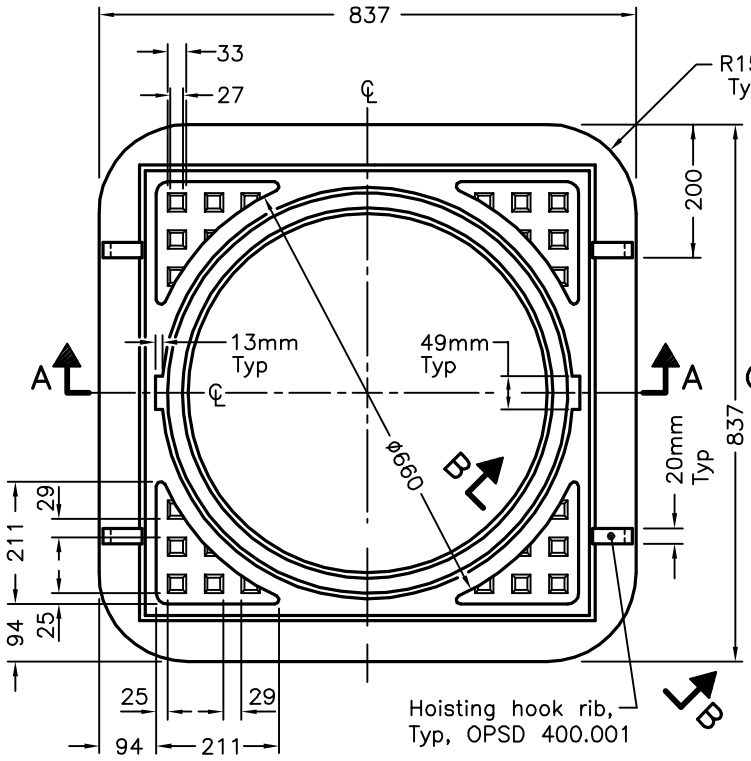
ONTARIO PROVINCIAL STANDARD DRAWING

# CAST IRON, ONE–PIECE FRAME AND FLAT SQUARE GRATE FOR TEMPORARY INSTALLATION, HERRING BONE OPENINGS

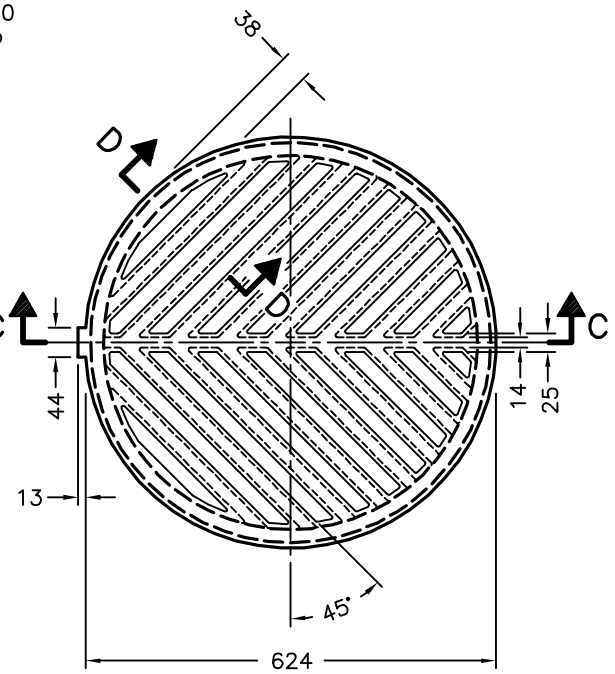
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

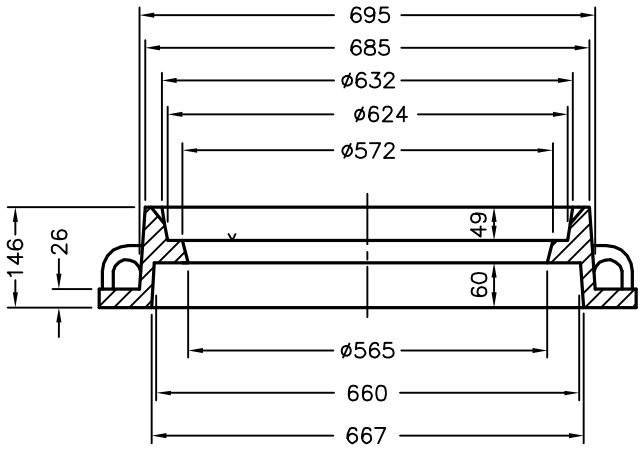
OPSD 400.040



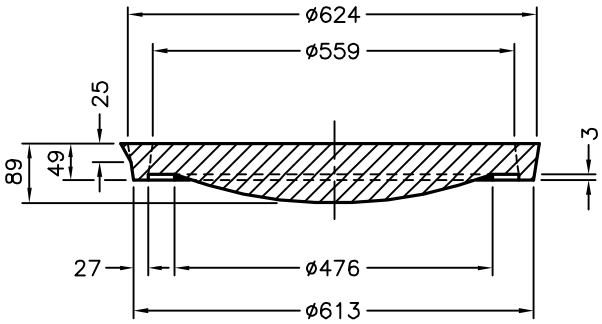

FRAME PLAN



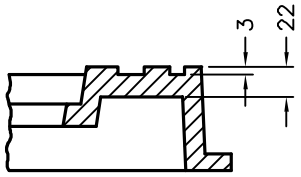

GRATE PLAN



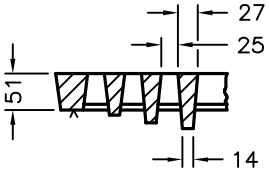

SECTION A–A




SECTION C–C




SECTION B–B

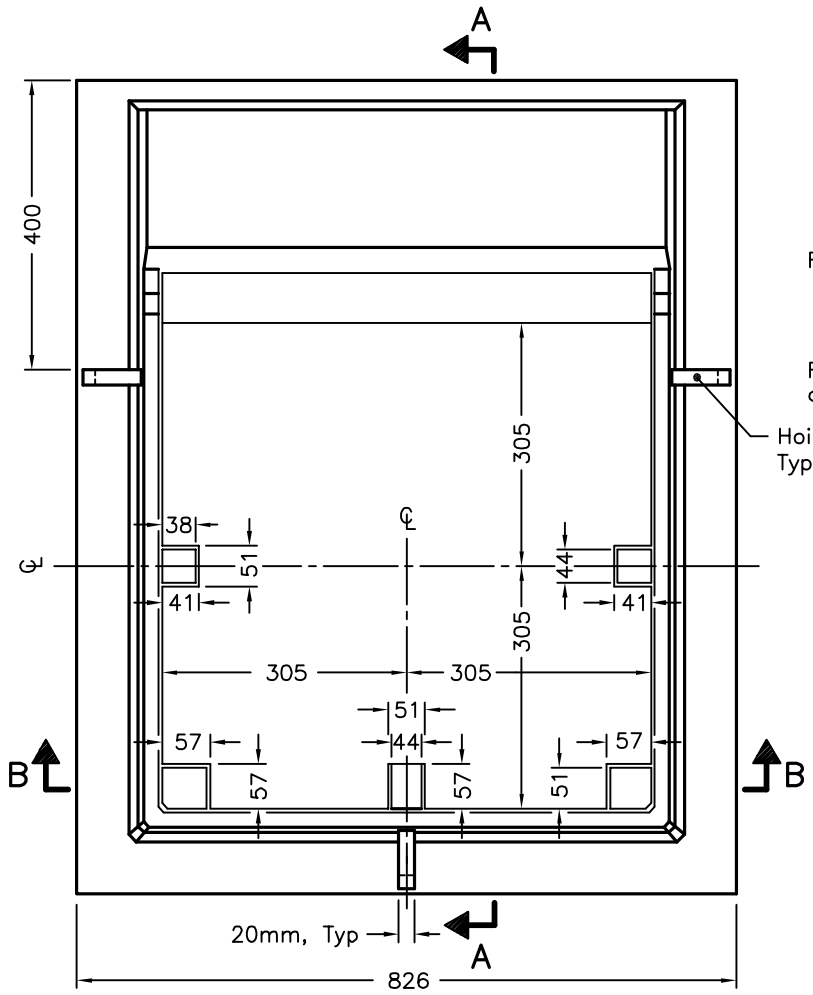



SECTION D–D

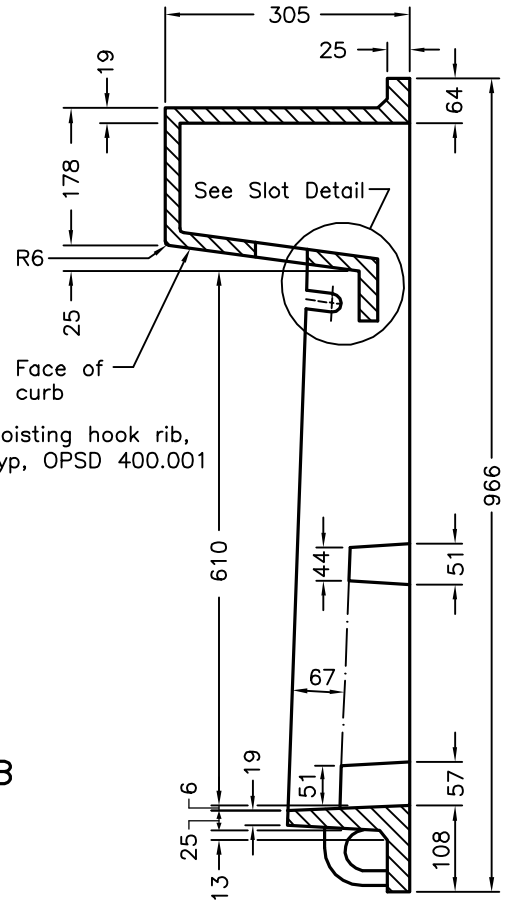
NOTES:

A All dimensions are in millimetres unless otherwise shown.

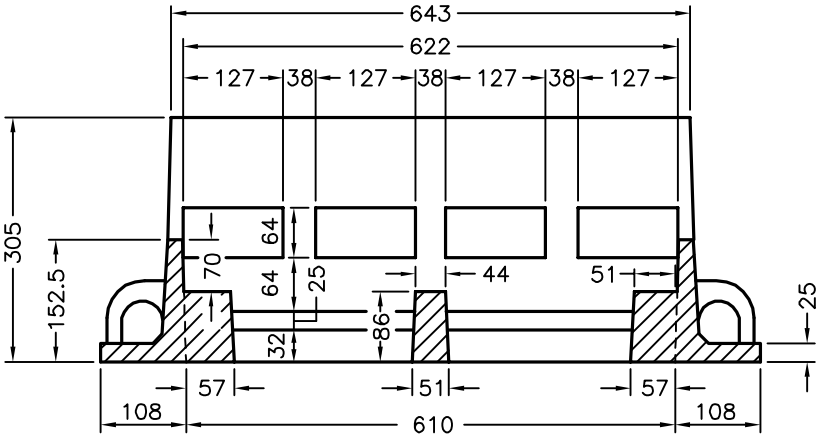
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 5 |
|---|---|---|---|
| CAST IRON, RAISED SQUARE FRAME WITH CIRCULAR FLAT GRATE FOR CATCH BASINS, HERRING BONE OPENINGS | | | |
| | OPSD 400.070 | | |



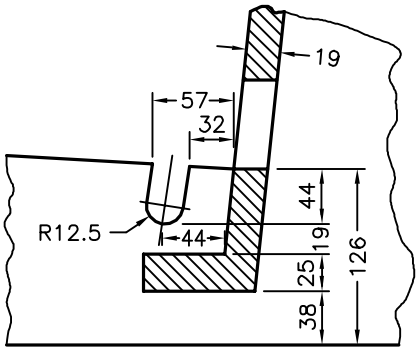

FRAME PLAN




SECTION A–A




SECTION B–B



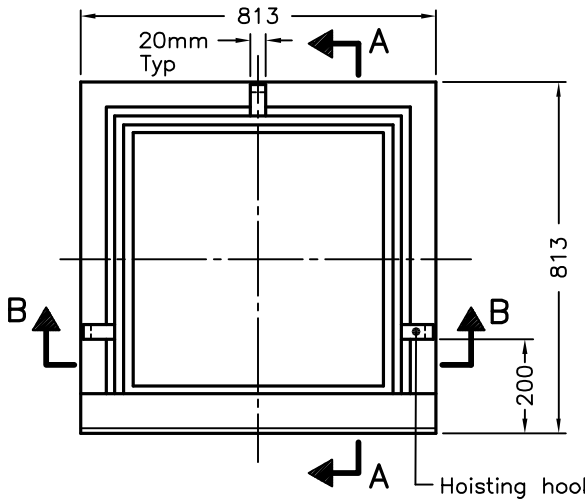

SLOT DETAIL

NOTES:

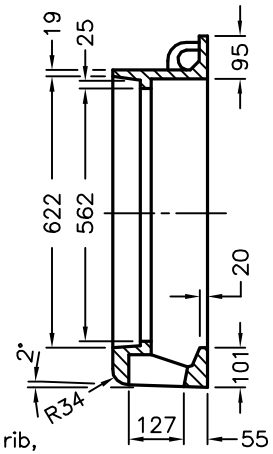
A For grate see OPSD 400.020 or 400.100.

B All dimensions are in millimetres unless otherwise shown.

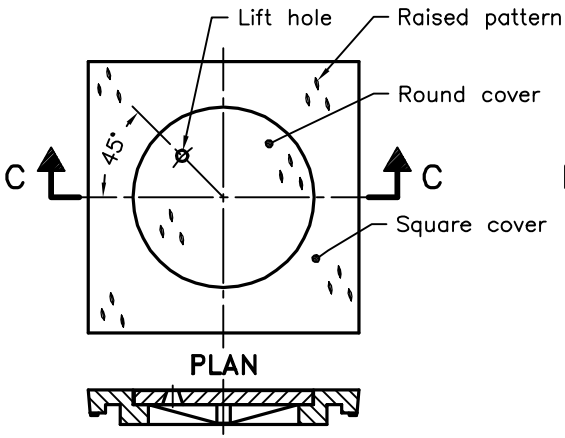
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| CAST IRON, SIDE INLET FOR CATCH BASINS | | | |
| | OPSD 400.080 | | |




PLAN



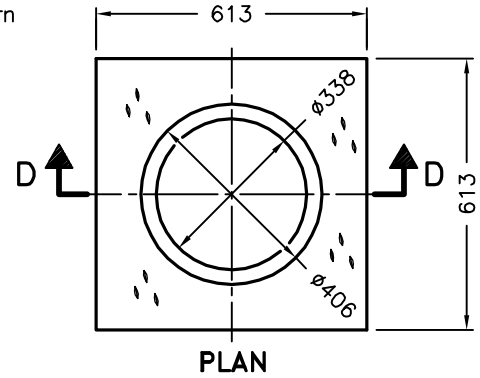

SECTION A–A



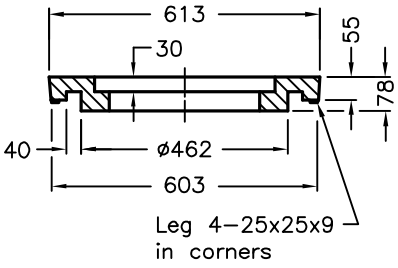

PLAN

SECTION C–C

COVER

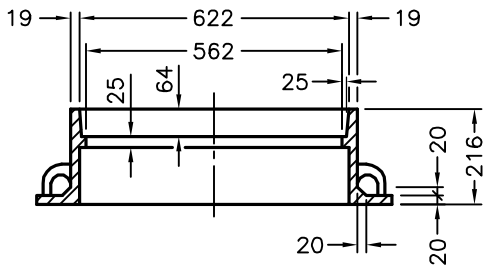



PLAN

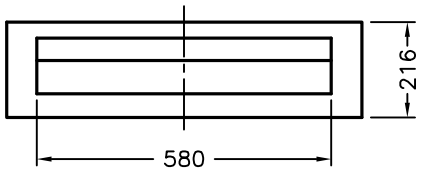



SECTION D–D

SQUARE COVER

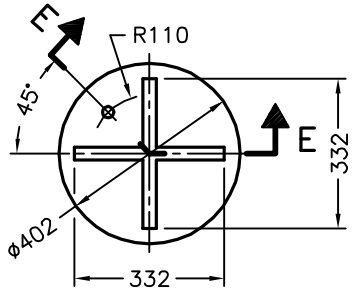



SECTION B–B

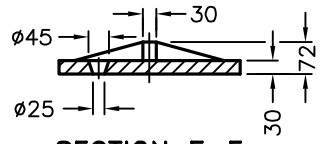



CURB ELEVATION

FRAME




BOTTOM VIEW




SECTION E–E

ROUND COVER

NOTE:

A Installation shall be according to OPSD 610.030.

B All dimensions are in millimetres unless otherwise shown.

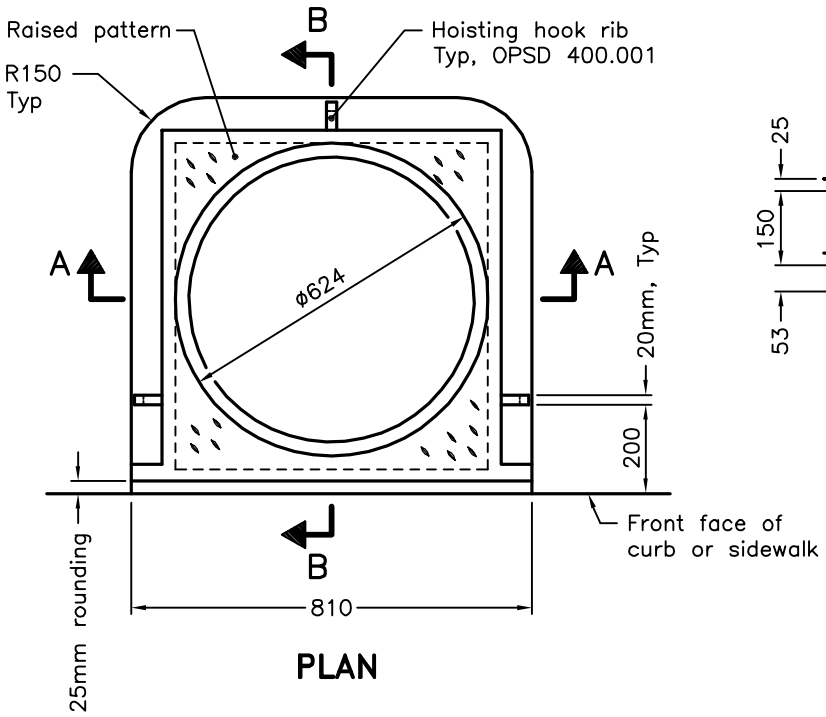
ONTARIO PROVINCIAL STANDARD DRAWING

# CAST IRON, CURB INLET FRAME WITH TWO–PIECE RAISED COVER FOR CATCH BASINS OUT OF ROADWAY

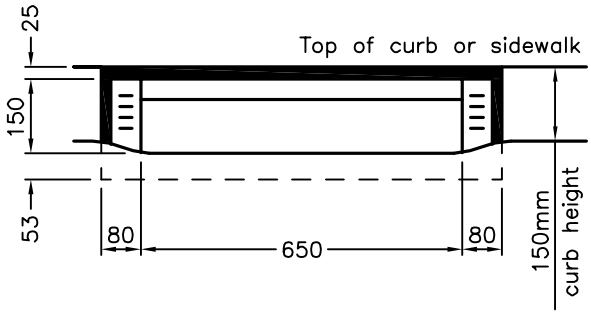
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

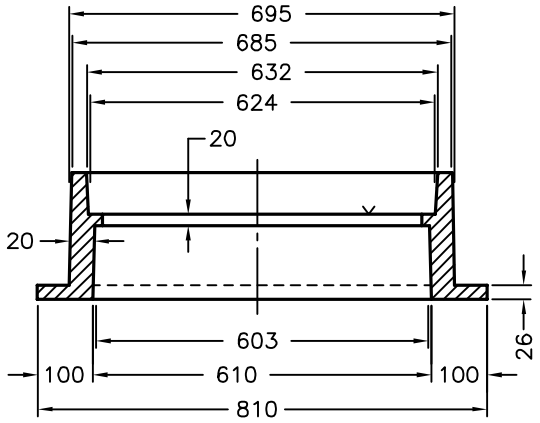
OPSD 400.081



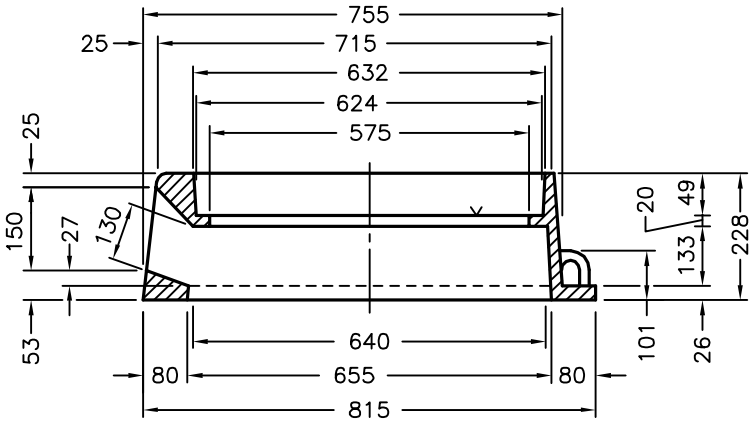

PLAN




CURB ELEVATION




SECTION A–A

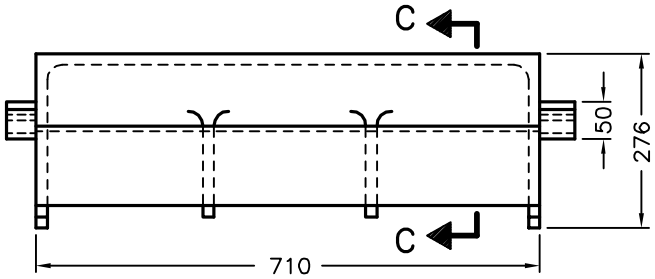



SECTION B–B

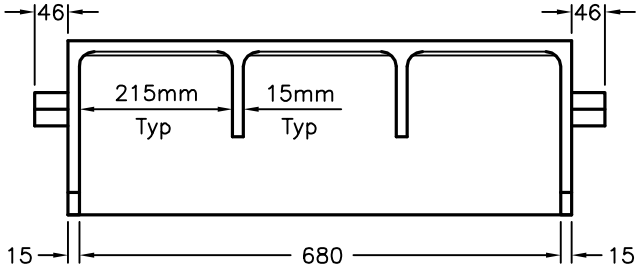
NOTES:

A Installation shall be according to OPSD 610.030.
B For cover types, see OPSD 401.010 or 401.080.
C All dimensions are in millimetres unless otherwise shown.

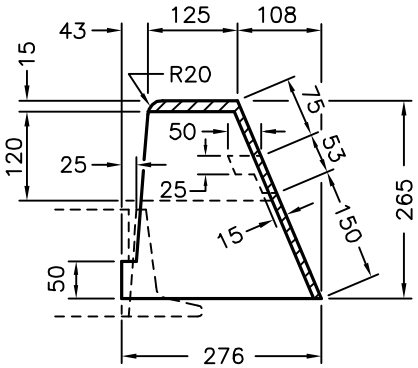
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 4 |
|---|---|---|---|
| CAST IRON, RAISED CURB INLET FRAME WITH COVER FOR CATCH BASINS OUT OF ROADWAY | | | |
| | OPSD 400.082 | | |




TOP VIEW

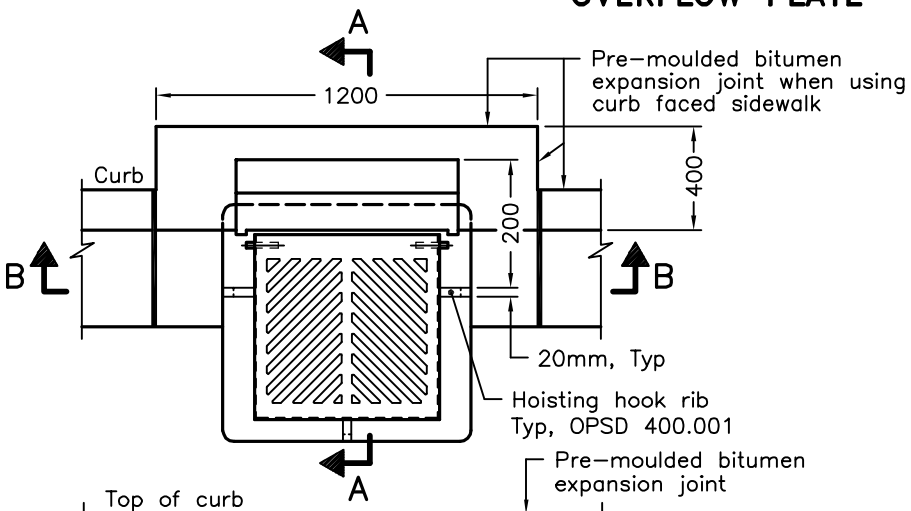


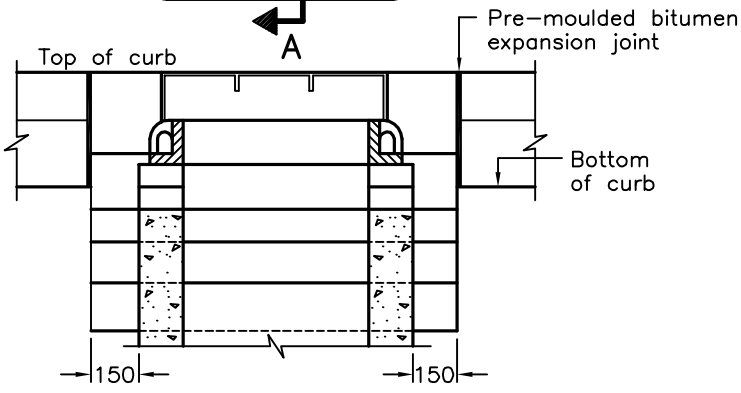

FRONT VIEW



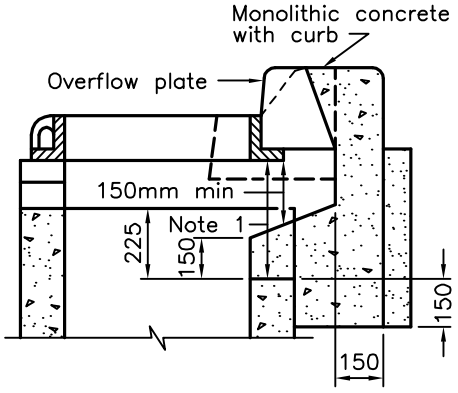

SECTION C–C

OVERFLOW PLATE




SECTION B–B




SECTION A–A

INSTALLATION DETAIL

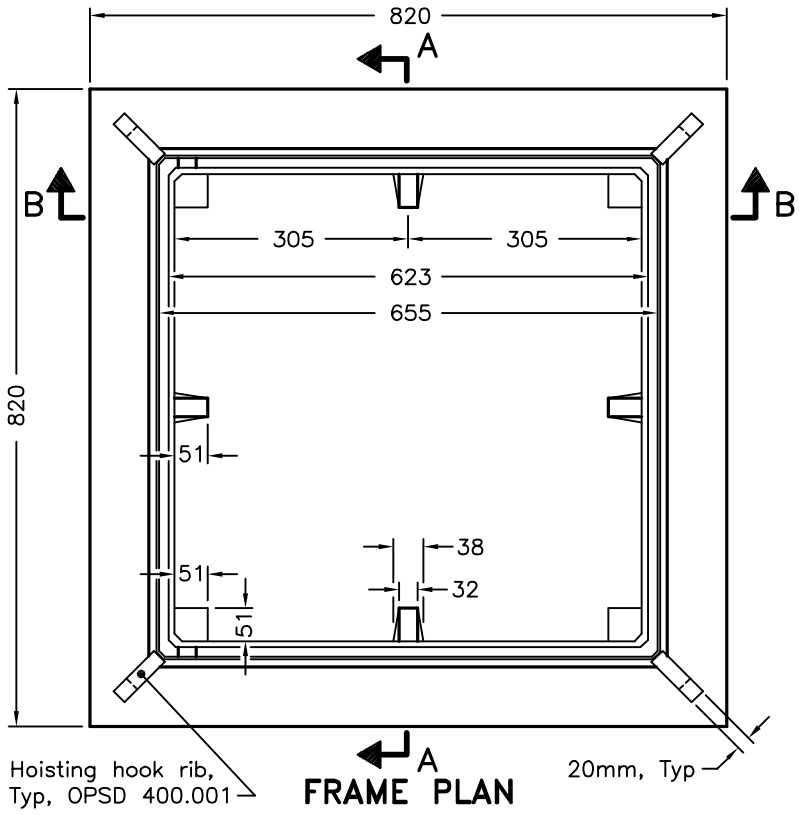
NOTES:

1 Temporary brick bulkhead prior to setting final grade of the frame with grate.

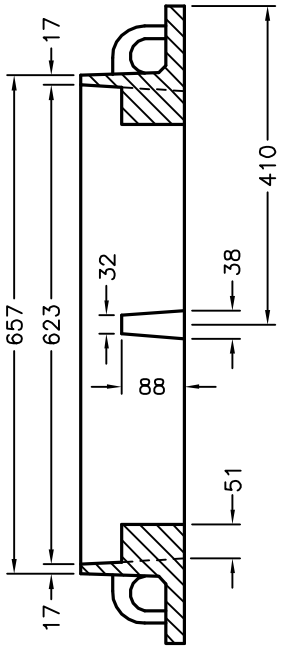
A Catch basin shall have 250mm diameter minimum lead.

B All dimensions are in millimetres unless otherwise shown.

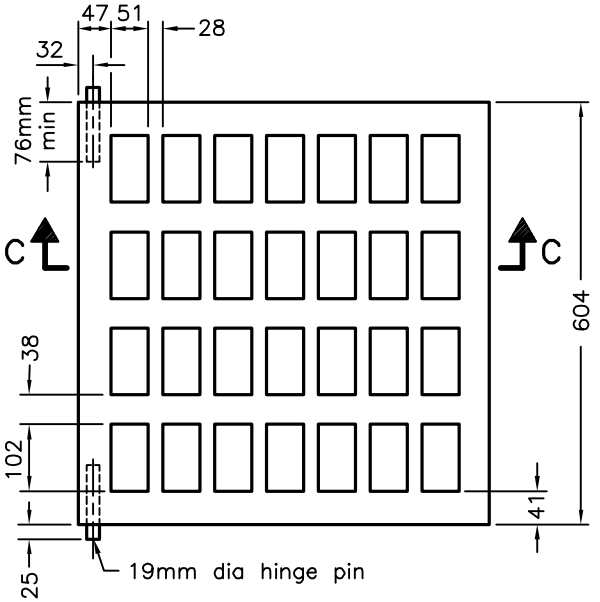
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| CAST IRON<br>CURB INLET OVERFLOW<br>FOR CATCH BASINS | | | |
| | OPSD 400.090 | | |



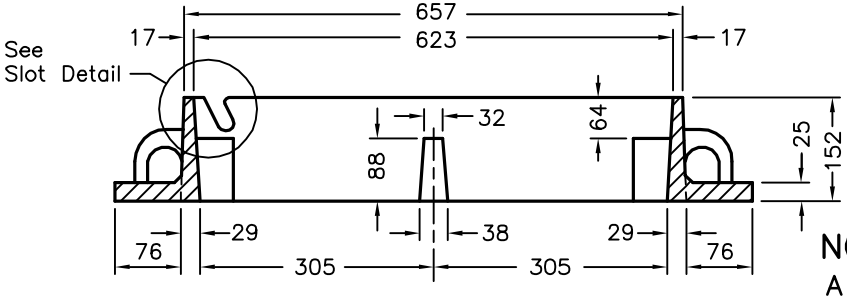

FRAME PLAN



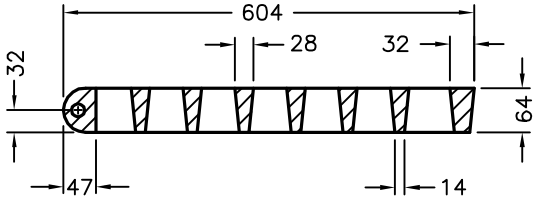

SECTION A–A




GRATE PLAN




SECTION B–B

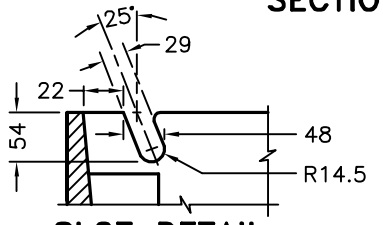



SECTION C–C

NOTE:

A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.

B All dimensions are in millimetres unless otherwise shown.



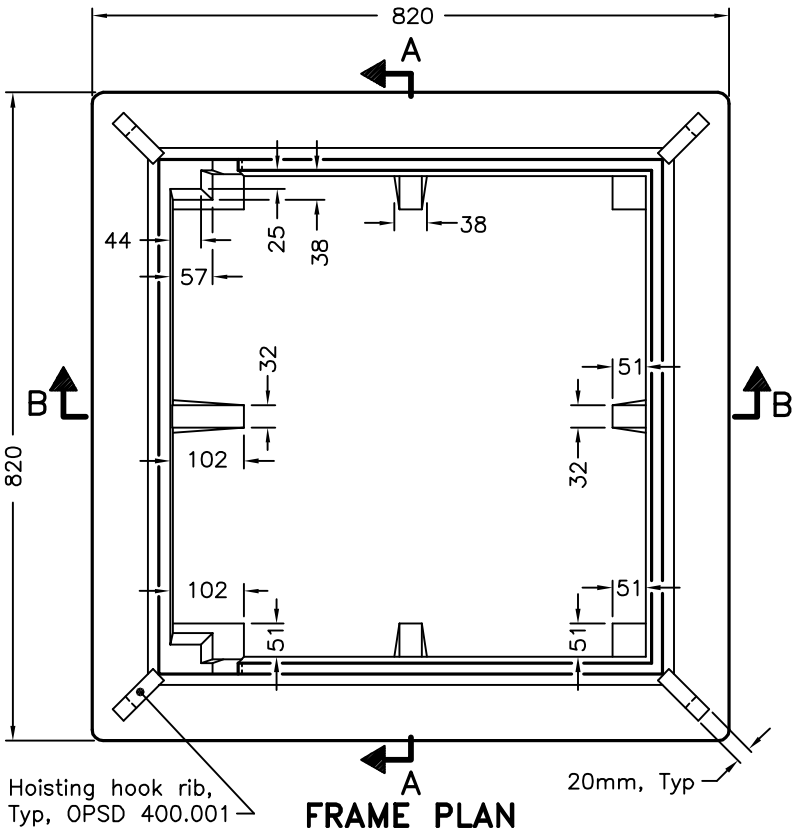

SLOT DETAIL

ONTARIO PROVINCIAL STANDARD DRAWING

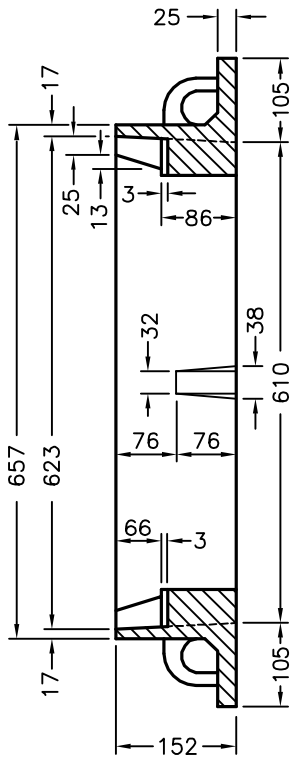
# CAST IRON, SQUARE FRAME WITH SQUARE FLAT GRATE FOR CATCH BASINS, PERFORATED OPENINGS

Nov 2013 | Rev 2

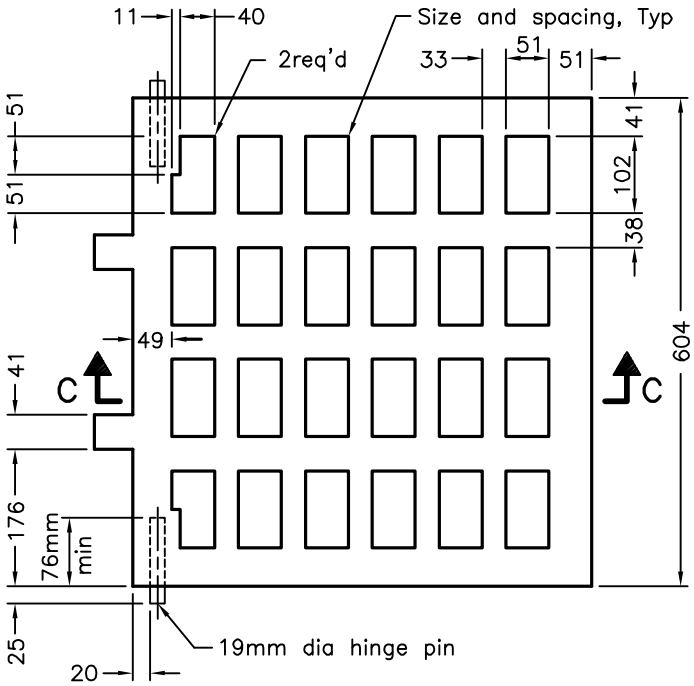
OPSD 400.100



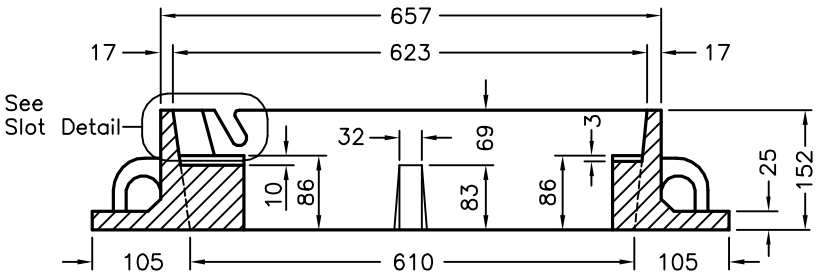

FRAME PLAN



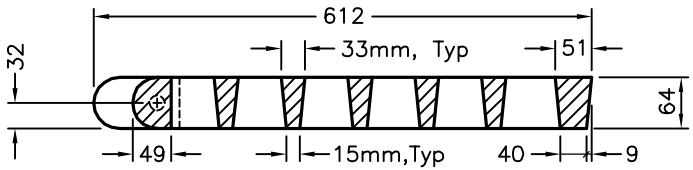

SECTION A–A



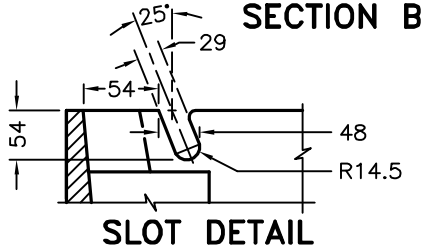

GRATE PLAN




SECTION B–B




SECTION C–C



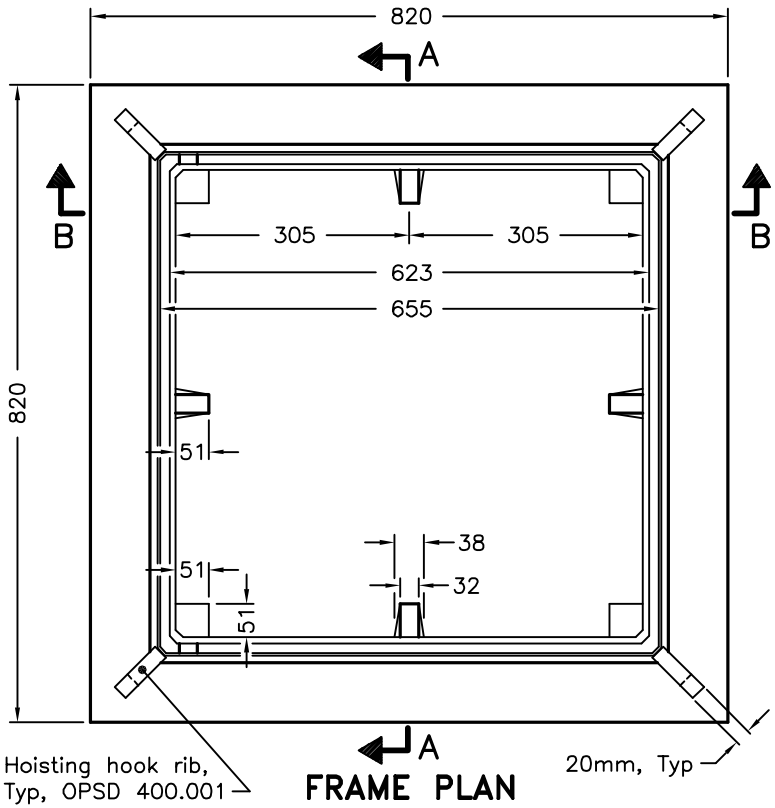

SLOT DETAIL

NOTES:

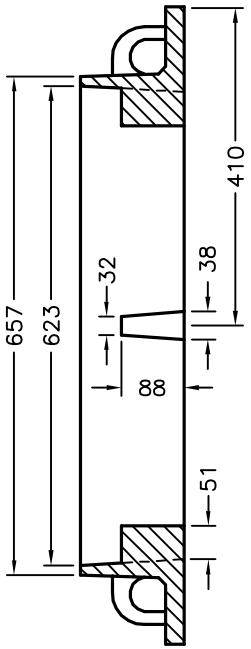
A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.

B All dimensions are in millimetres unless otherwise shown.

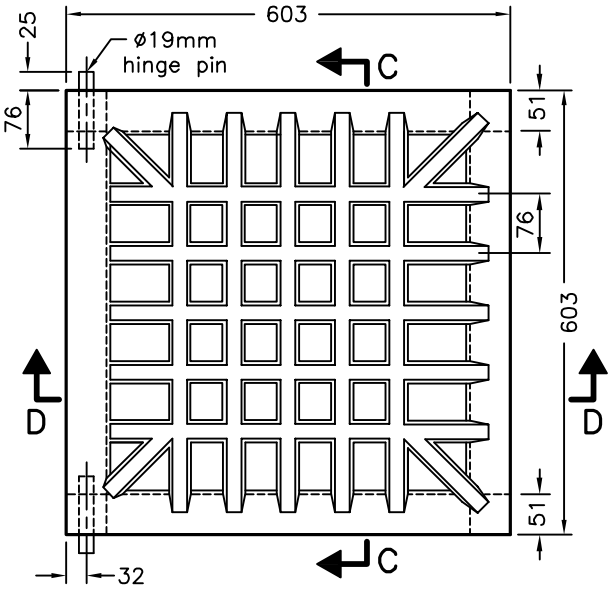
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE FLAT GRATE FOR CATCH BASINS, PERFORATED OPENINGS | | | |
| | OPSD 400.110 | | |



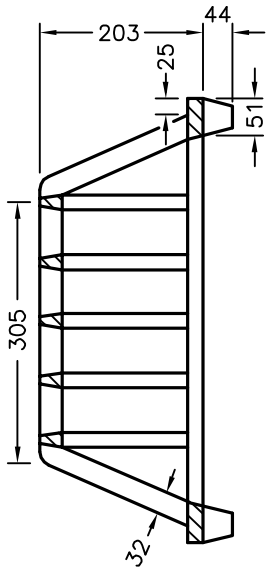

FRAME PLAN



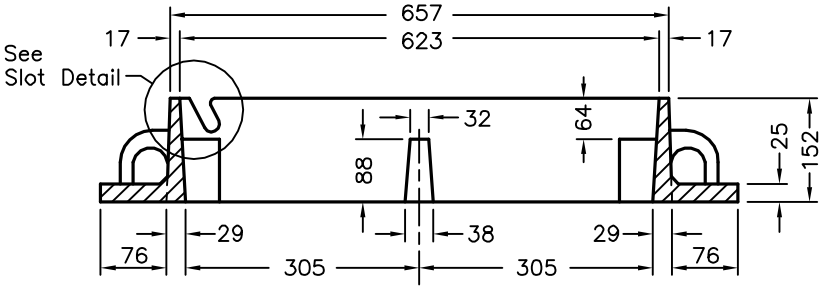

SECTION A–A



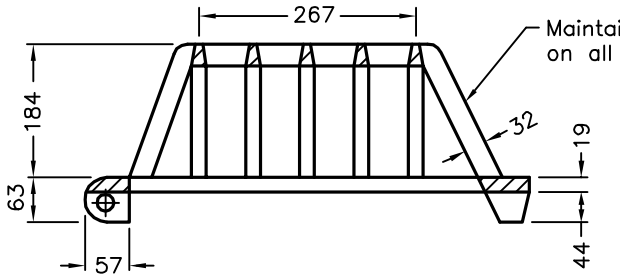

GRATE PLAN



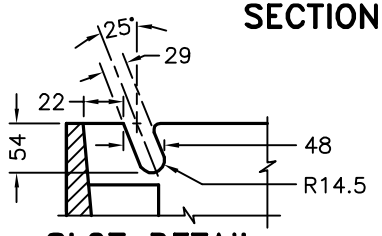

SECTION C–C




SECTION B–B




SECTION D–D

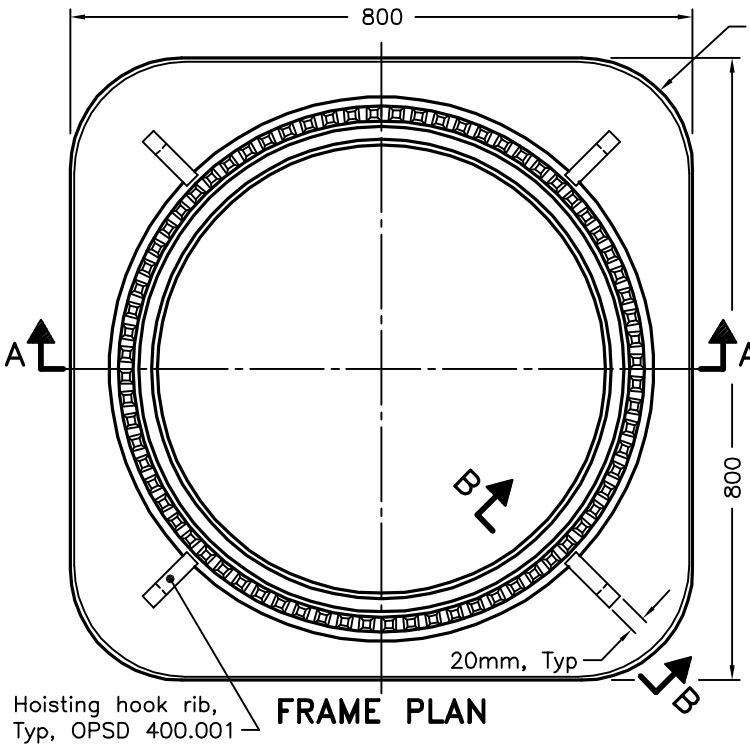



SLOT DETAIL

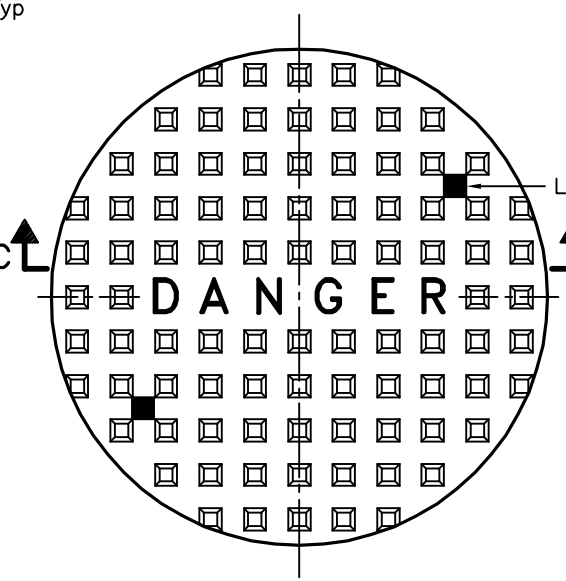
NOTES:

A All dimensions are in millimetres unless otherwise shown.

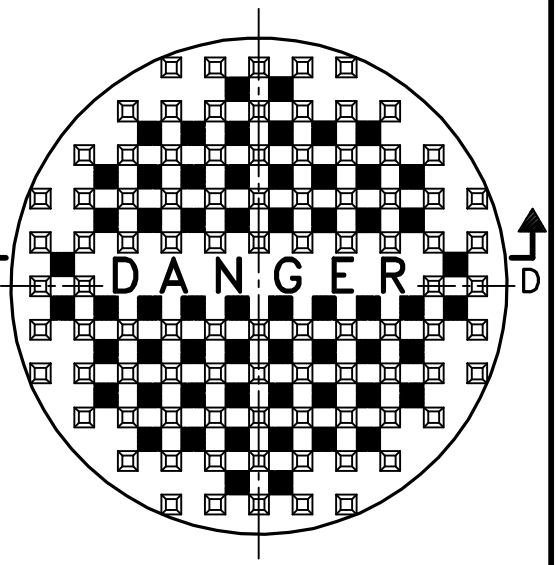
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| CAST IRON, SQUARE FRAME WITH BIRDCAGE GRATE FOR CATCH BASINS | | | |
| | OPSD 400.120 | | |



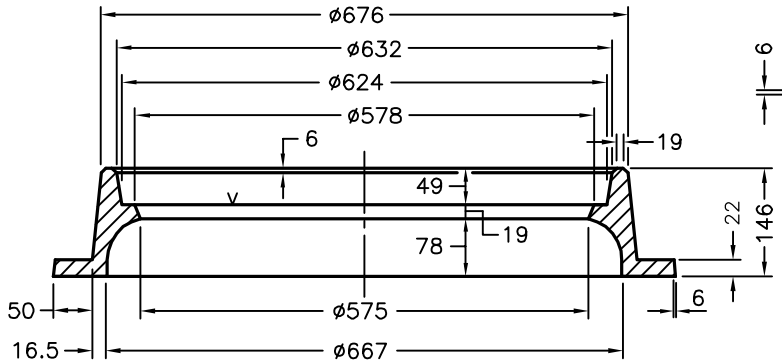

FRAME PLAN



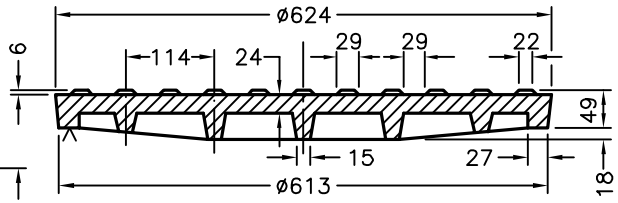

TYPE A
CLOSED COVER



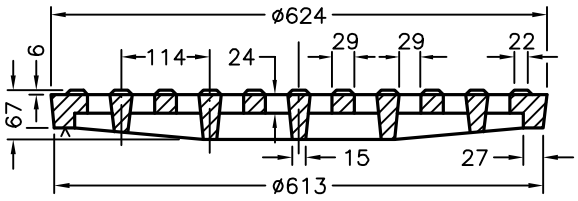

TYPE B
OPEN COVER




SECTION A–A




SECTION C–C

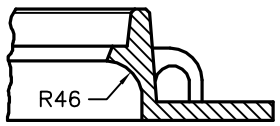



SECTION D–D

NOTES:

A Covers shall be Type A or Type B, as specified.

B All dimensions are in millimetres unless otherwise shown.



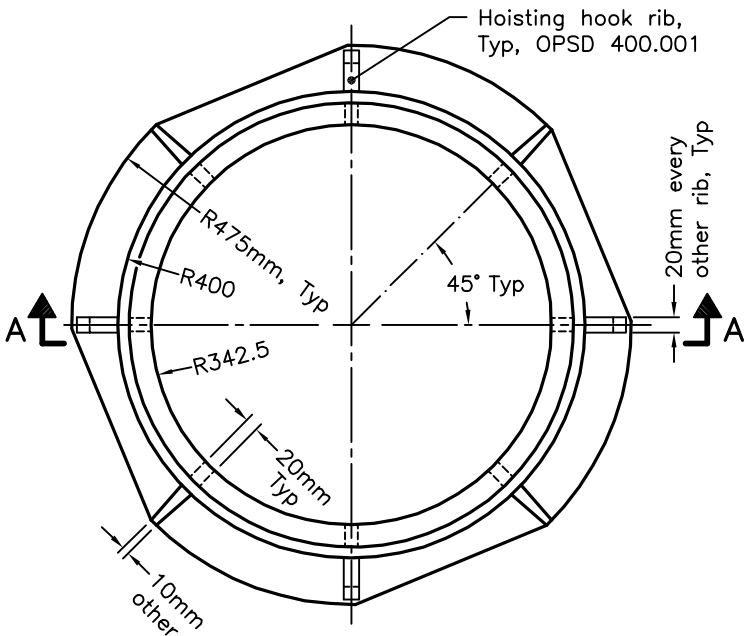

SECTION B–B

ONTARIO PROVINCIAL STANDARD DRAWING

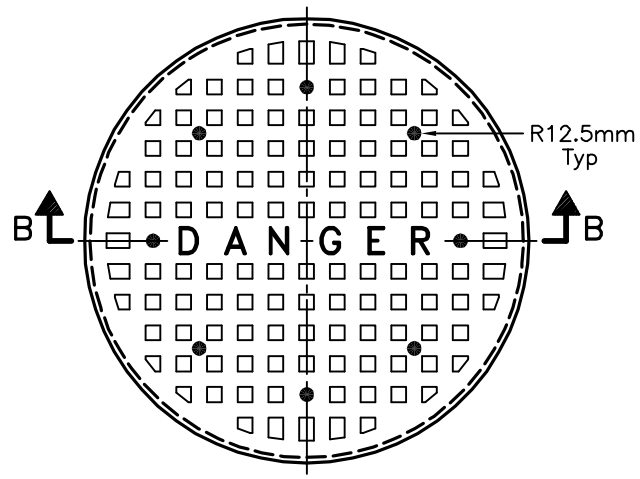
Nov 2013 | Rev 3

# CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN COVER FOR MAINTENANCE HOLES

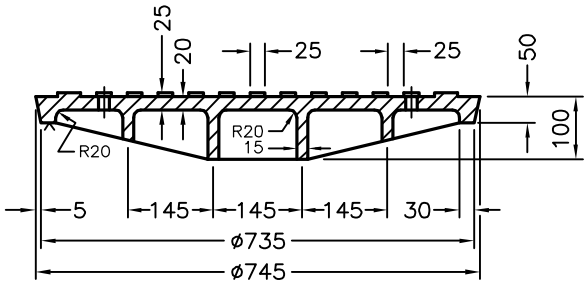
OPSD 401.010



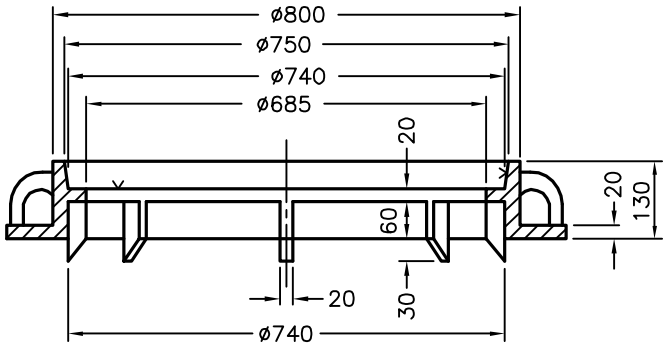

**FRAME PLAN**
**NOTE 1**



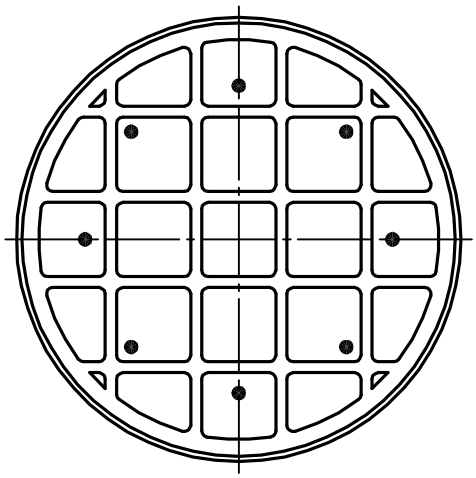

**COVER PLAN**




**SECTION B–B**




**SECTION A–A**



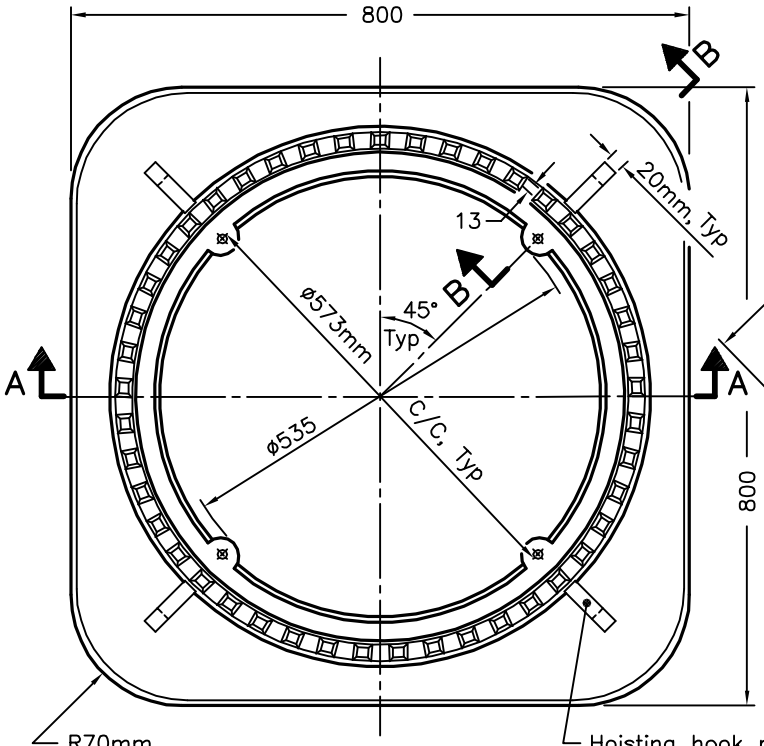
**COVER BOTTOM VIEW**

NOTE:

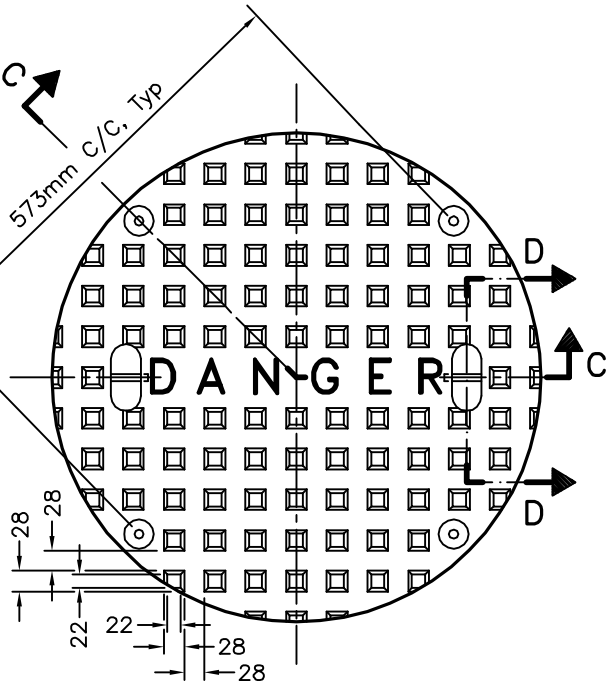
1 As an option, frame may be completely round.

A All dimensions are in millimetres unless otherwise shown.

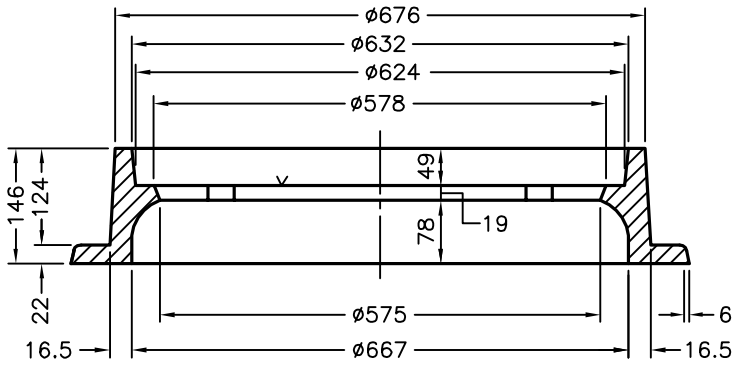
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| CAST IRON, CIRCULAR FRAME WITH CIRCULAR 745mm COVER FOR MAINTENANCE HOLES | | | |
| | OPSD 401.020 | | |



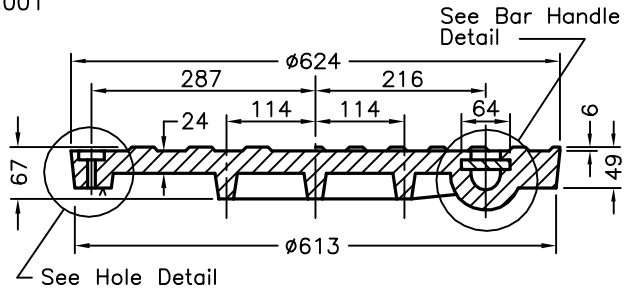

FRAME PLAN



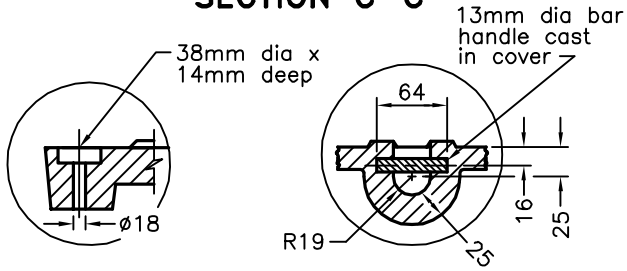

COVER PLAN




SECTION A–A

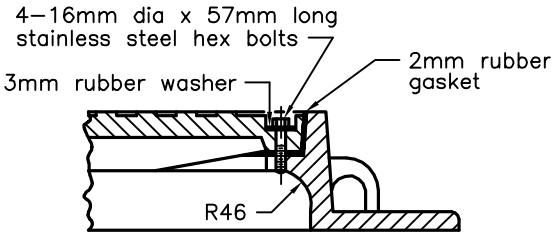



SECTION C–C

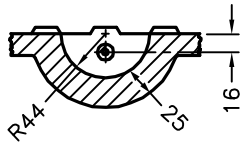



HOLE DETAIL

BAR HANDLE DETAIL




SECTION B–B

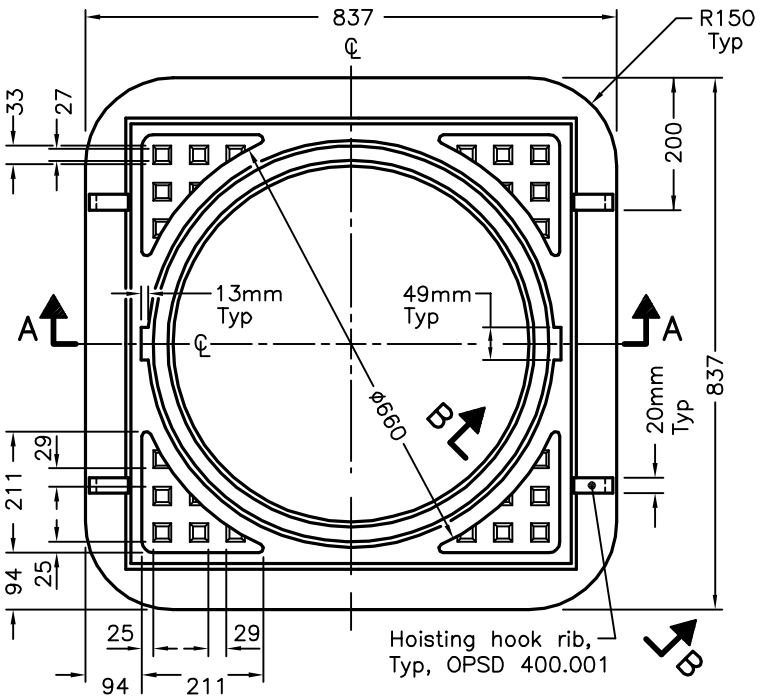



SECTION D–D

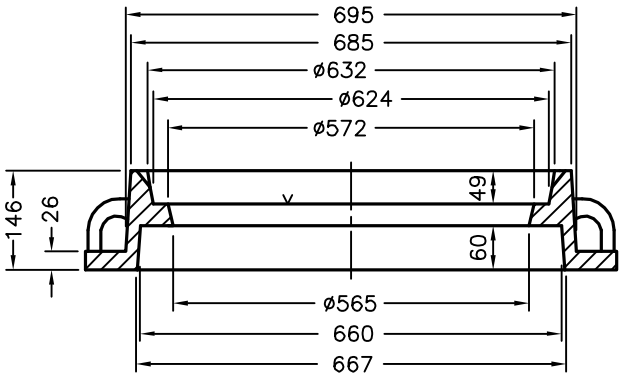
NOTE:

A All dimensions are in millimetres unless otherwise shown.

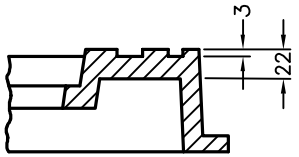
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| CAST IRON, SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES | | | |
| | OPSD 401.030 | | |



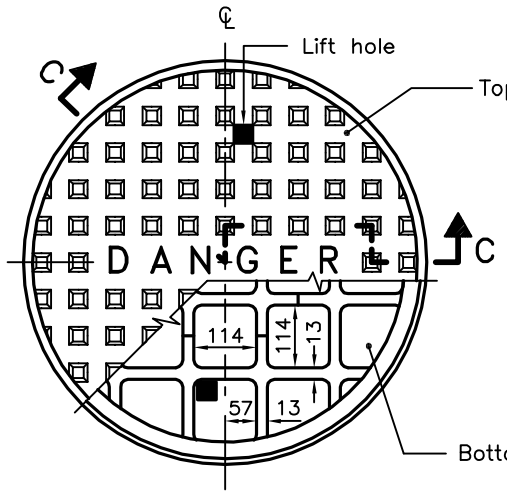

FRAME PLAN



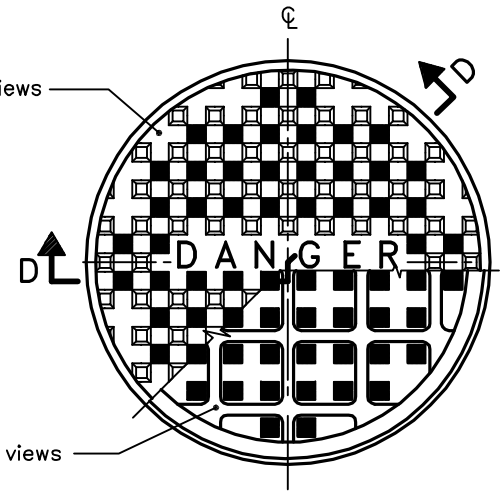

SECTION A–A



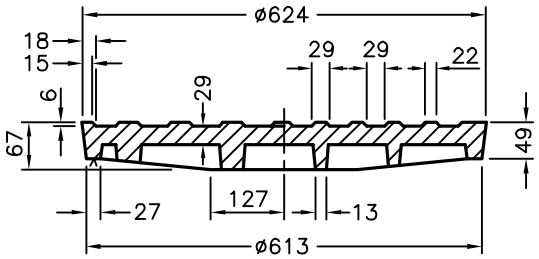

SECTION B–B



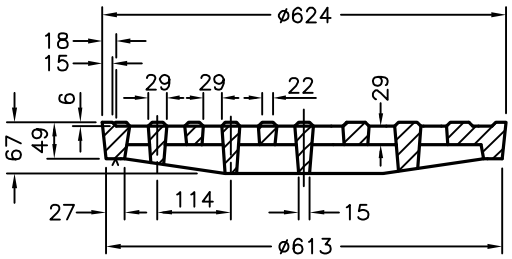

TYPE A
CLOSED COVER




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.

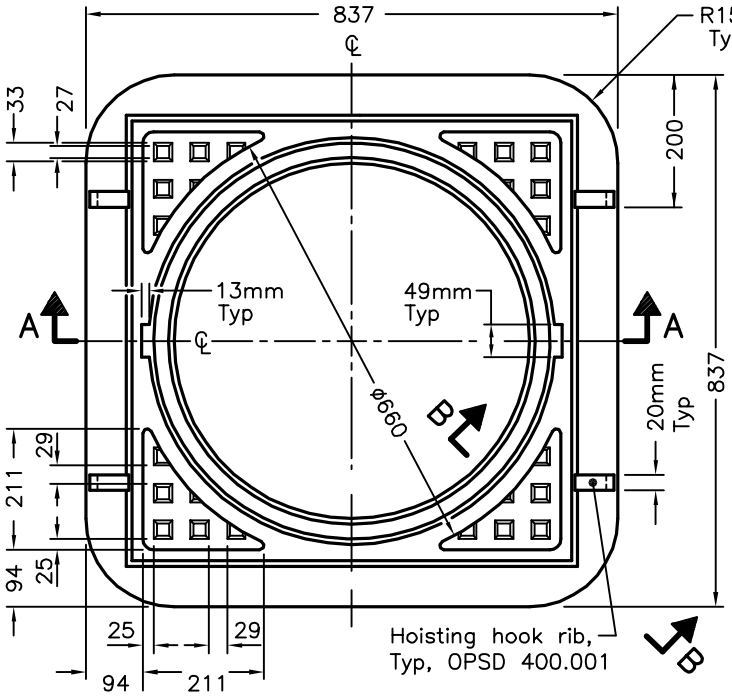
ONTARIO PROVINCIAL STANDARD DRAWING

Apr 2015 | Rev 4

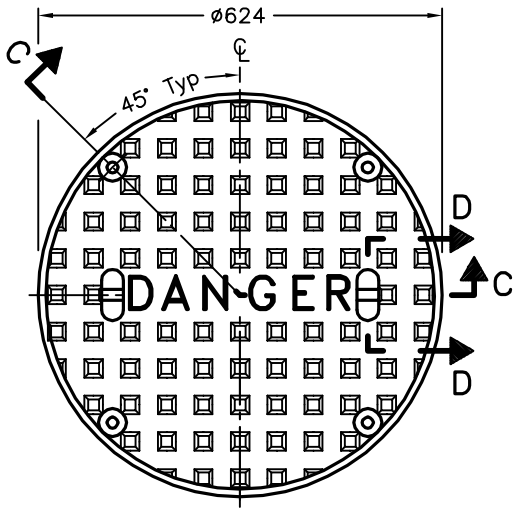
# CAST IRON, RAISED SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN COVER FOR MAINTENANCE HOLES

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

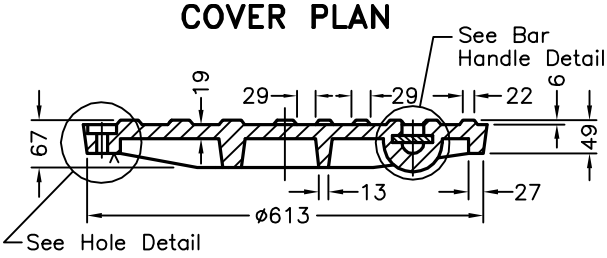
OPSD 401.040



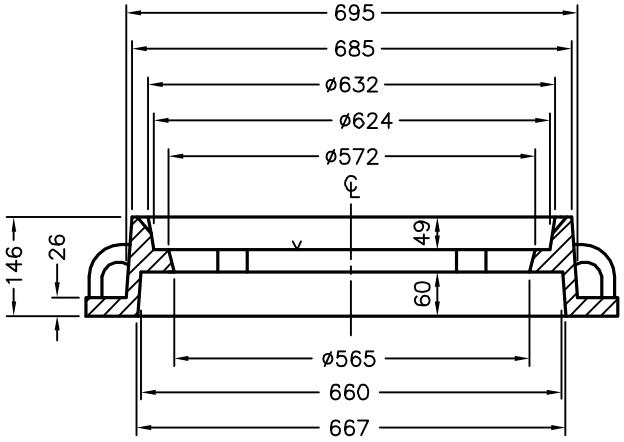

FRAME PLAN



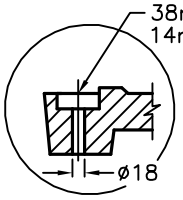

COVER PLAN



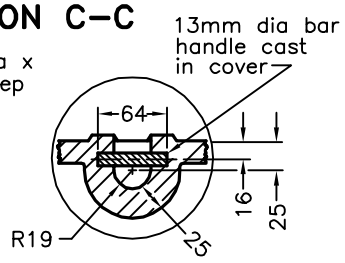

SECTION C–C



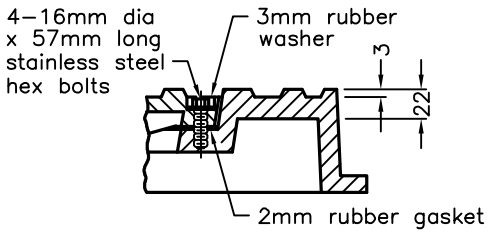

SECTION A–A



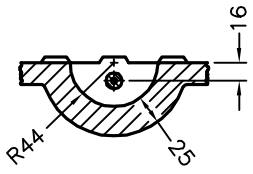

HOLE DETAIL



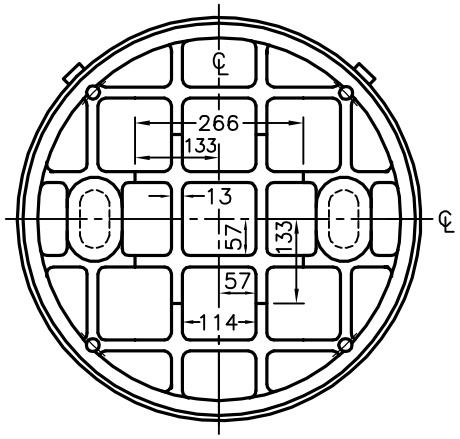

BAR HANDLE DETAIL




SECTION B–B
SHOWN WITH COVER IN PLACE




SECTION D–D

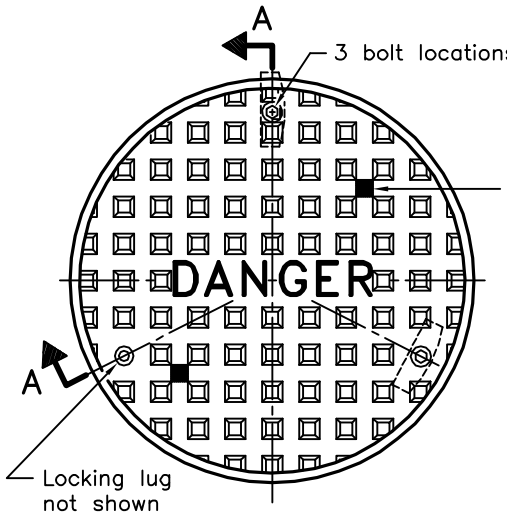



BOTTOM VIEW

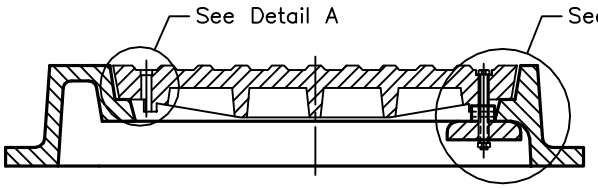
NOTES:

A All dimensions are in millimetres unless otherwise shown.

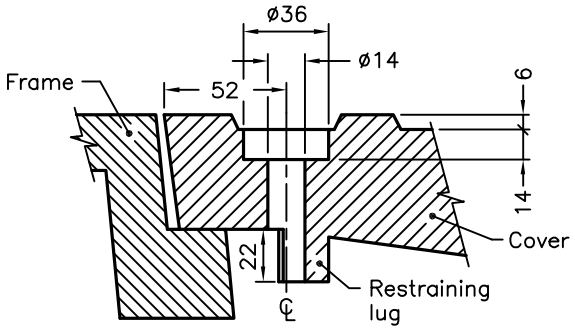
| ONTARIO PROVINCIAL STANDARD DRAWING | Apr 2015 | Rev | 4 |
|---|---|---|---|
| CAST IRON, RAISED SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES | | | |
| | OPSD 401.050 | | |

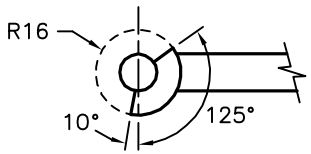



COVER

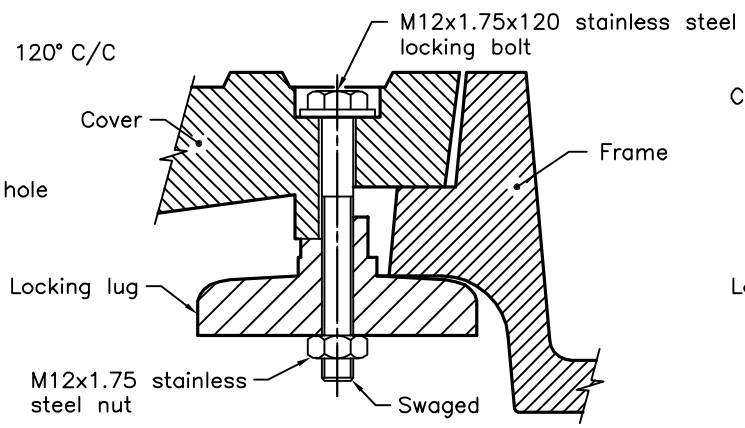



SECTION A–A
FRAME WITH COVER SHOWN

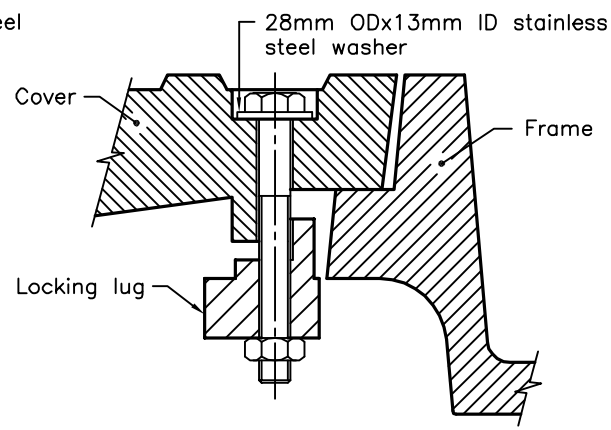



DETAIL A

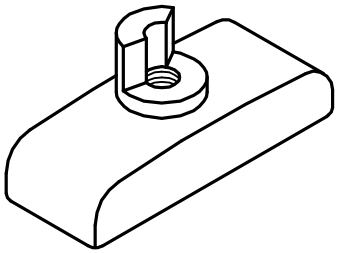



LOCKED POSITION

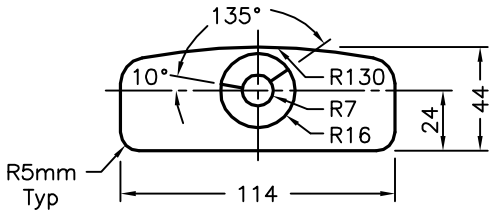



OPEN POSITION

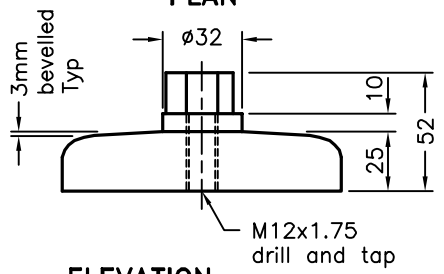
DETAIL B



ISOMETRIC VIEW




PLAN




ELEVATION

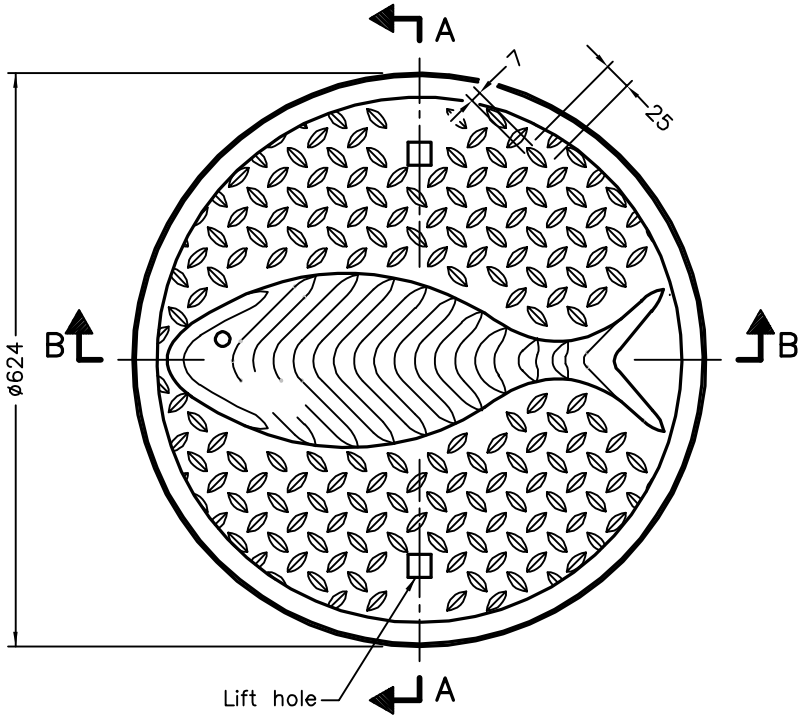
LOCKING LUG

NOTES:

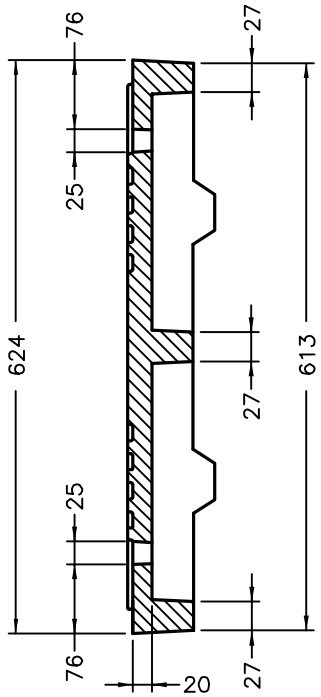
A Locking bolt shall be securely tightened.

B All dimensions are in millimetres unless otherwise shown.

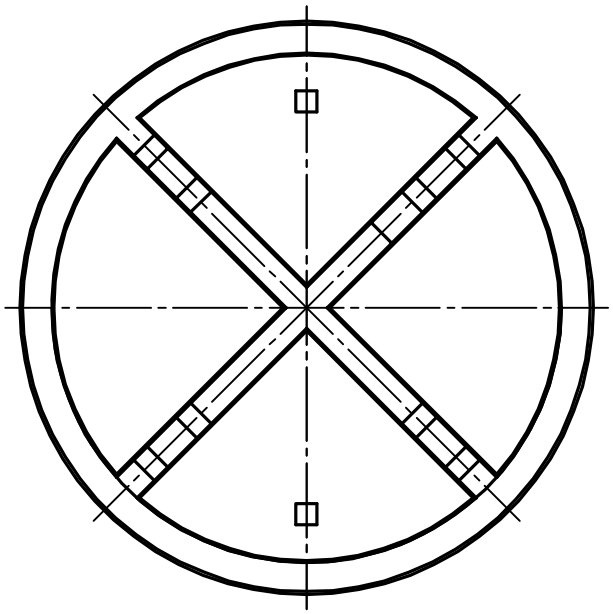
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| CAST IRON<br>**CIRCULAR LOCKING COVER**<br>FOR MAINTENANCE HOLES | | | |
| | | | **OPSD 401.060** |



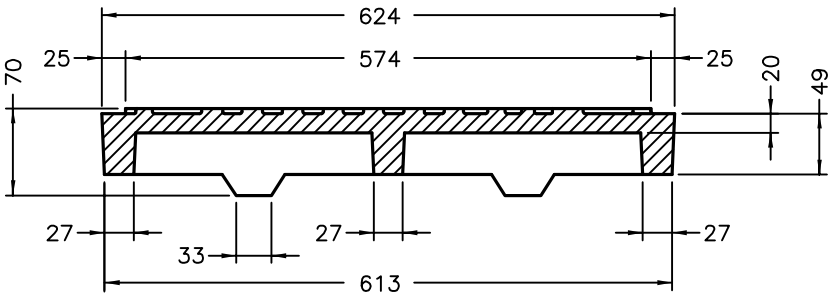

PLAN



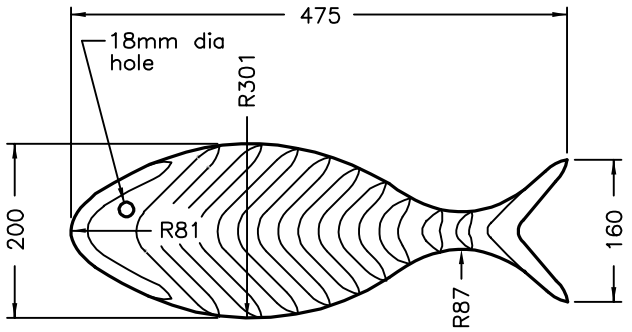

SECTION A–A



BOTTOM VIEW



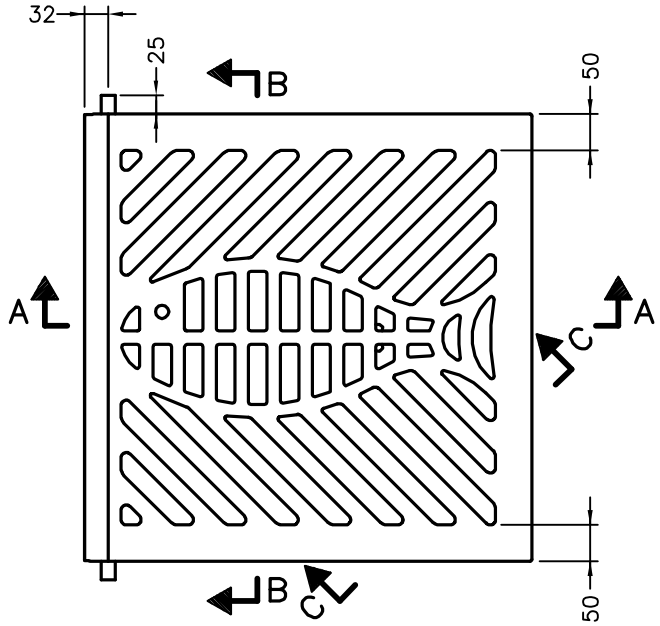

SECTION B–B



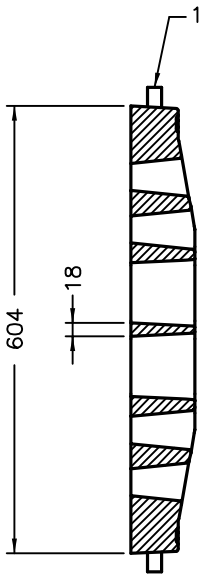

FISH DETAIL

NOTE:
A All dimensions are in millimetres unless otherwise shown.

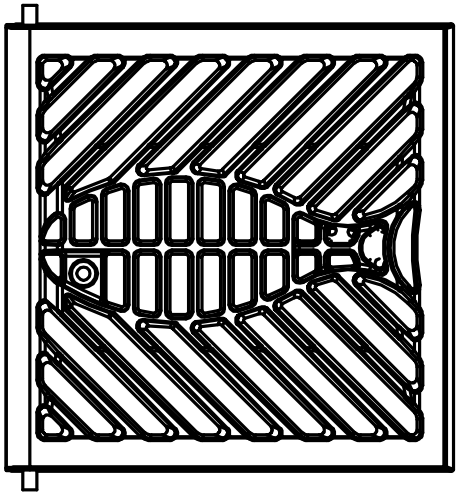
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| CAST IRON, CURB INLET<br>FISH TYPE COVER FOR CATCH BASINS<br>OUT OF ROADWAY | | | |
| | OPSD 401.080 | | |



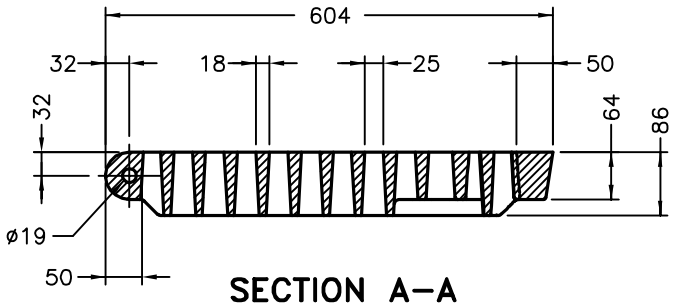

PLAN



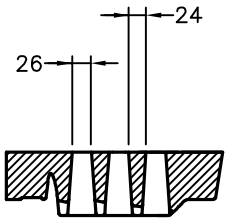

SECTION B–B



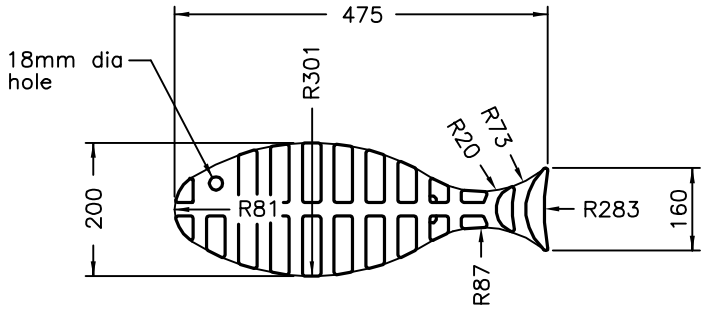
BOTTOM VIEW




SECTION A–A




SECTION C–C




FISH DETAIL

NOTE:

A This OPSD shall be read in conjunction with OPSD 400.020.

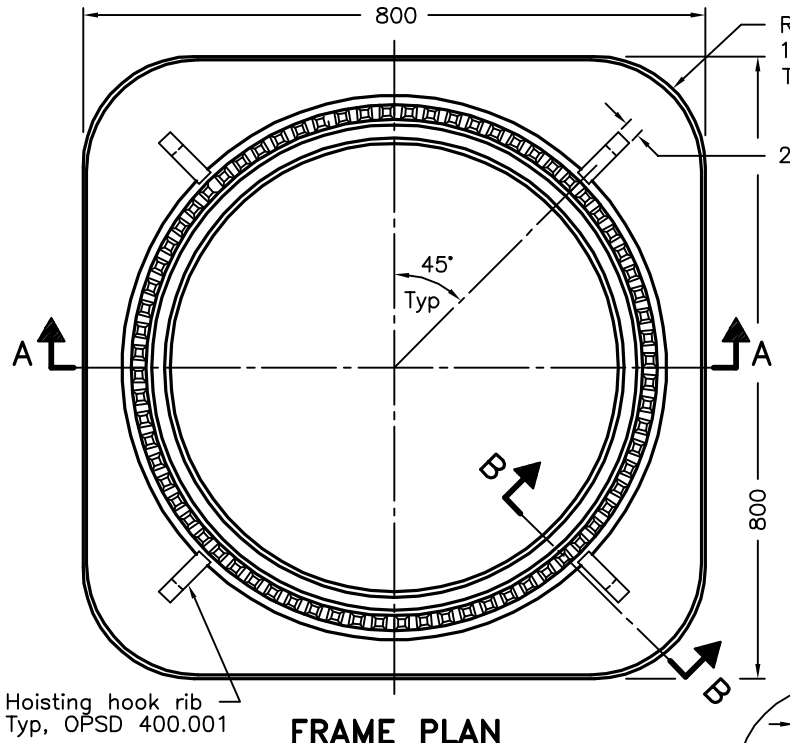
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

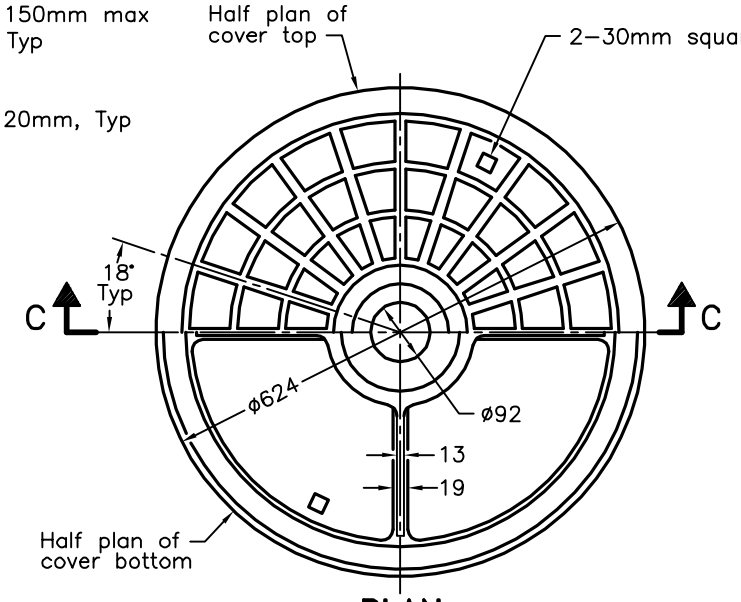
# CAST IRON, SQUARE FRAME FISH TYPE COVER

Nov 2015 | Rev 1

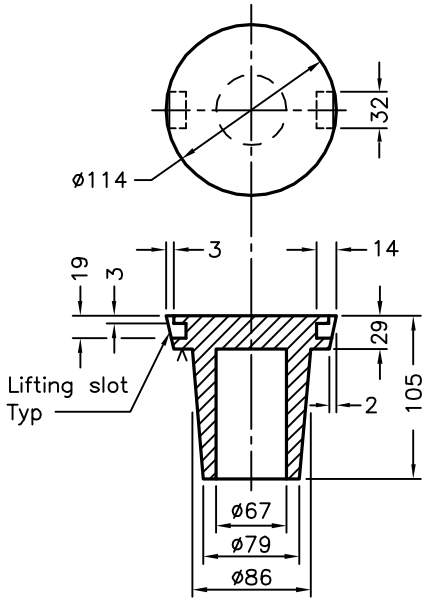
OPSD 401.081



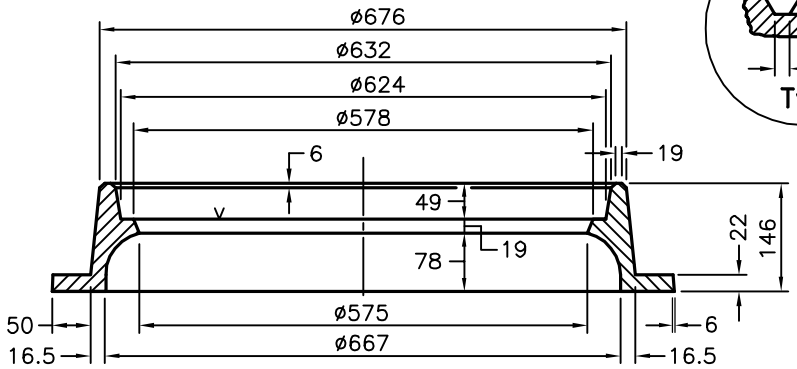

FRAME PLAN



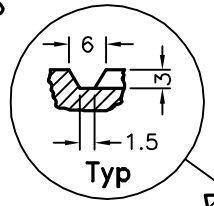

PLAN

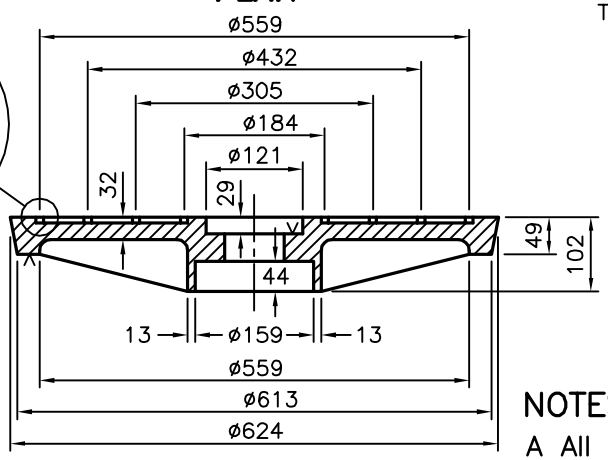



PLUG DETAIL




SECTION A–A

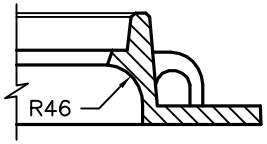



SECTION C–C

NOTES:

A All dimensions are in millimetres unless otherwise shown.



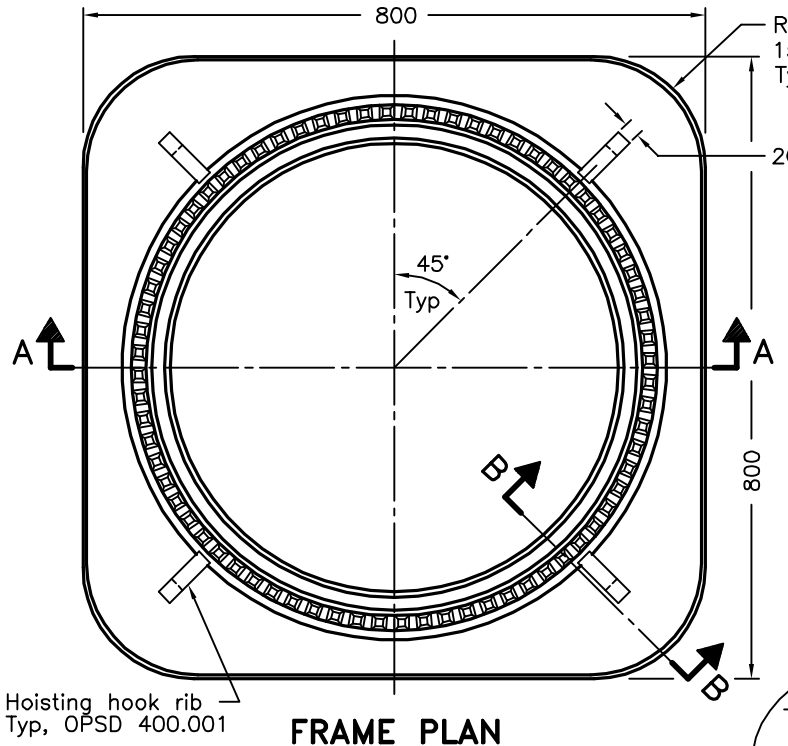

SECTION B–B

ONTARIO PROVINCIAL STANDARD DRAWING

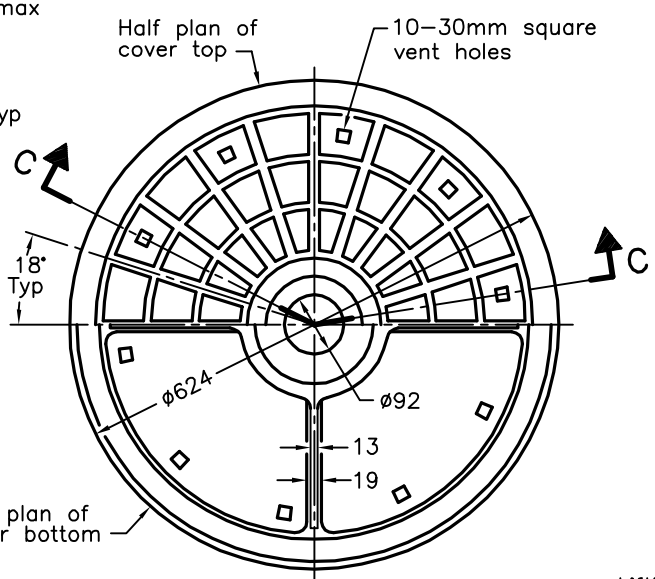
# CAST IRON, SQUARE FRAME WITH CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

Nov 2014 | Rev 3

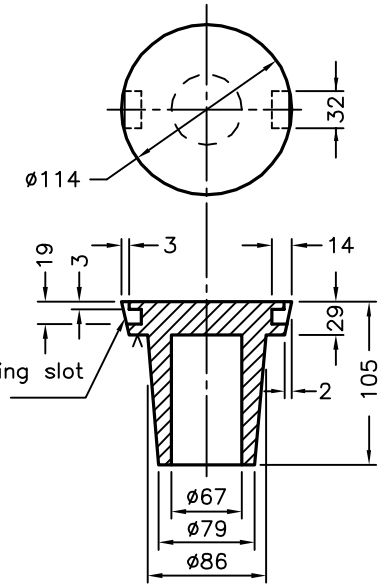
OPSD 402.010



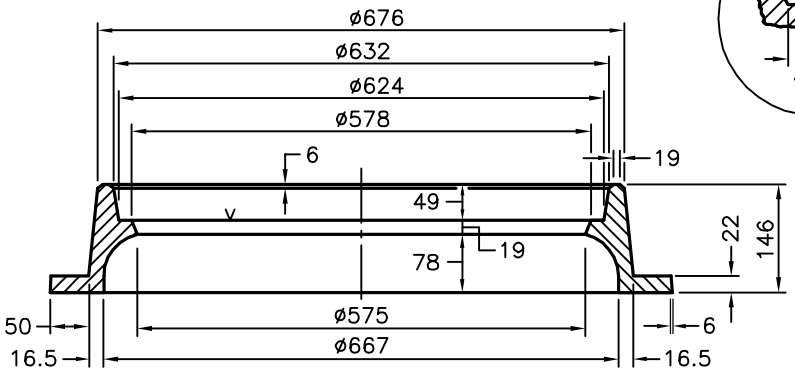

FRAME PLAN



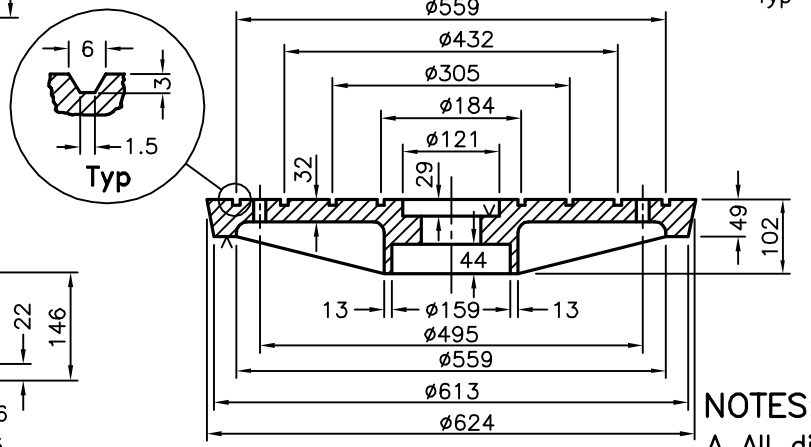

PLAN




PLUG DETAIL



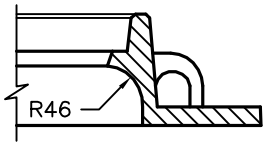

SECTION A–A




SECTION C–C

NOTES:

A All dimensions are in millimetres unless otherwise shown.




SECTION B–B

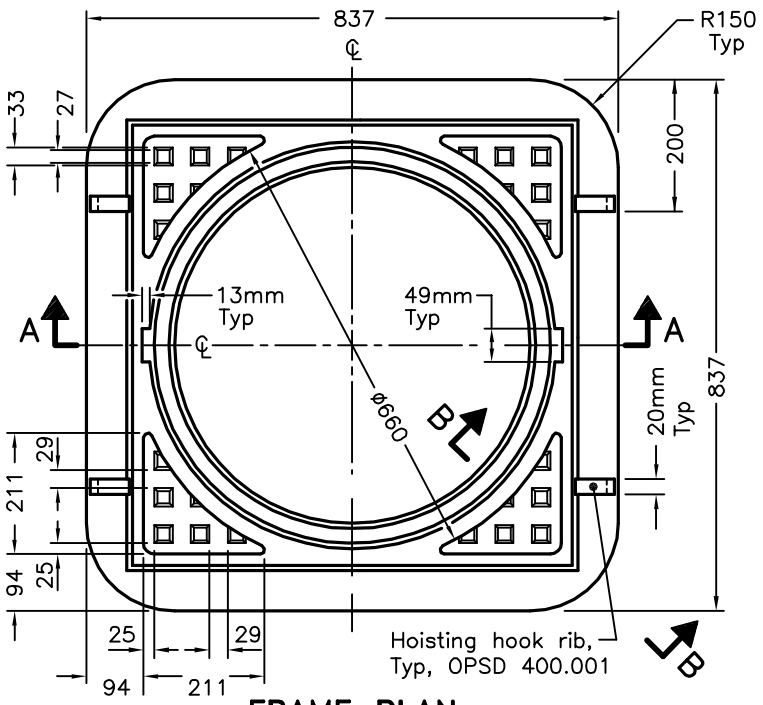
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev 3

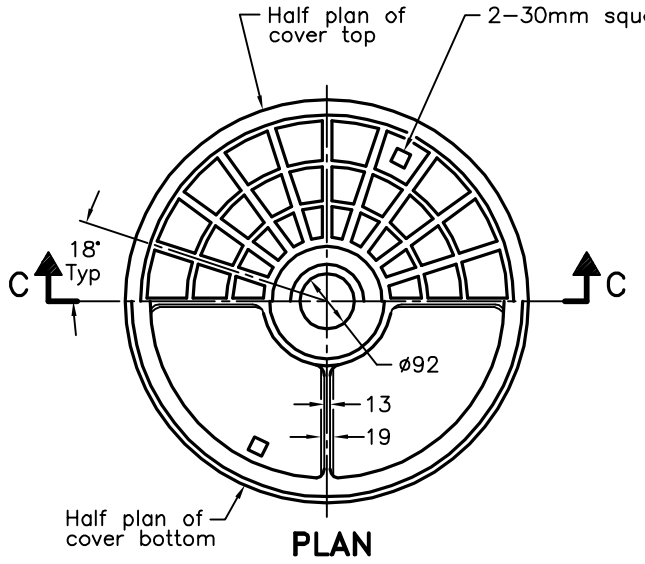
# CAST IRON, SQUARE FRAME WITH VENTED CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

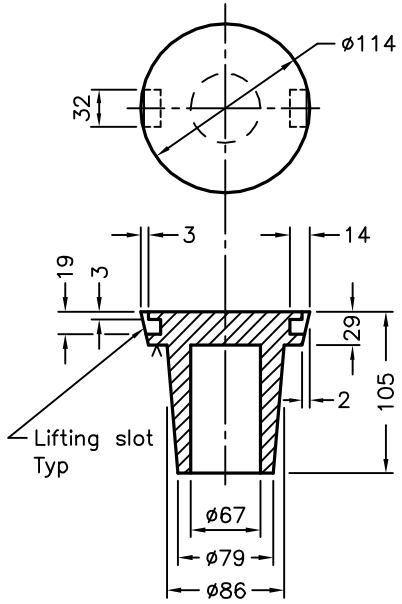
OPSD 402.011



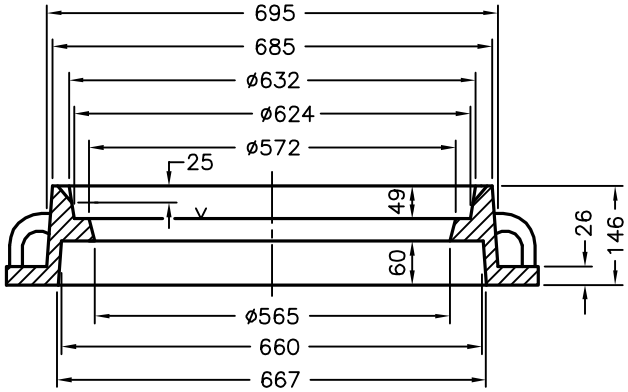

FRAME PLAN



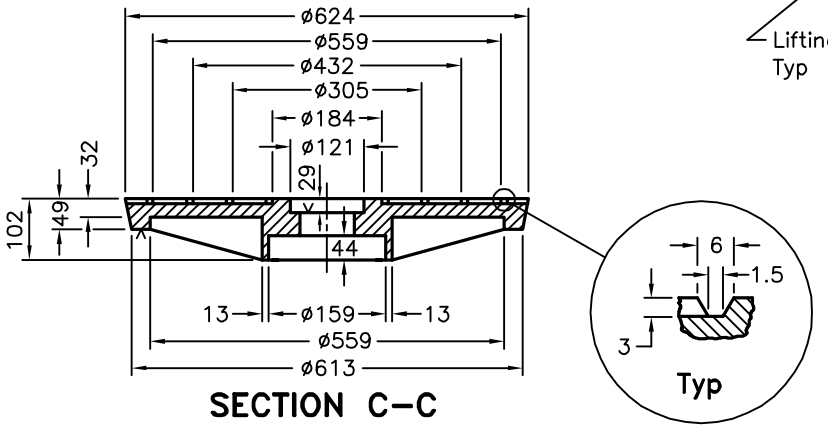

PLAN



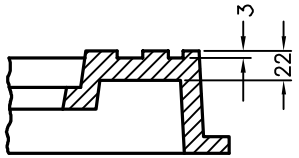

PLUG DETAIL




SECTION A–A




SECTION C–C




SECTION B–B

NOTES:

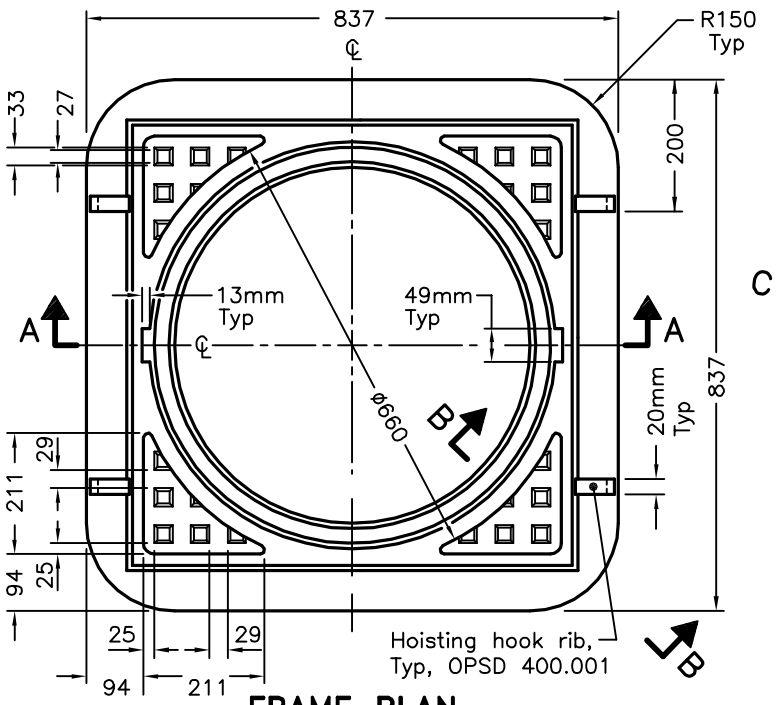
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

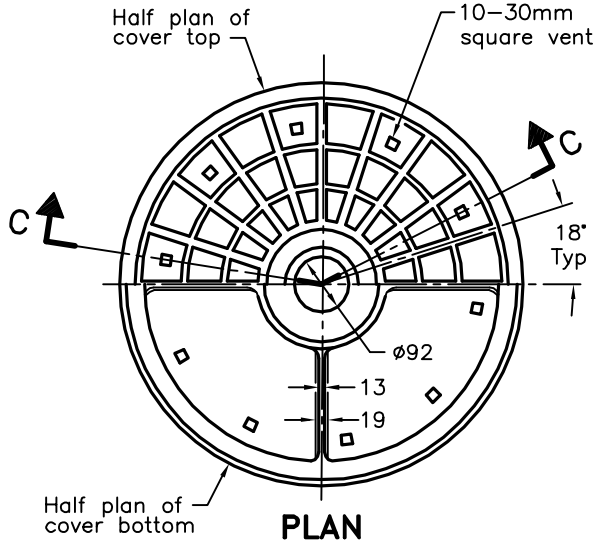
Apr 2015 | Rev 4

# CAST IRON, RAISED SQUARE FRAME WITH CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

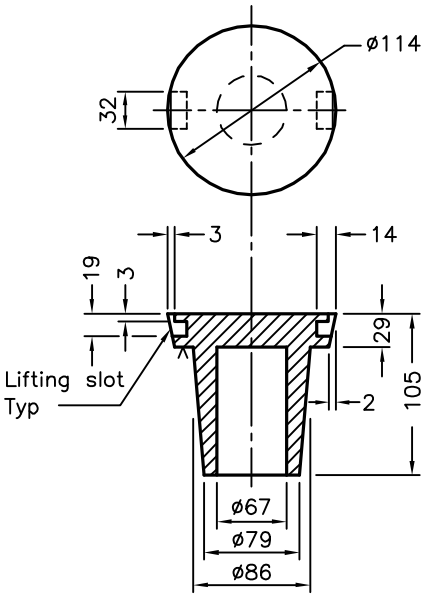
OPSD 402.020



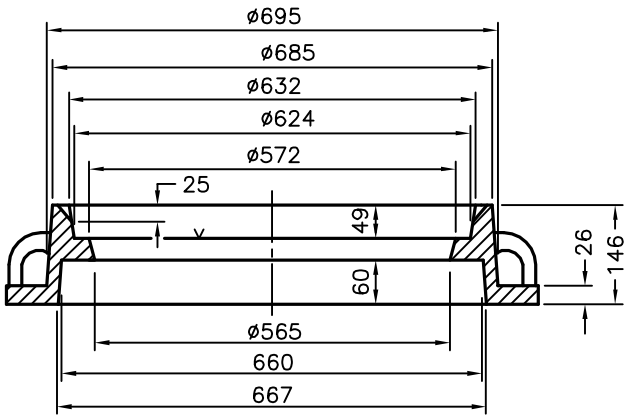

FRAME PLAN



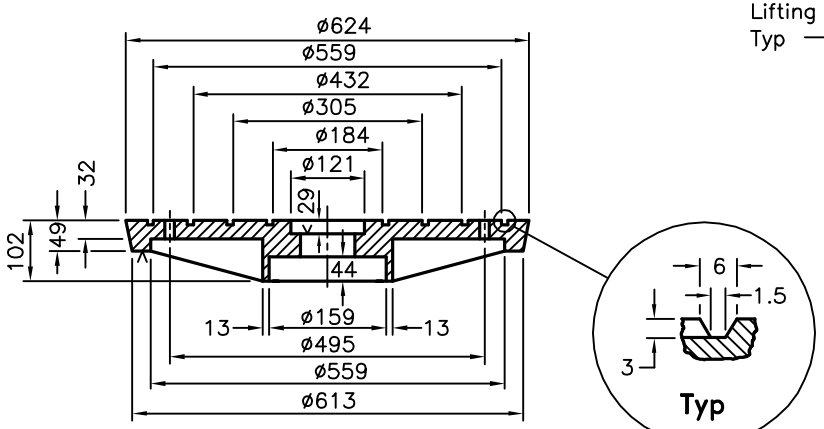

PLAN



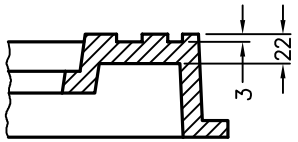

PLUG DETAIL




SECTION A–A




SECTION C–C




SECTION B–B

NOTES:

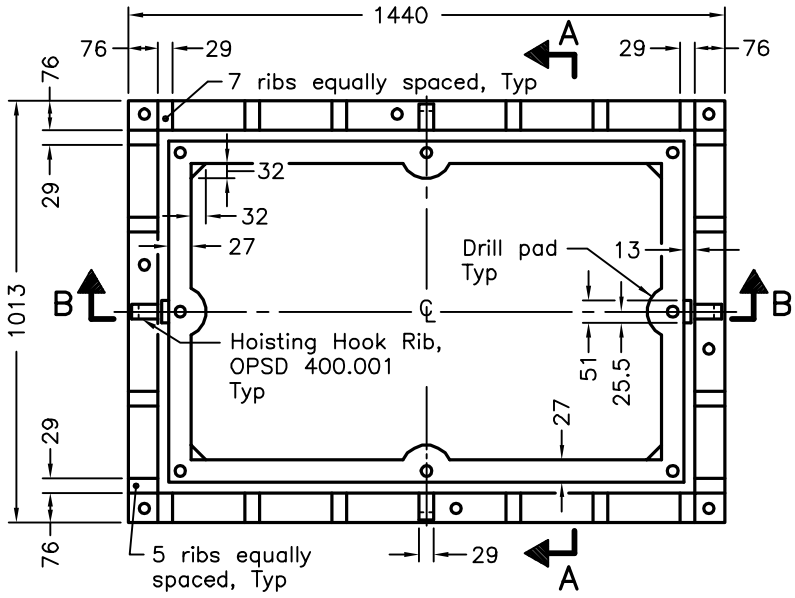
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

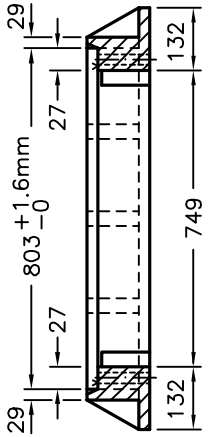
Apr 2015 | Rev 3

# CAST IRON, RAISED SQUARE FRAME WITH VENTED CIRCULAR COVER AND PLUG FOR VALVE CHAMBERS

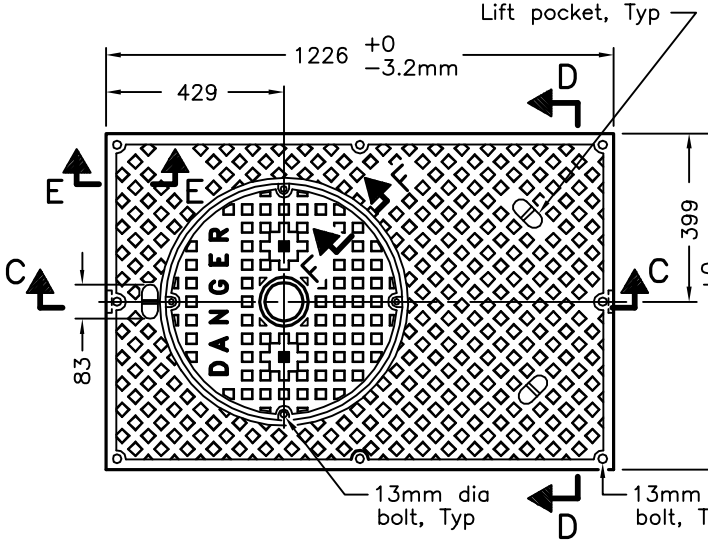
OPSD 402.021



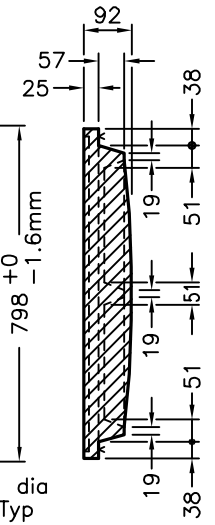

FRAME PLAN



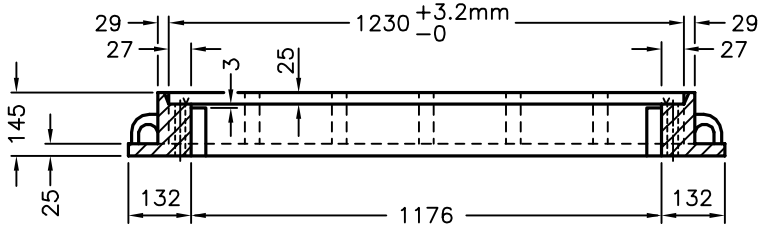

SECTION A–A



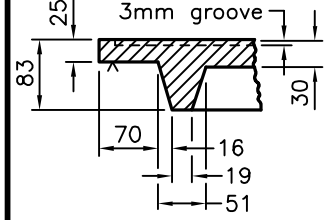

LARGE COVER PLAN



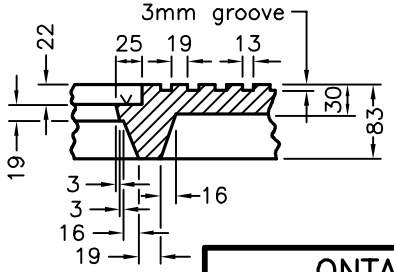

SECTION D–D



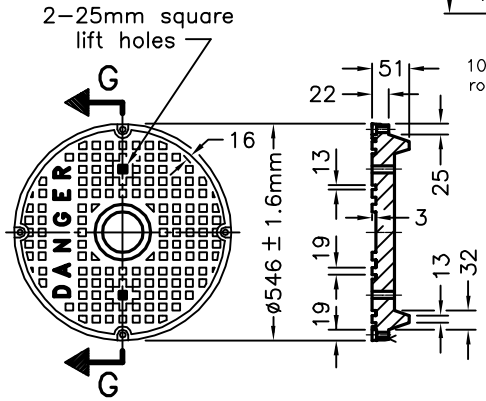

SECTION B–B



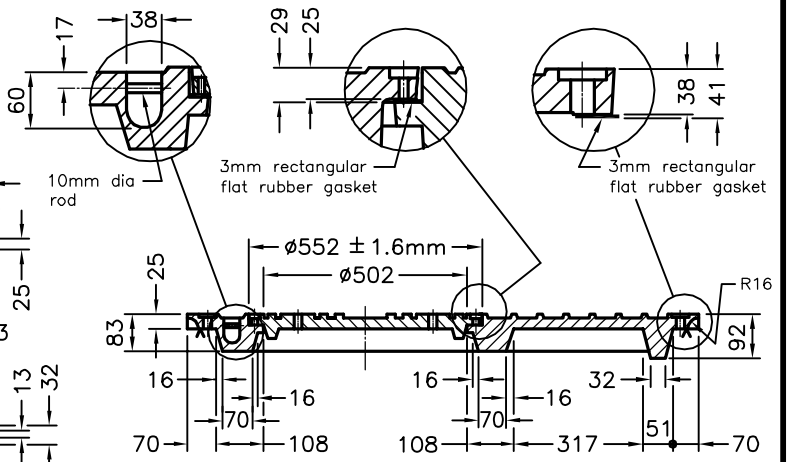

SECTION E–E




SECTION F–F




CIRCULAR COVER SECTION G–G




SECTION C–C

NOTE:
All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

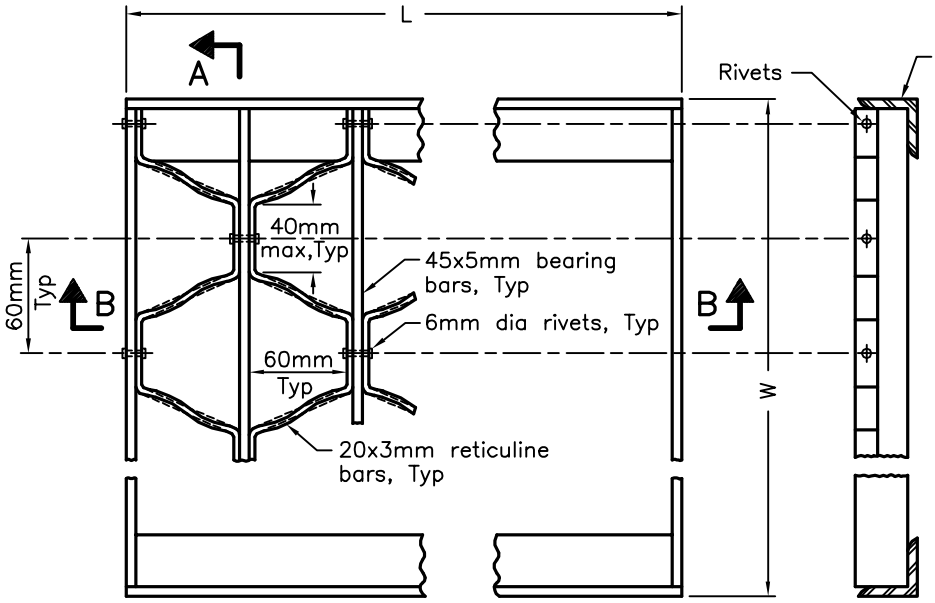
# CAST IRON, RECTANGULAR FRAME WITH TWO PIECE COVER

FOR METER AND VALVE CHAMBERS

Nov 2014 | Rev 4

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 402.030



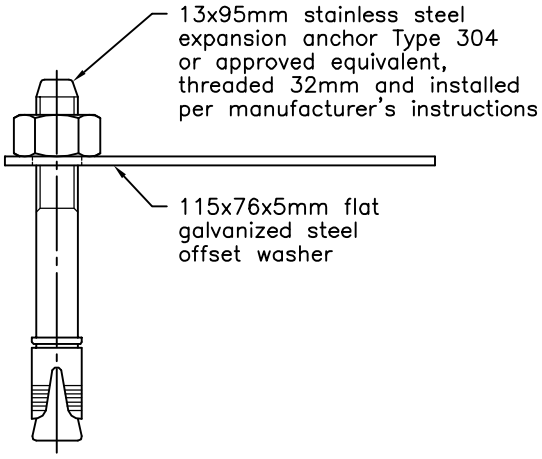

| Grating Type | Grating Size | |
|---|---|---|
| | Length L | Width W |
| A | 762 | 768 |
| B | 1338 | 768 |
| C | 1465 | 768 |

PLAN OF GRATE

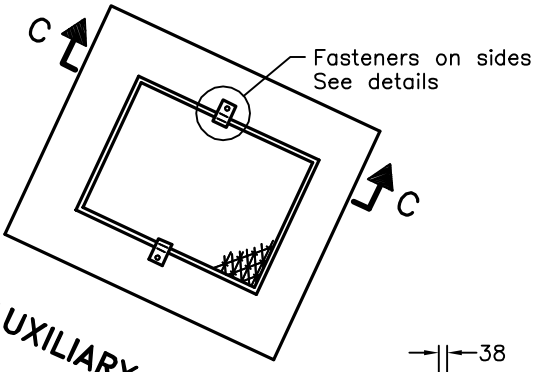
SECTION A–A



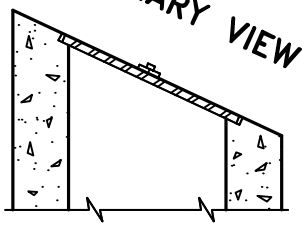
SECTION B–B



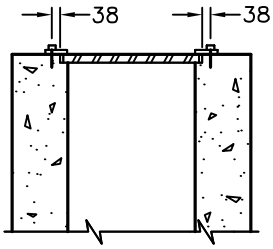

FASTENER DETAIL



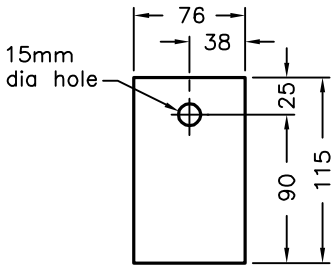

AUXILIARY VIEW



SECTION C–C




FASTENER EMBEDMENT DETAIL




OFFSET WASHER DETAIL

NOTES:

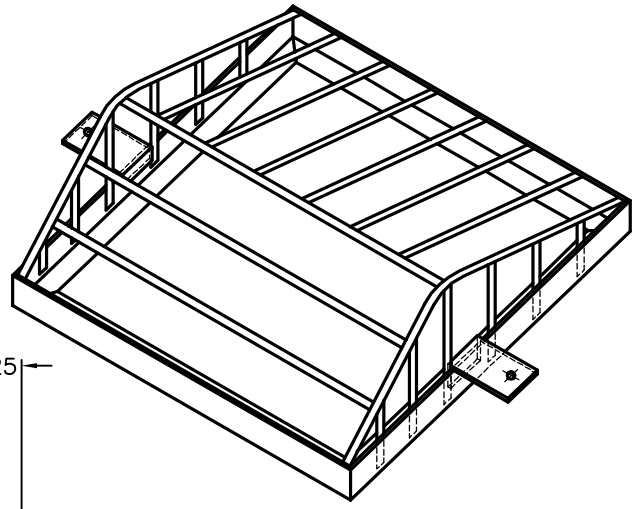
A Fastener shall be inserted to maintain minimum concrete cover requirements.

B All steel components and rivets shall be galvanized.

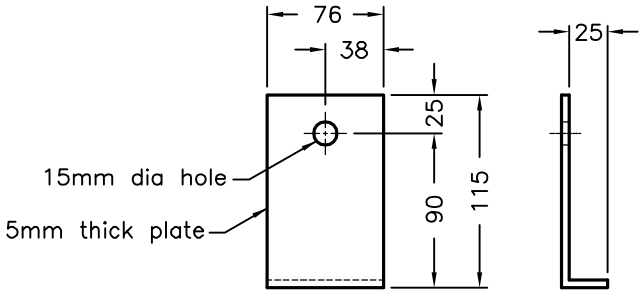
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| GALVANIZED STEEL HONEYCOMB GRATING FOR DITCH INLETS | | | |
| | OPSD 403.010 | | |

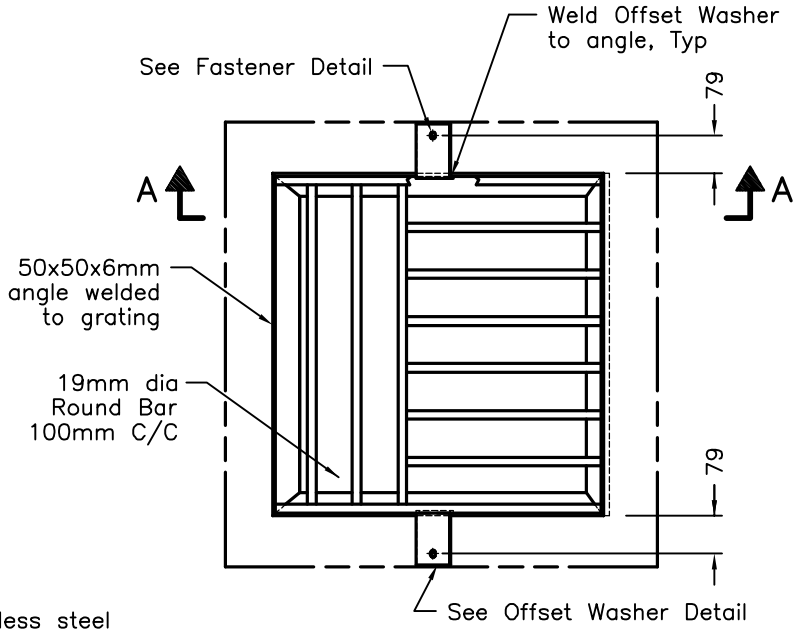
| Slope of Grating | Dimension *a* |
|---|---|
| 2H:1V | 343 |
| 3H:1V | 243 |
| 4H:1V | 186 |



GRATE ISOMETRIC VIEW




OFFSET WASHER DETAIL




PLAN OF GRATE

NOTES:

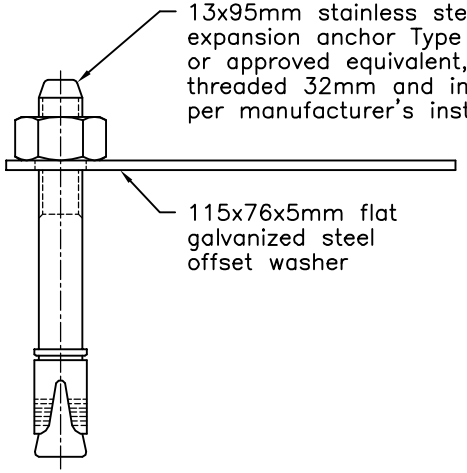
A Grate dimensions shall be according to OPSD 705.030.

B Bearing bars shall be welding quality steel having the minimum tensile strength of SAE 1015.

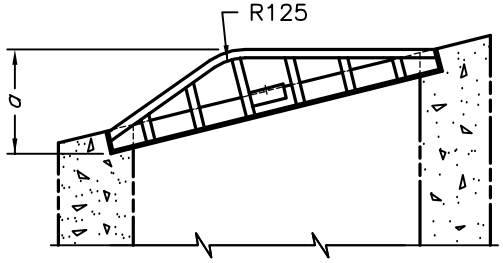
C When specified, all surfaces shall be painted in the shop with one coat of asphalt or tar base black paint having a minimum softening point of 71° C.
All joints and crevices shall be thoroughly coated.

D Bearing bars shall be welded to angle bar along both legs with a 5mm fillet weld.

E All dimensions are in millimetres unless otherwise shown.




FASTENER DETAIL



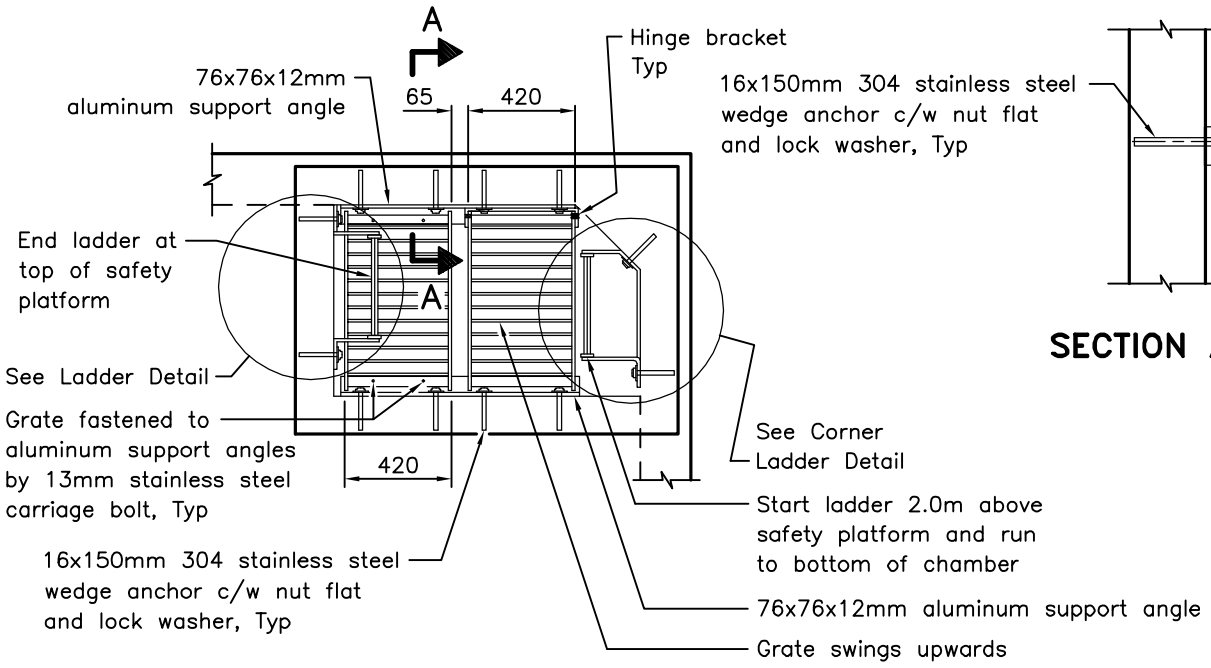

SECTION A–A

ONTARIO PROVINCIAL STANDARD DRAWING

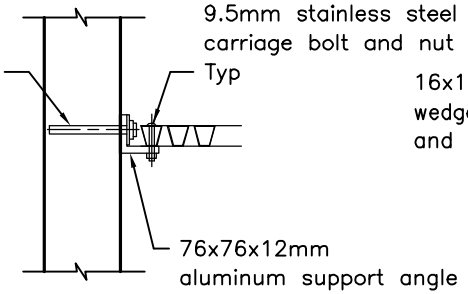
# RAISED BAR GRATE FOR DITCH INLET 600 x 600mm

Nov 2012 | Rev 0

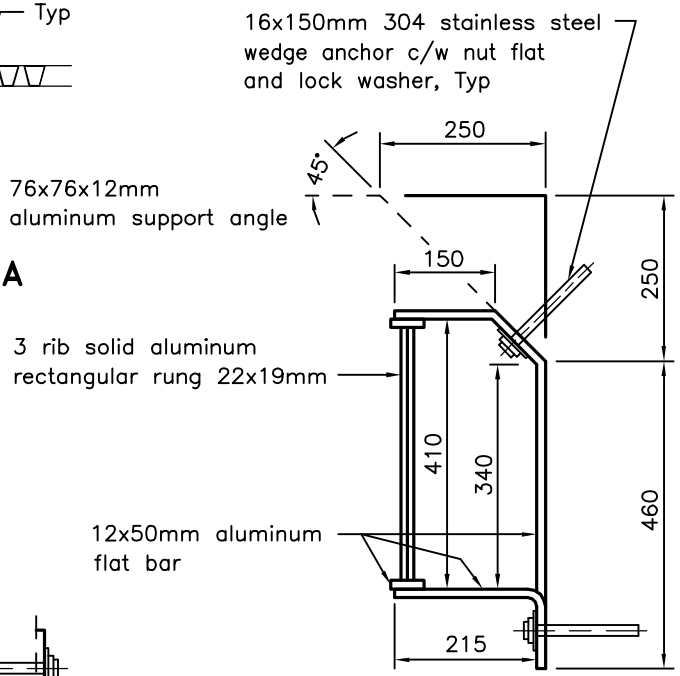
OPSD 403.011



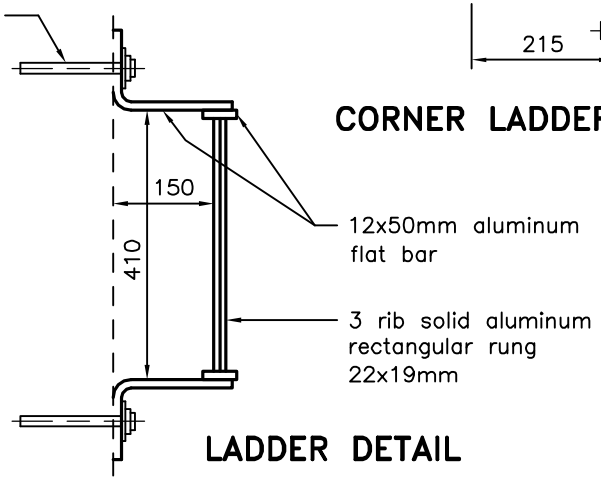

## SAFETY PLATFORM IN CHIMNEY




## SECTION A–A




## CORNER LADDER DETAIL




## LADDER DETAIL

NOTES:

A Safety platform required if combined height of chamber and chimney is 5.0m or greater.

B All aluminum shall be 6061–T6.

C All aluminum surfaces in contact with concrete shall receive two coats of bituminous paint.

D Welding shall be according to CSA W47.2 and CSA W59.2.

E Grind rough edges smooth. Welded surfaces shall remain as welded.

F Fabricate safety platform same as OPSD 404.020 for 1500mm diameter maintenance hole and modified as required to fit.

G This OPSD shall be read in conjunction with OPSD 1101.012, 1101.013, 1101.014, 1101.015, 1101.016, 1101.017, 1101.018, and 1101.019.

H All dimensions are in millimetres unless otherwise shown.

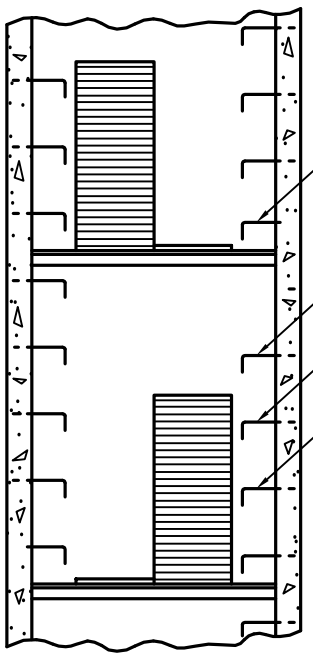
ONTARIO PROVINCIAL STANDARD DRAWING

# ALUMINUM SAFETY PLATFORM AND LADDER FOR RECTANGULAR PRECAST CONCRETE VALVE CHAMBERS

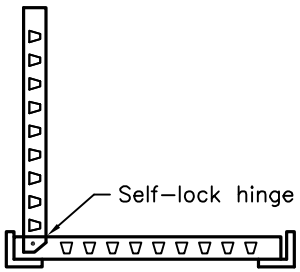
Nov 2012 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

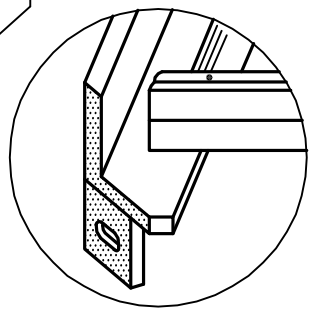
OPSD 404.010



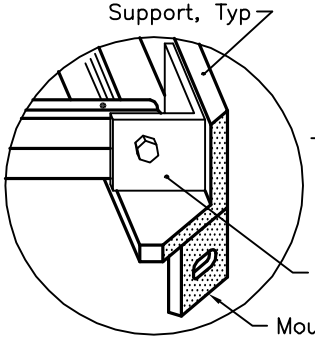

GRATING OPEN
SECTION A–A



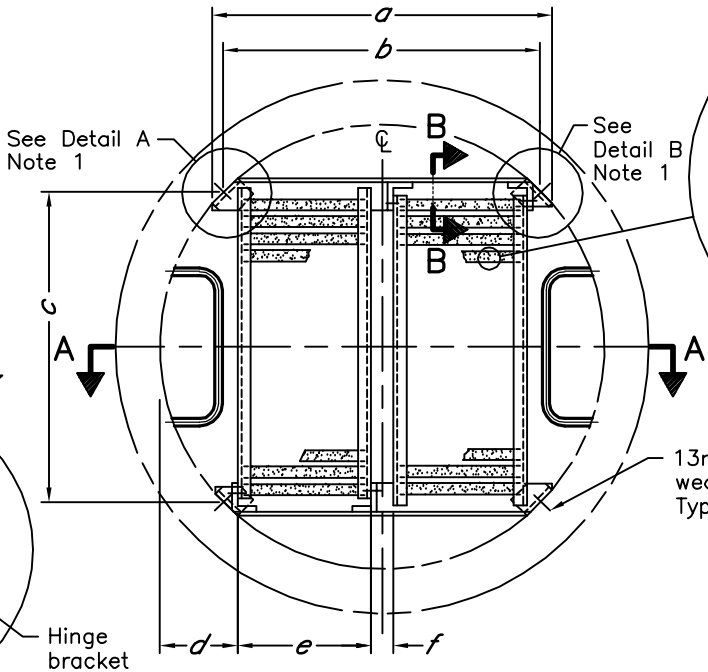

OPEN POSITION
SIDE VIEW



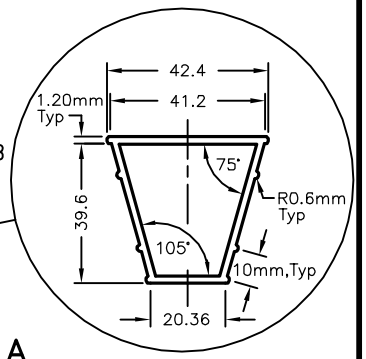
DETAIL A



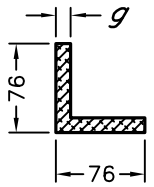

DETAIL B




DETAIL OF GRATING AND BOLT–ON SUPPORT
PLAN




GRATING RUNG
DETAIL




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 |

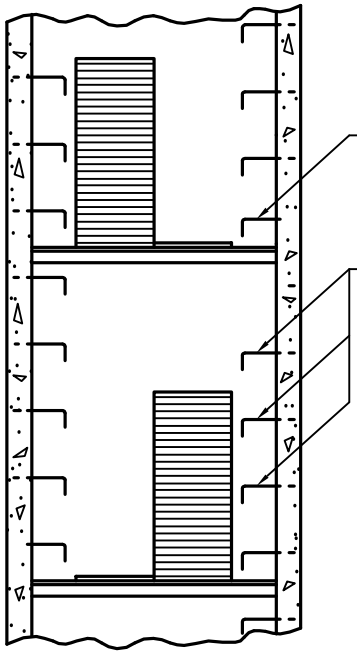
ONTARIO PROVINCIAL STANDARD DRAWING

# ALUMINUM SAFETY PLATFORM FOR CIRCULAR MAINTENANCE HOLES

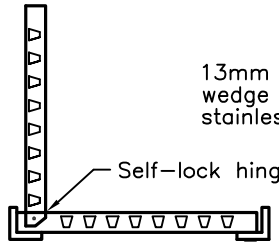
Nov 2013 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

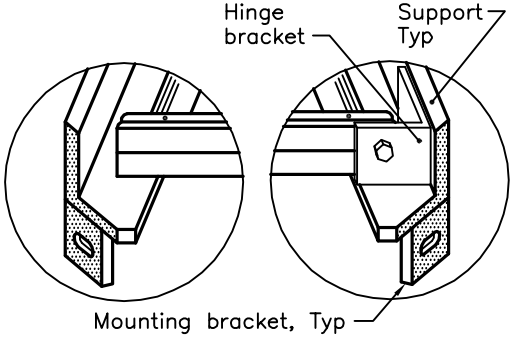
OPSD 404.020



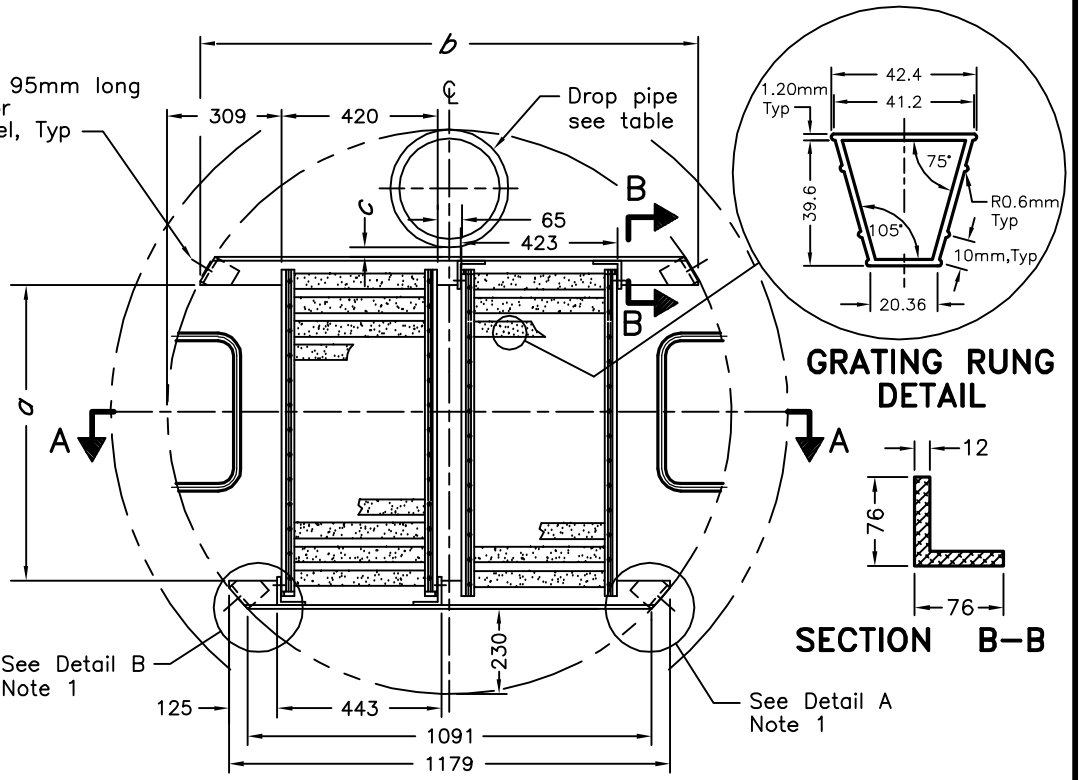

GRATING OPEN
SECTION A–A




OPEN POSITION
SIDE VIEW




DETAIL A DETAIL B




DETAIL OF GRATING AND BOLT–ON SUPPORT
PLAN




GRATING RUNG
DETAIL




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.

| INSIDE DIA DROP PIPE | a | b | c | OUTSIDE DIA DROP PIPE, MAX |
|---|---|---|---|---|
| 150 | 932 | 1143 | 59 | 160 |
| 200 | 866 | 1254 | 62 | 213 |
| 250 | 799 | 1335 | 76 | 267 |
| 300 | 799 | 1335 | 25 | 318 |

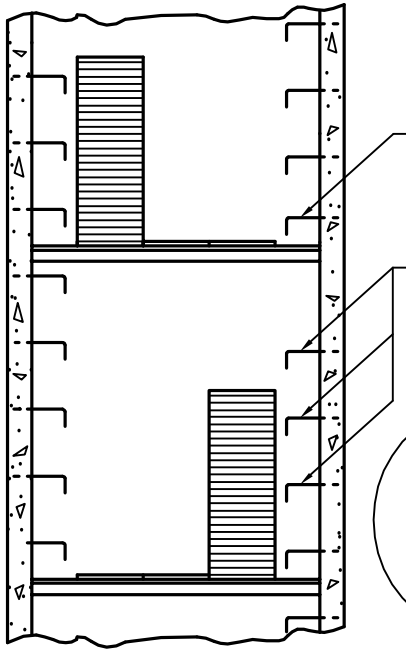
ONTARIO PROVINCIAL STANDARD DRAWING

# ALUMINUM SAFETY PLATFORM FOR 1500mm DIAMETER CIRCULAR MAINTENANCE HOLES WITH DROP PIPE

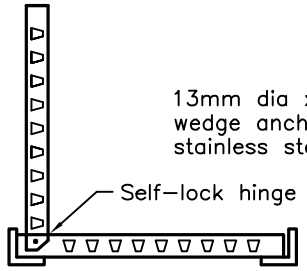
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

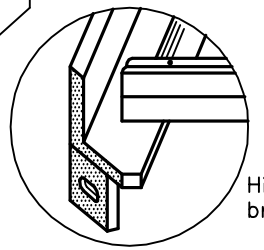
OPSD 404.021



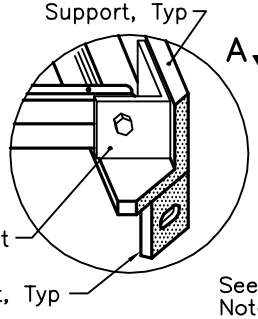

GRATING OPEN
SECTION A–A



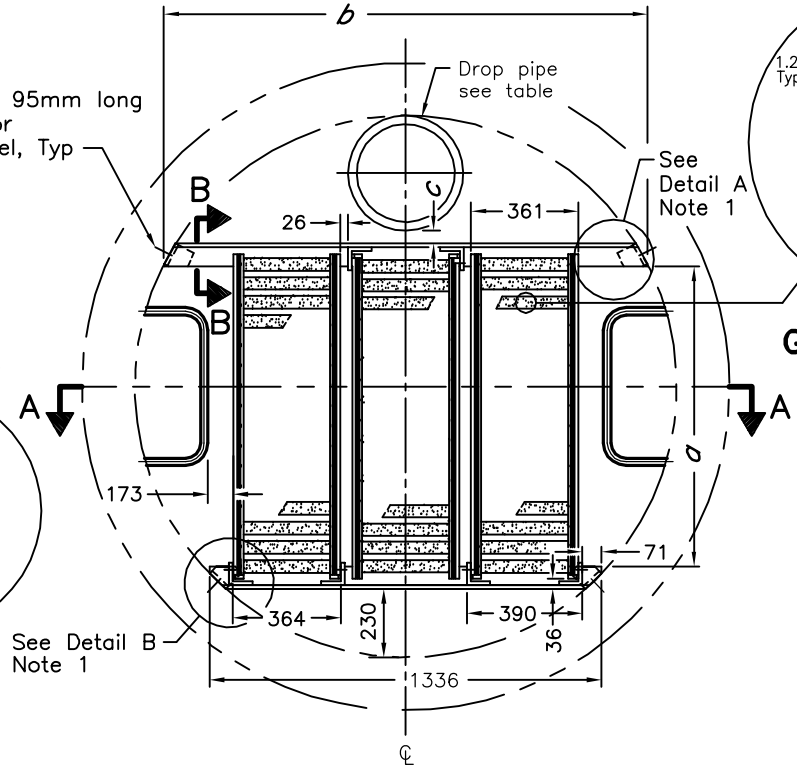

OPEN POSITION
SIDE VIEW



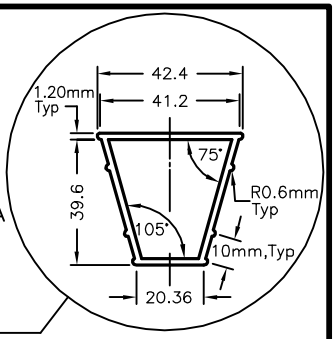
DETAIL A



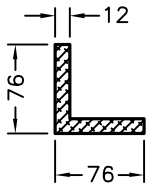

DETAIL B




DETAIL OF GRATING AND BOLT–ON SUPPORT
PLAN




GRATING RUNG
DETAIL




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.

| INSIDE DIA DROP PIPE | *a* | *b* | *c* | OUTSIDE DIA DROP PIPE, MAX |
|---|---|---|---|---|
| 150 | 1218 | 1316 | 79 | 160 |
| 200 | 1218 | 1316 | 29 | 213 |
| 250 | 1150 | 1433 | 47 | 267 |
| 300 | 1082 | 1524 | 65 | 318 |
| 375 | 1014 | 1610 | 58 | 389 |

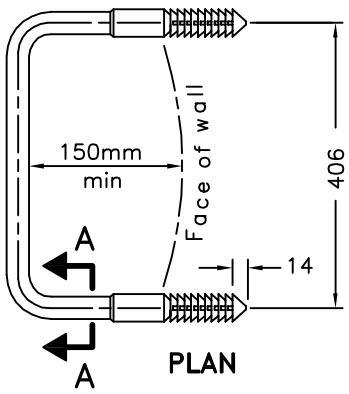
ONTARIO PROVINCIAL STANDARD DRAWING

# ALUMINUM SAFETY PLATFORM FOR 1800mm DIAMETER CIRCULAR MAINTENANCE HOLES WITH DROP PIPE

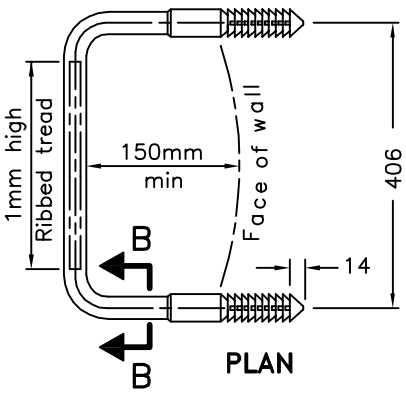
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

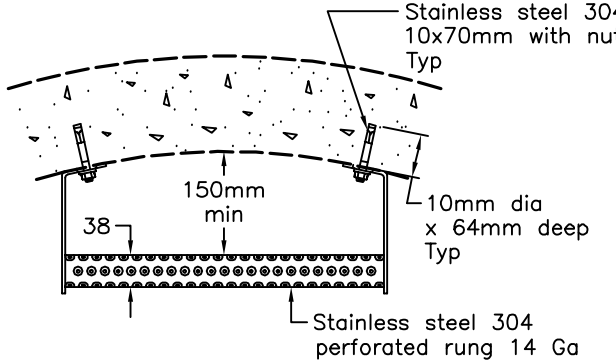
OPSD 404.022



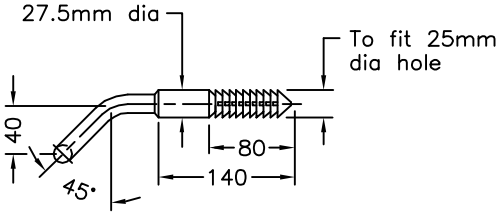

PLAN



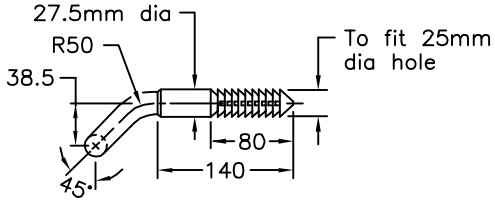

PLAN



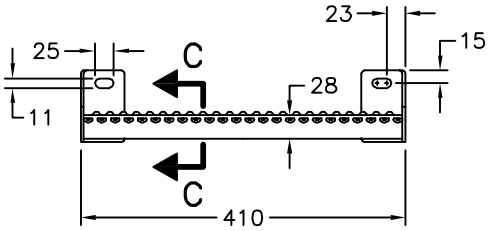

PLAN



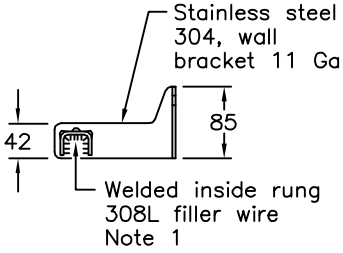

SIDE VIEW



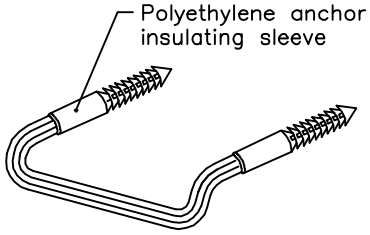

SIDE VIEW



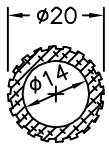

FRONT VIEW



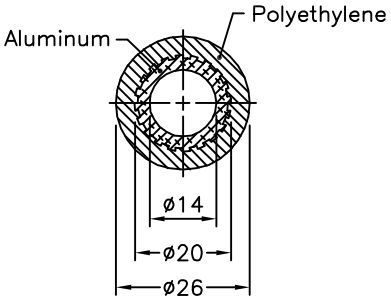

SECTION C–C



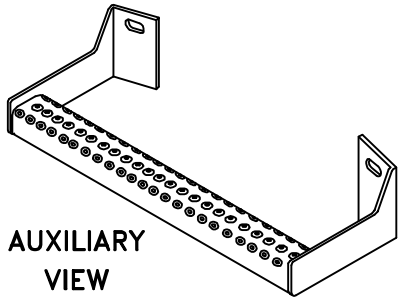

AUXILIARY
VIEW




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.

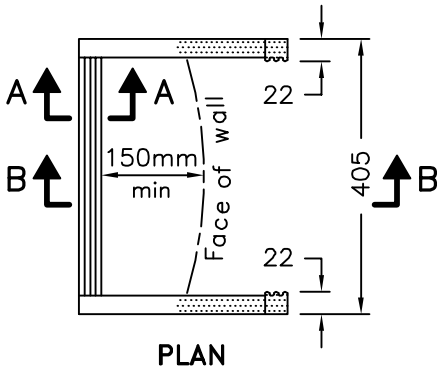
ONTARIO PROVINCIAL STANDARD DRAWING

# MAINTENANCE HOLE STEPS

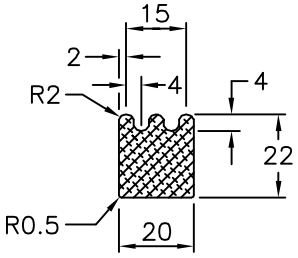
HOLLOW

Nov 2013 | Rev 3

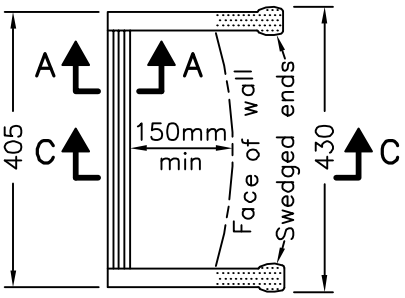
OPSD 405.010



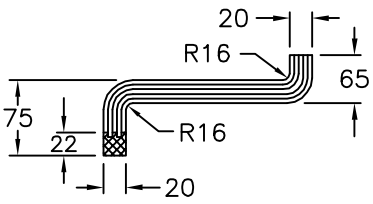

PLAN



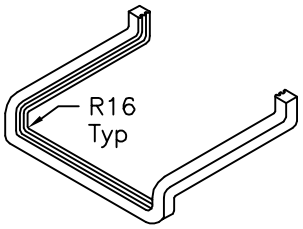

SECTION A–A



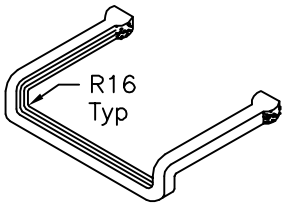

PLAN



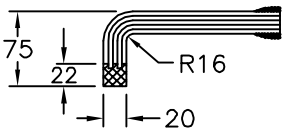

SECTION B–B




AUXILIARY VIEW



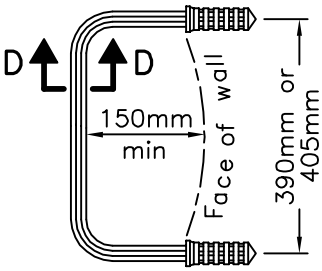

AUXILIARY VIEW



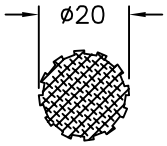

SECTION C–C

**TYPE A** **TYPE B**

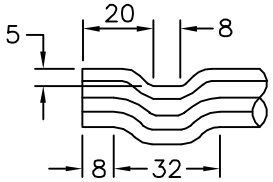
## RECTANGULAR ALUMINUM



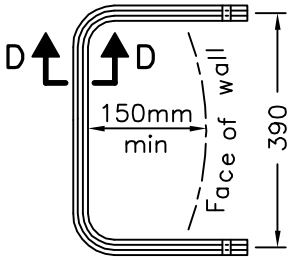

PLAN



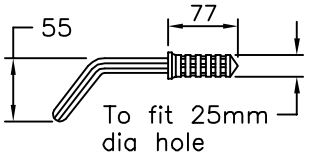

SECTION D–D



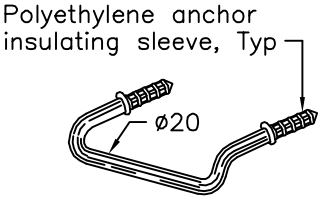

FORMED ANCHOR LOCK DETAIL



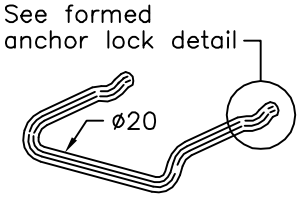

PLAN



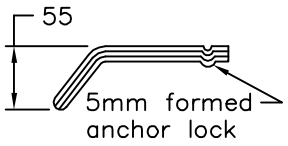

SIDE VIEW




AUXILIARY VIEW




AUXILIARY VIEW




SIDE VIEW

**TYPE A** **TYPE B**

## CIRCULAR ALUMINUM

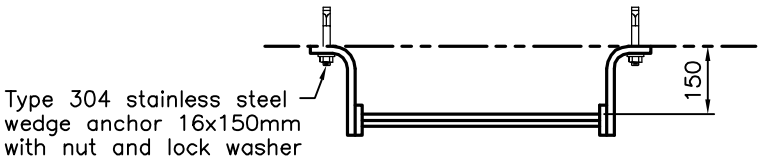
NOTES:

A All aluminum components shall be 6000 series structural aluminum.

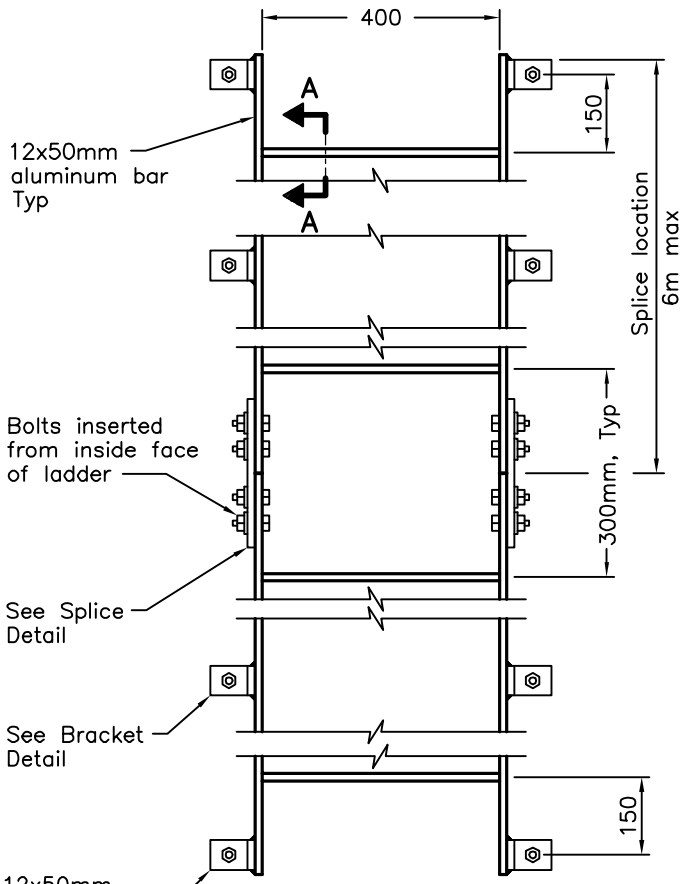
B All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.

C All dimensions are in millimetres unless otherwise shown.

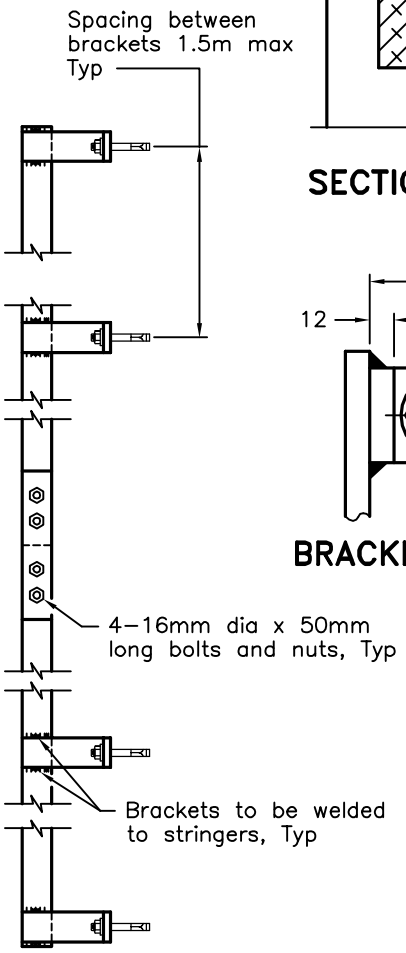
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| **MAINTENANCE HOLE STEPS**<br>SOLID | | | |
| | **OPSD 405.020** | | |



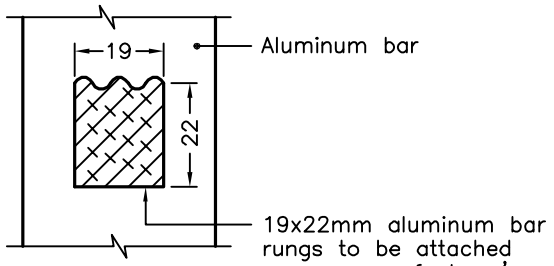

PLAN



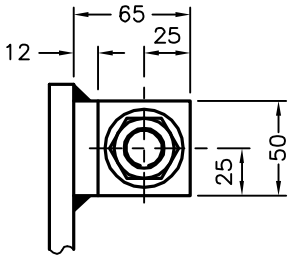

ELEVATION



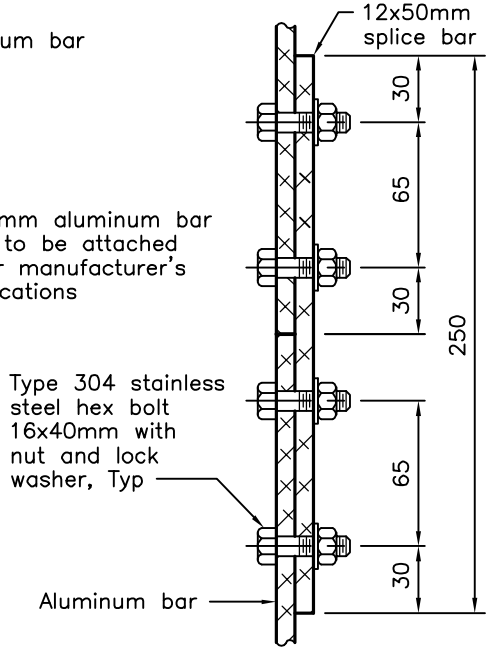

SIDE VIEW




SECTION A–A




BRACKET DETAIL




SECTION THROUGH SPLICE DETAIL

NOTES:

A All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.

B All bolts, nuts, and washers shall be made of Type 304 stainless steel.

C All welding shall be according to CSA W47.2 and W59.2.

D All brackets, bars, rungs, and stringers shall be fabricated from 6000 series structural aluminum.

E All dimensions are in millimetres unless otherwise shown.

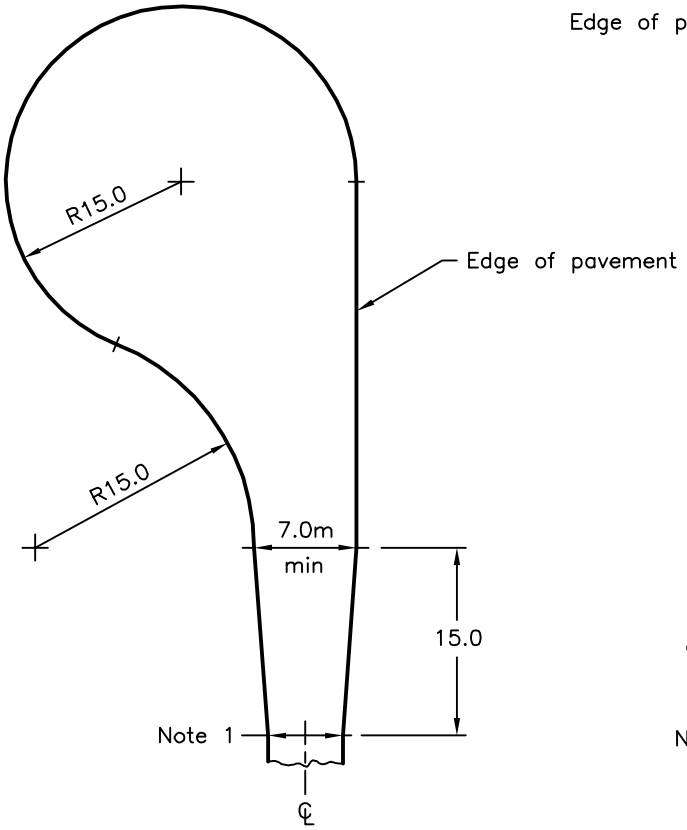
ONTARIO PROVINCIAL STANDARD DRAWING

# ALUMINUM LADDER

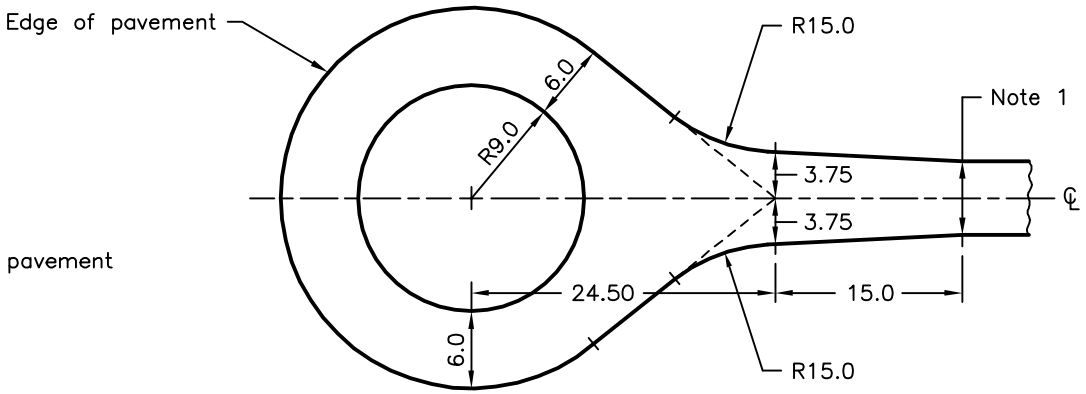
FOR MAINTENANCE HOLES

Nov 2013 | Rev 2

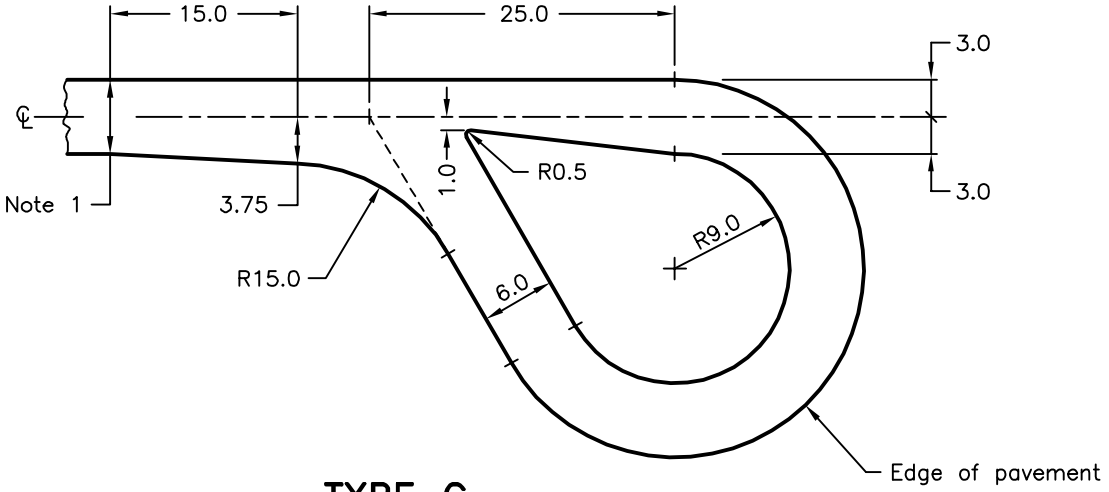
OPSD 406.010




TYPE A




TYPE B




TYPE C

NOTES:

1 Width of pavement, shoulder, and rounding to match terminated roadway.

A Drainage and grading as specified.

B All dimensions are in metres unless otherwise shown.

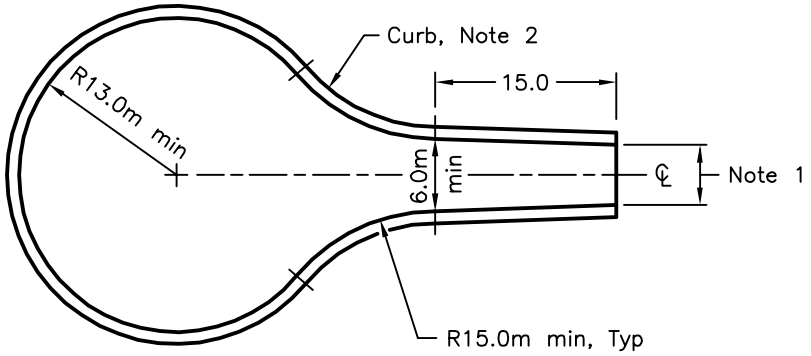
ONTARIO PROVINCIAL STANDARD DRAWING

# TURNING BASINS FOR TERMINATED RURAL ROADWAYS

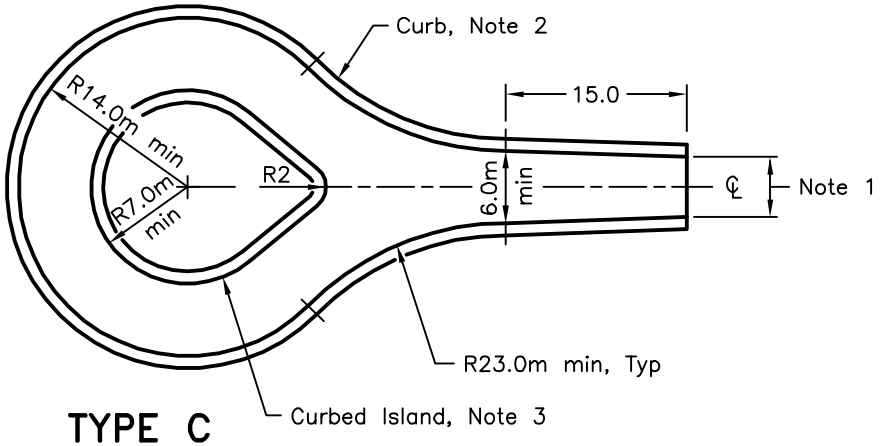
Nov 2009 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

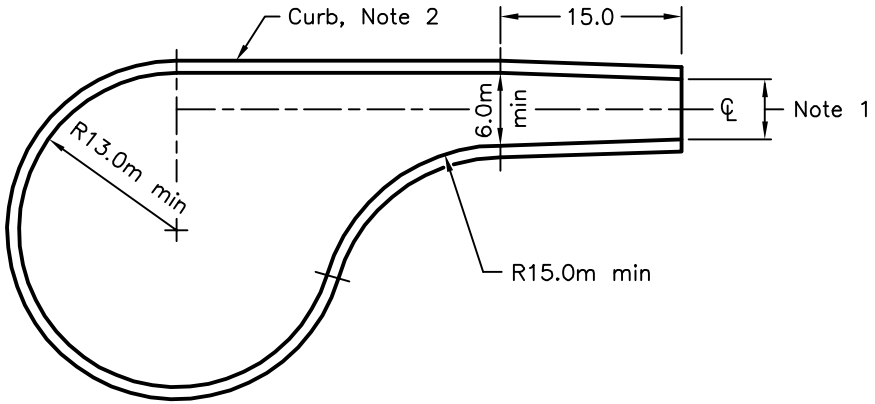
OPSD 500.010



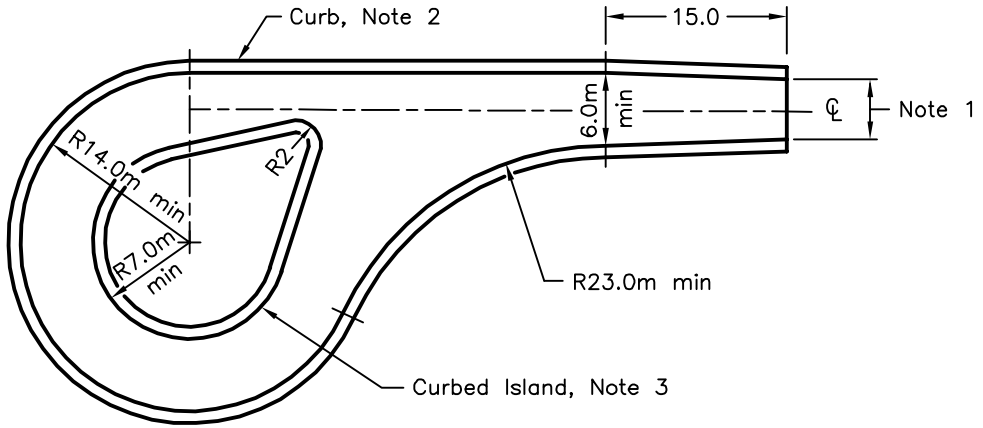

TYPE A




TYPE C




TYPE B




TYPE D

NOTES:

1 Width of pavement to match terminated roadway.
2 Type of curb to match terminated roadway.
3 Island curb shall be according to OPSD 600.090.

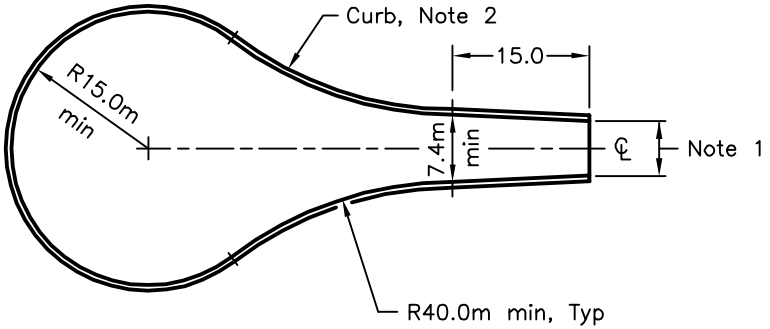
A Drainage and grading as specified.
B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

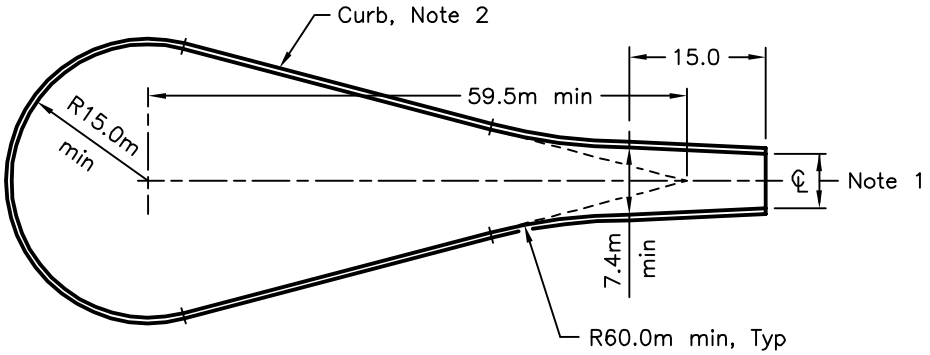
# TURNING BASINS FOR TERMINATED URBAN ROADWAYS RESIDENTIAL

Nov 2009 | Rev 0

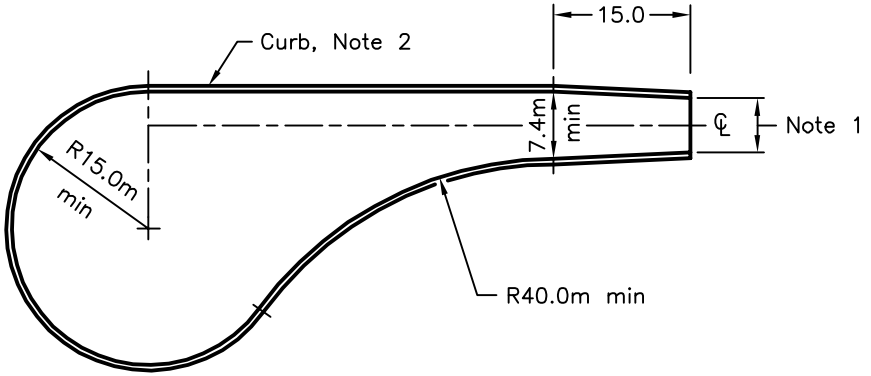
OPSD 500.020



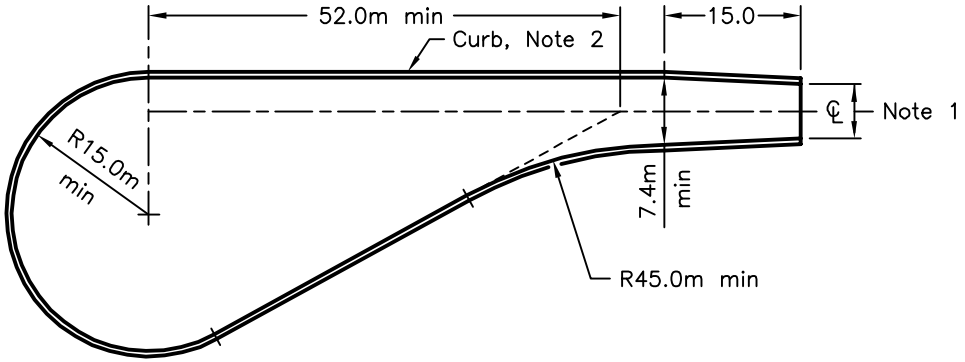

TYPE A




TYPE C




TYPE B



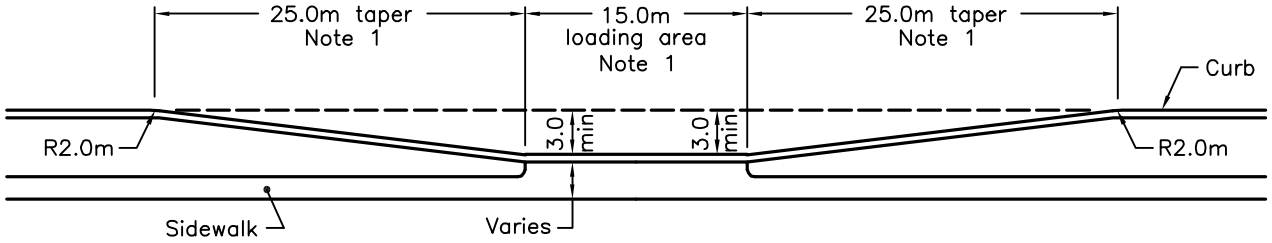

TYPE D

NOTES:

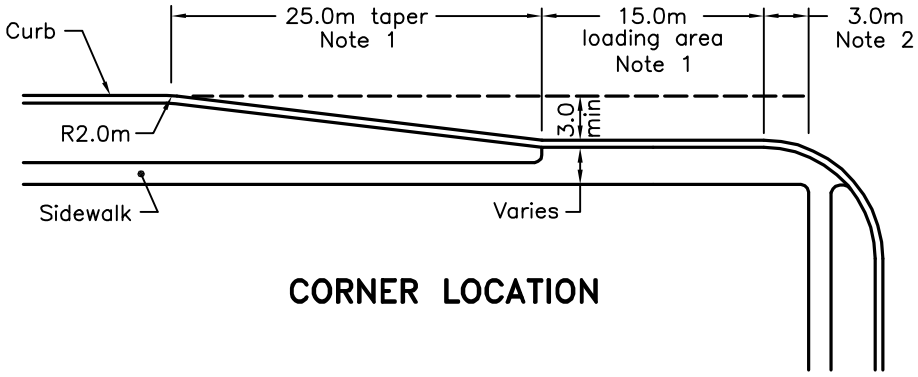
1 Width of pavement to match terminated roadway.
2 Type of curb to match terminated roadway.

A Drainage and grading as specified.
B All dimensions are in metres unless otherwise shown.

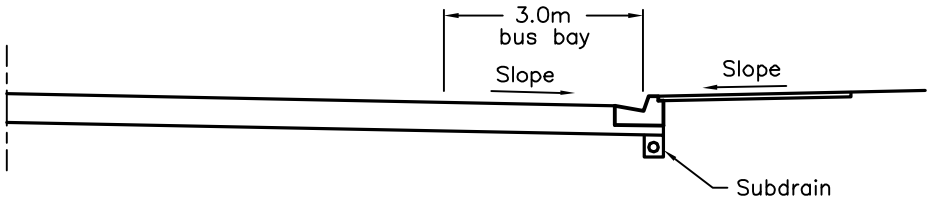
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 0 |
|---|---|---|---|
| TURNING BASINS<br>FOR TERMINATED URBAN ROADWAYS<br>INDUSTRIAL AND COMMERCIAL | | | |
| | OPSD 500.030 | | |




## BETWEEN INTERSECTIONS




## CORNER LOCATION




## TYPICAL CROSS SECTION

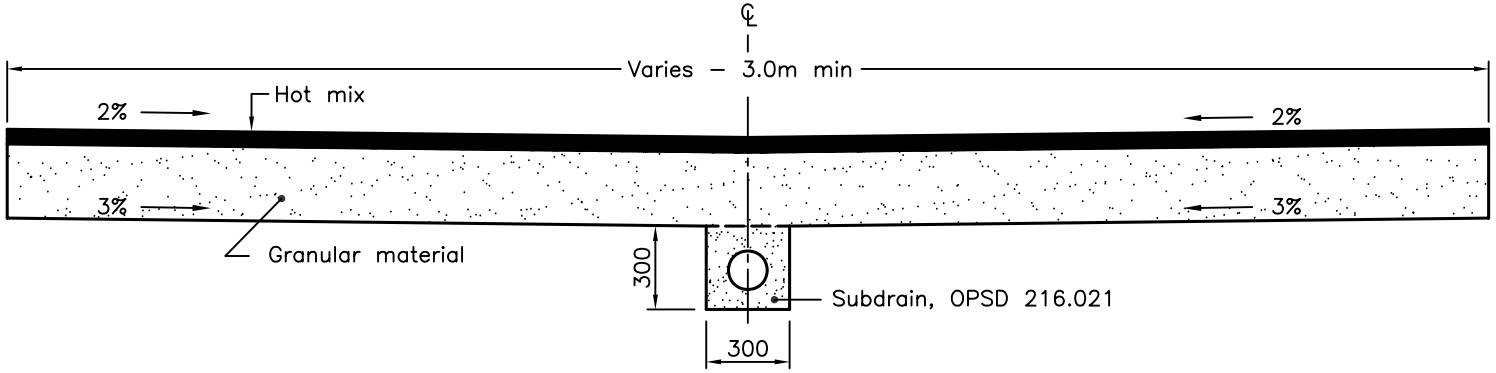
NOTES:

1 Where the use of articulated buses is anticipated, the bus bay dimensions shall be increased to provide a 25.0m loading area and 35.0m tapers.

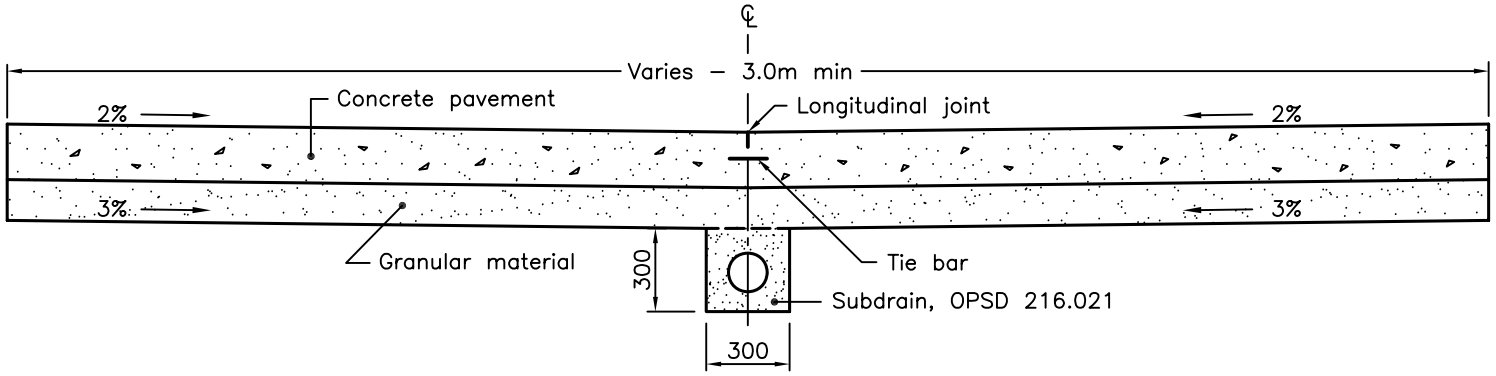
2 When the bus bay surface is concrete on an asphalt road, it shall be extended by 3.0m.

A All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| BUS BAYS | | | |
| | OPSD 501.010 | | |




**FLEXIBLE PAVEMENT**




**CONCRETE PAVEMENT**

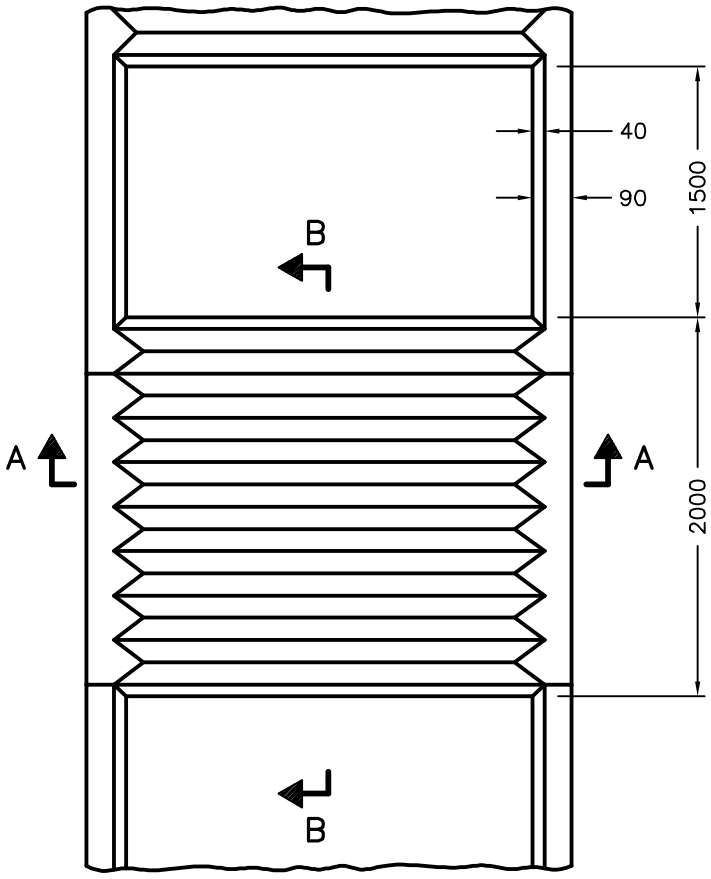
NOTES:

A Joint spacing in concrete pavement shall be according to OPSD 551.010.

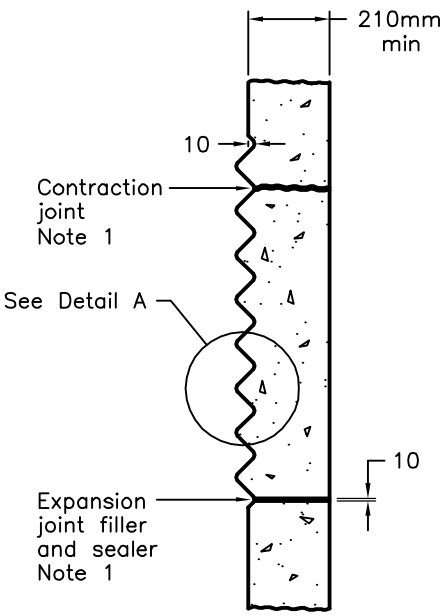
B Joint details in concrete pavement shall be according to OPSD 552.010.

C All dimensions are in millimetres unless otherwise shown.

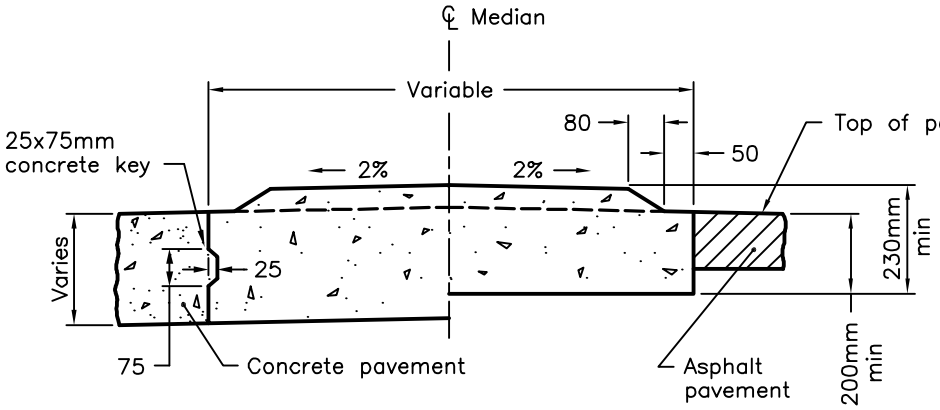
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| **ACCESS LANES**<br>FOR REAR LOTS | | | |
| | **OPSD 502.010** | | |



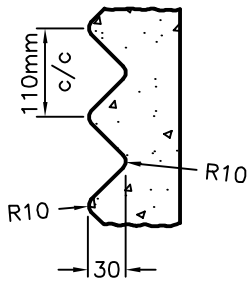

PLAN




SECTION B–B




SECTION A–A



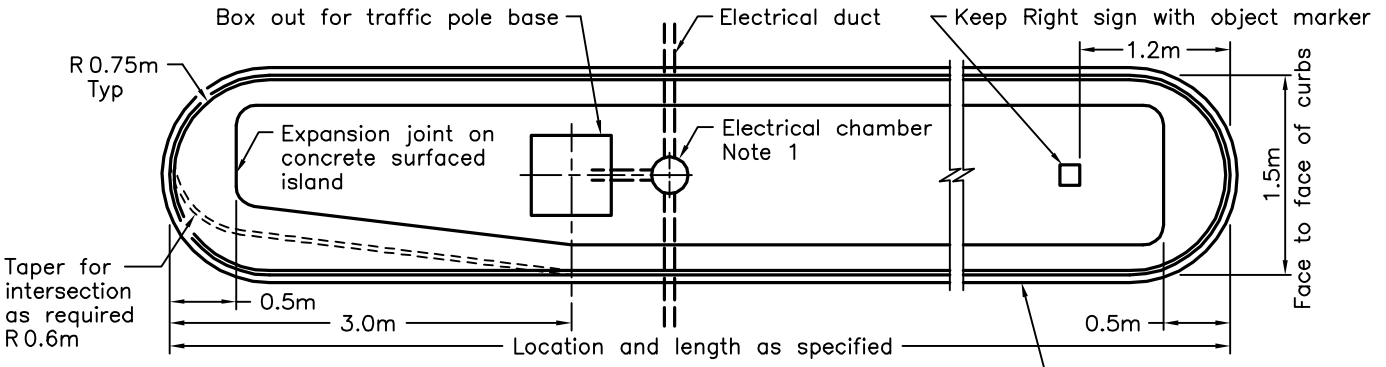

DETAIL A

NOTES:

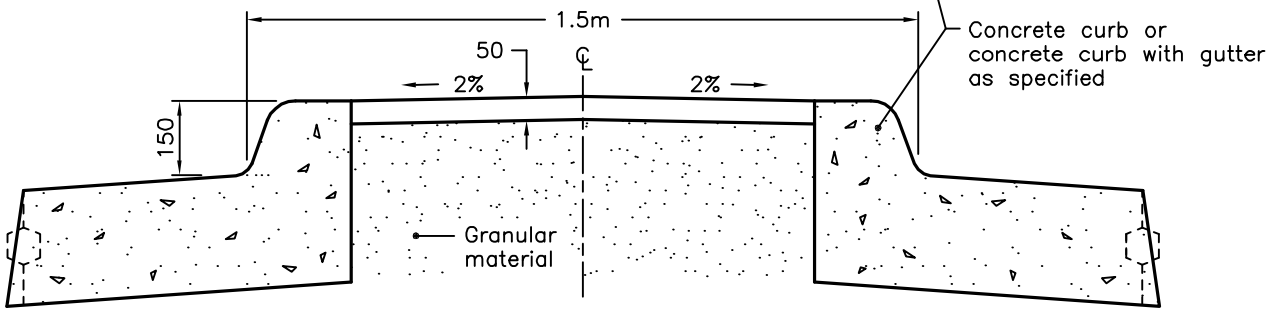
1 Expansion and contraction joint spacing shall coincide with adjacent concrete pavement or where adjacent to asphalt pavement joint spacing shall not exceed 4.0m.

A All dimensions are in millimetres unless otherwise shown.

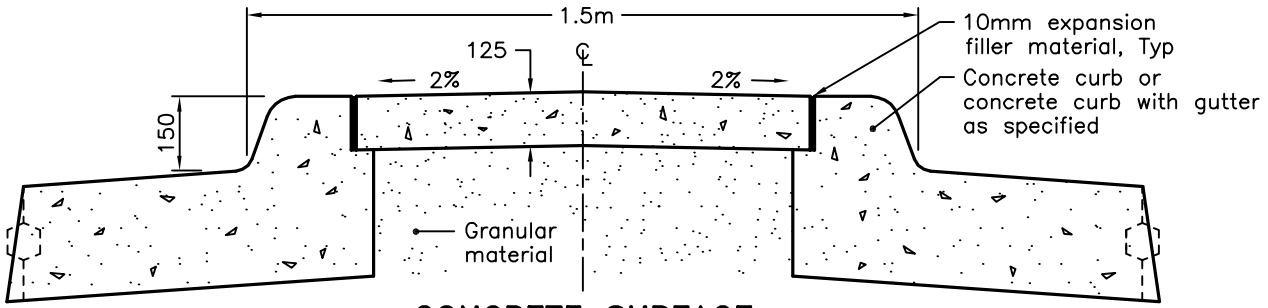
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| CONCRETE RIPPLE STRIP | | | |
| | OPSD 503.010 | | |



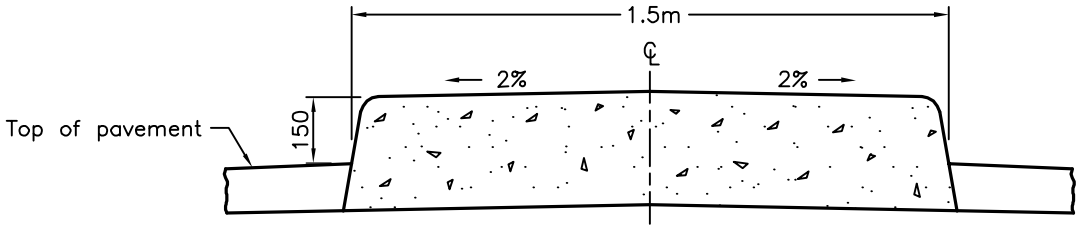

**PLAN**




**ASPHALT SURFACE**




**CONCRETE SURFACE**
Note 2



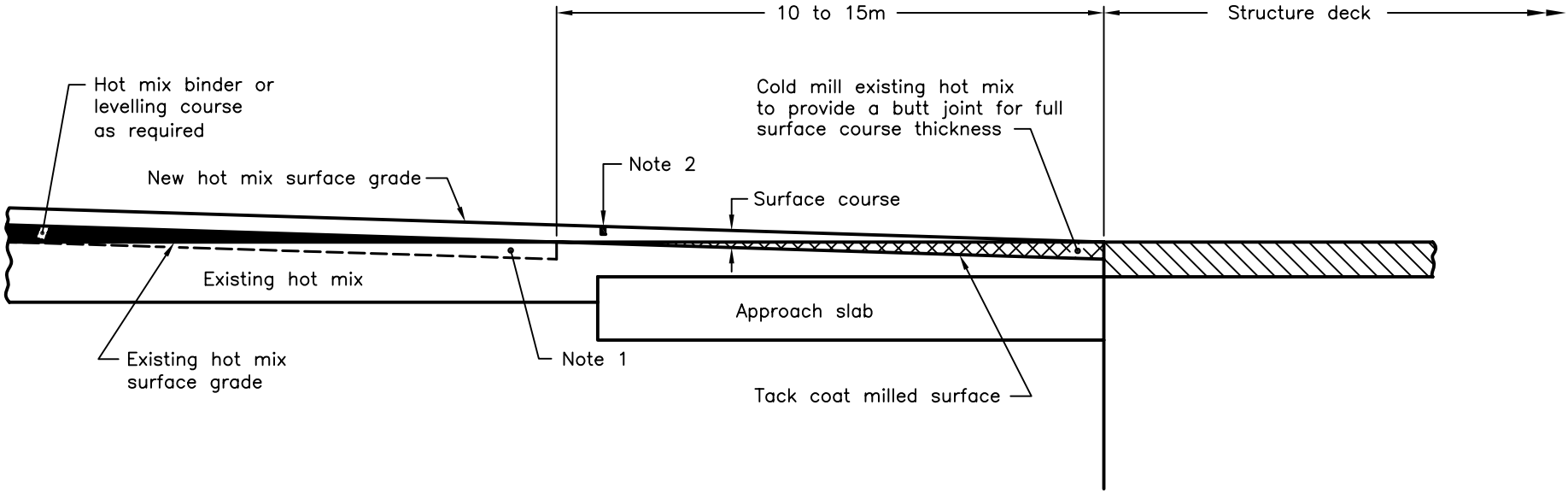

**CONCRETE SLAB**
Note 3

NOTES:

1 For electrical chamber and duct details refer to electrical drawings.
2 For concrete surfaced island, place contraction joints in median to match curb joints.
3 For concrete slab island, place contraction joints in median to match pavement joints where placed on a concrete base.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 1 |
|---|---|---|---|
| **RAISED TRAFFIC ISLAND** | | | |
| | **OPSD 504.010** | | |



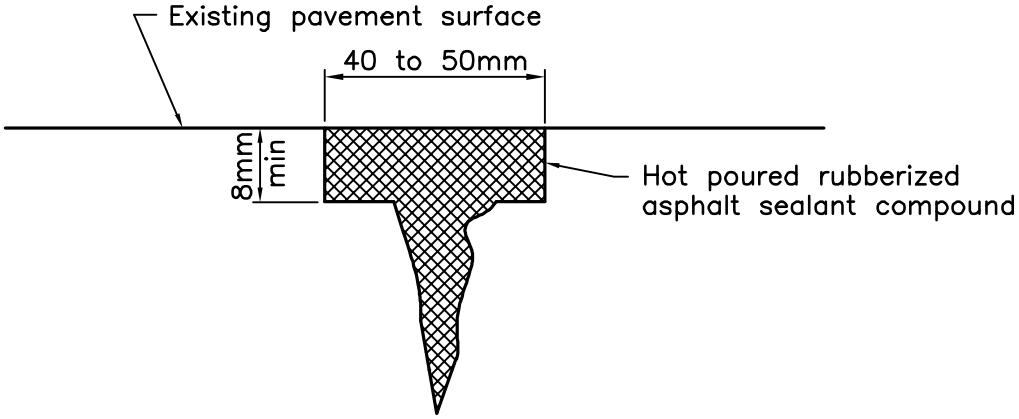

NOTES:

1 As an alternative, cold mill existing hot mix to provide a butt joint for full binder course thickness.

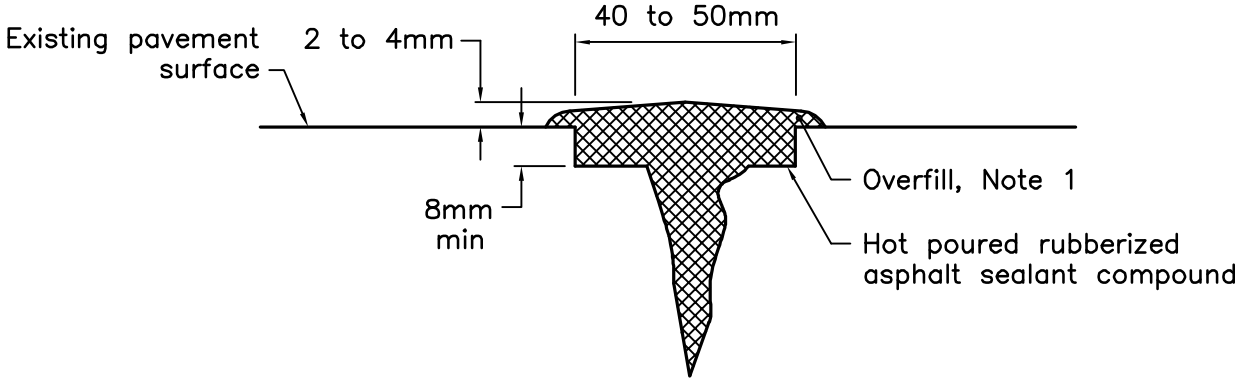
2 For integral and semi–integral abutments provide for a 25 x 25mm sawn joint filled with hot poured rubberized asphalt joint sealing compound in the hot mix over the end of the approach slab.

A All dimensions are in metres unless otherwise shown.

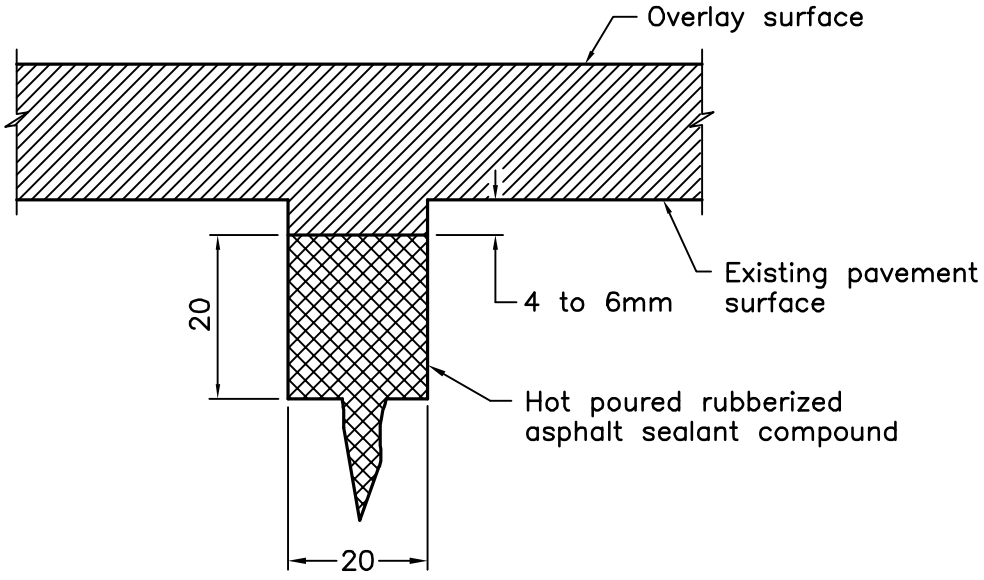
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| HOT MIX RESURFACING TREATMENT AT STRUCTURE APPROACHES | | | |
| | OPSD 506.010 | | |




FLUSH FILL OF CRACKS WITHOUT OVERLAY




OVERFILL OF CRACKS WITHOUT OVERLAY



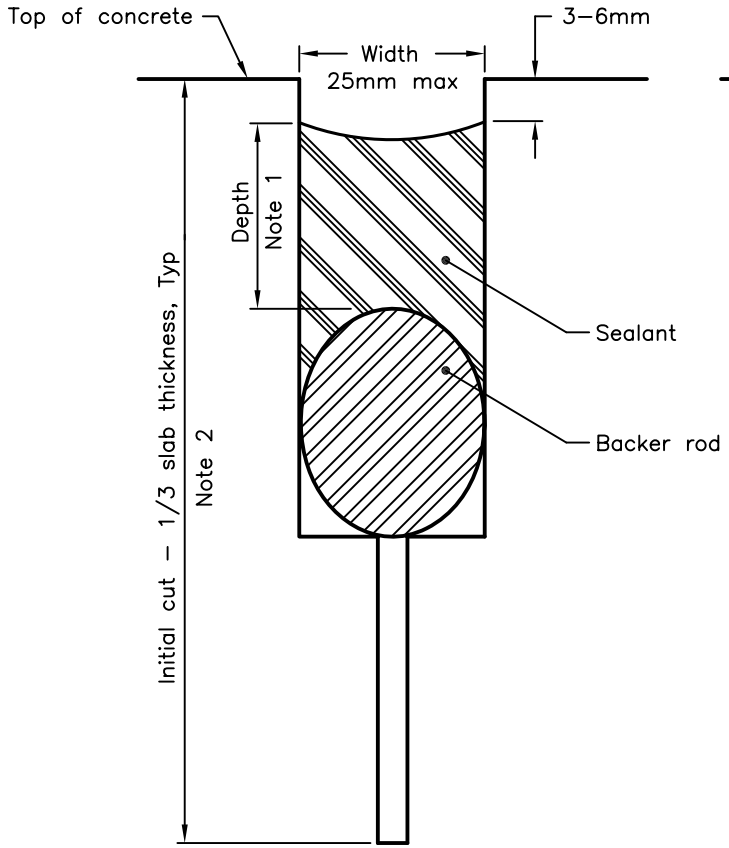

CRACKS WITH ASPHALT OVERLAY

NOTE:

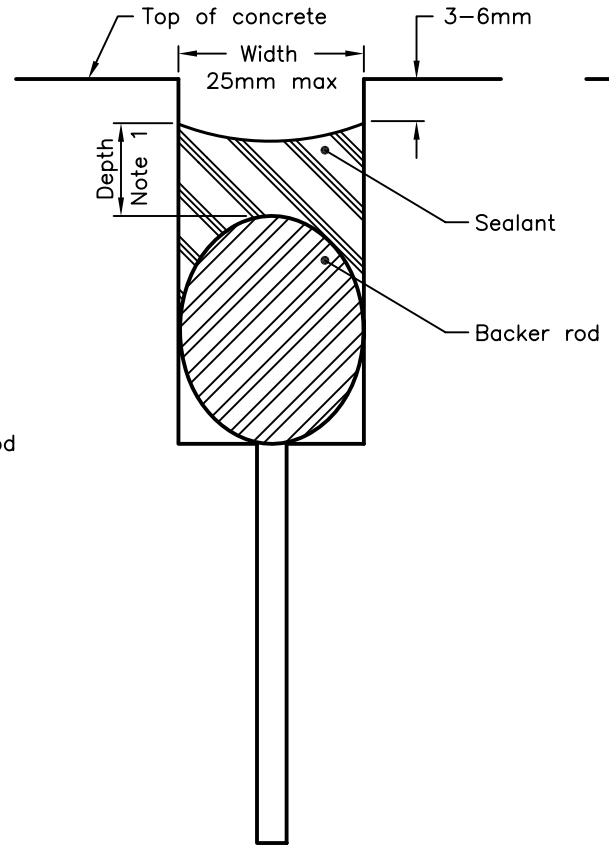
1 Final overfill geometry after cooling of sealant material.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| ROUTING AND SEALING CRACKS UP TO 20mm IN WIDTH IN ASPHALT PAVEMENT | | | |
| | OPSD 508.010 | | |

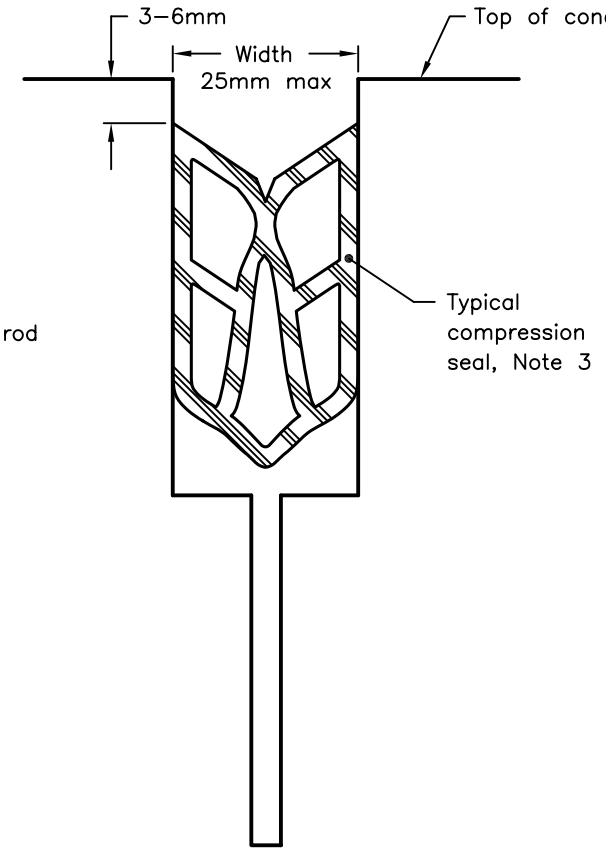



HOT POURED RUBBERIZED SEALANT




SILICONE SEALANT

NOTE 4




COMPRESSION SEAL

NOTE 4

NOTES:

1 Shape factor has a width to depth ratio of
   – 1H:1V for hot poured rubberized sealant
   – 2H:1V for silicone sealant.
2 Initial saw cut is only required in fresh concrete.
3 Dimensions of compression seal and reservoir as per manufacturer's requirements.
4 Silicone sealant or compression seals shall be used when specified.

A Reservoir width design to accommodate anticipated slab movement.
B All dimensions are in millimetres unless otherwise shown.

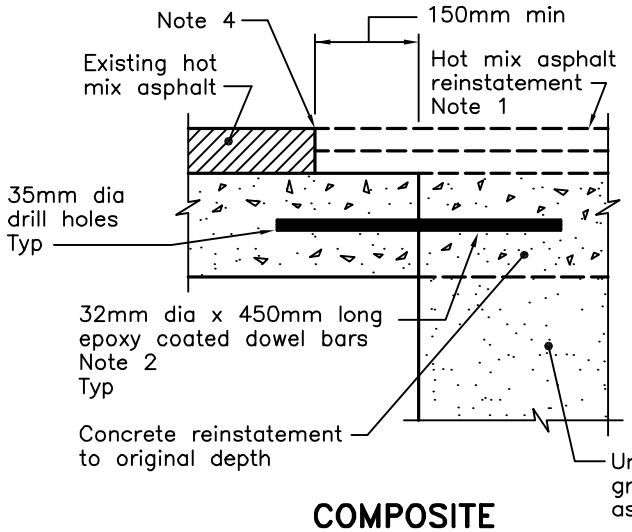
ONTARIO PROVINCIAL STANDARD DRAWING

# SEALING OR RESEALING OF JOINTS AND CRACKS IN CONCRETE PAVEMENT AND CONCRETE BASE

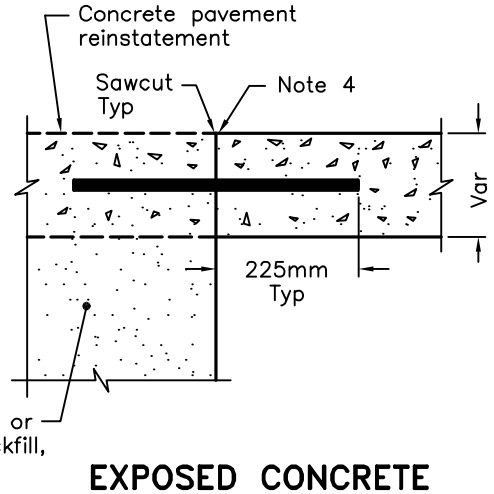
Nov 2008 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

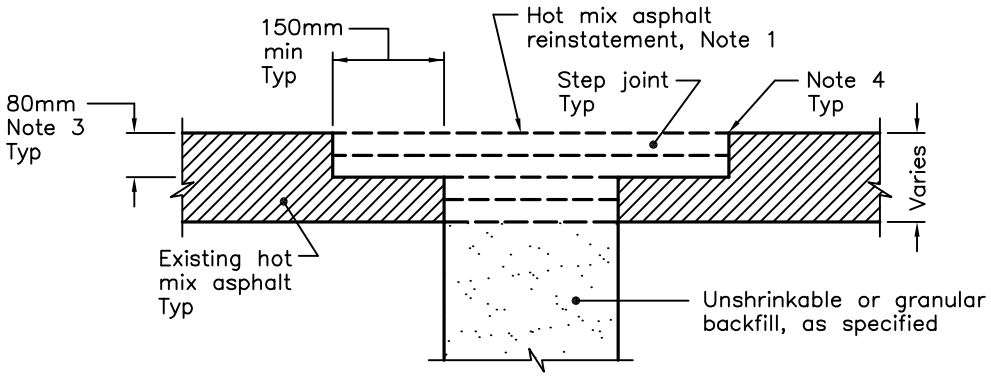
OPSD 508.020




**COMPOSITE PAVEMENT**




**EXPOSED CONCRETE PAVEMENT**




**HOT MIX ASPHALT PAVEMENT**

NOTES:

1 Hot mix asphalt type as specified. The surface course shall be placed in a minimum 40mm lift, other binder course lift thicknesses shall not exceed 80mm.

2 Dowels shall be installed at 300mm intervals along all transverse faces. The dowel bars shall be placed mid–depth of the specified slab thickness and parallel to the longitudinal axis and the horizontal plane of the pavement within the following tolerances:
   a) Vertical Alignment: ± 15mm along the length of the dowel bar.
   b) Horizontal Alignment: ± 15mm along the length of the dowel bar.
   c) Side Shift: The centre of the dowel bar shall lie within ± 40mm from the transverse joint.

   Tie bars shall be installed at 600mm intervals along all longitudinal faces and shall be aligned perpendicular to the longitudinal axis of the pavement. The tie bars shall be installed within a tolerance of ± 15mm from the specified depth.

   Where reinforcement is present, dowel and tie bars may be adjusted 25mm horizontally and raised or lowered 10mm to avoid drilling reinforcement.

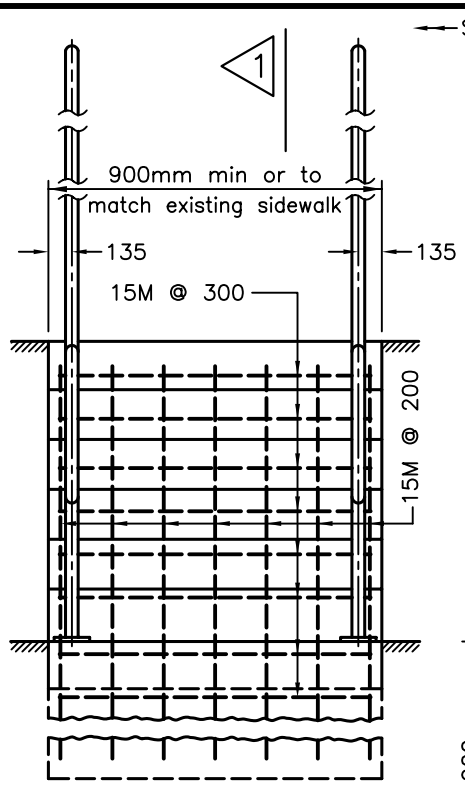
   All dowels and tie bars shall be set with epoxy grout.

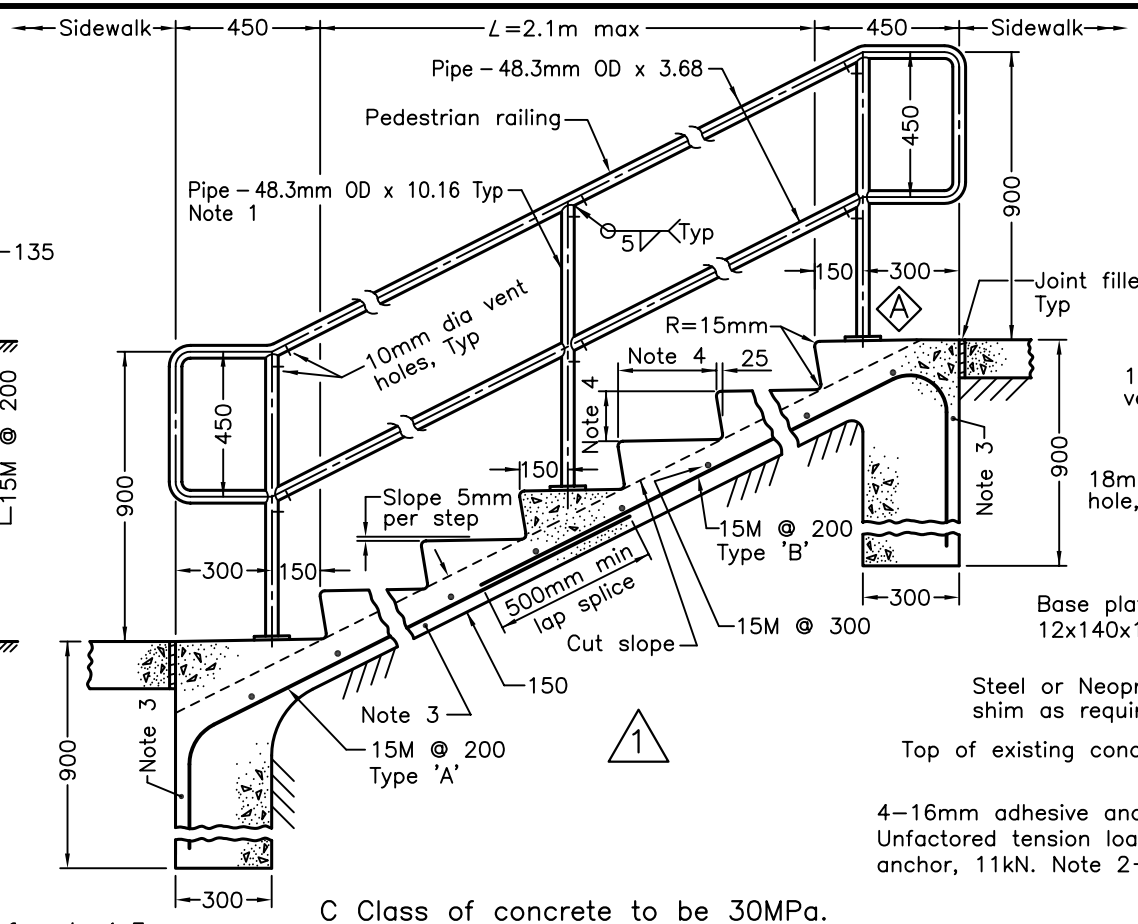
3 Where existing hot mix asphalt depth is between 80 and 120mm the step joint shall be 40mm deep. A step joint is not required for pavement depths less than 80mm.

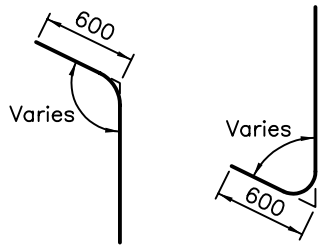
4 Joint treatment as specified.

A All dimensions are in millimetres unless otherwise shown.

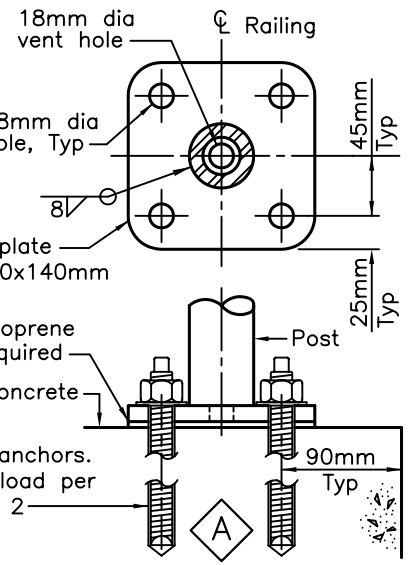
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| **PAVEMENT REINSTATEMENT FOR UTILITY CUTS** | | | |
| | | | **OPSD 509.010** |




REINFORCING BARS DETAILS




## NOTES:

1 Centre post not required for $L$<1.5m.

2 Adhesive anchor installation and embedment depth shall be as per manufacturer's requirements. The embedment depth shall not be greater than 80% of concrete thickness.

3 Concrete cover to reinforcing steel 70±10mm.

4 Steps shall have a uniform run of not less than 250mm but not more than 355mm, and a uniform rise of not less than 125mm but not more than 200mm.

A Number of steps as specified.

B The difference in elevation between the adjacent ground level and steps shall not exceed 600mm.

C Class of concrete to be 30MPa.

D Reinforcing steel shall be according to CAN/CSA–G30.18–M92 (R1998) Grade 400.

E Threaded rod for adhesive anchors shall be equivalent to ASTM A325.

F Pipe shall be according to ASTM Specification A53 Grade 'B'.

G Steel plate shall be according to CSA G40.20/G40.21–98 Grade 300W.

H All pedestrian railing components to be hot dip galvanized after fabrication in conformance with CAN/CSA–G164–M92 (R1998).

I All dimensions are in millimetres unless otherwise shown.

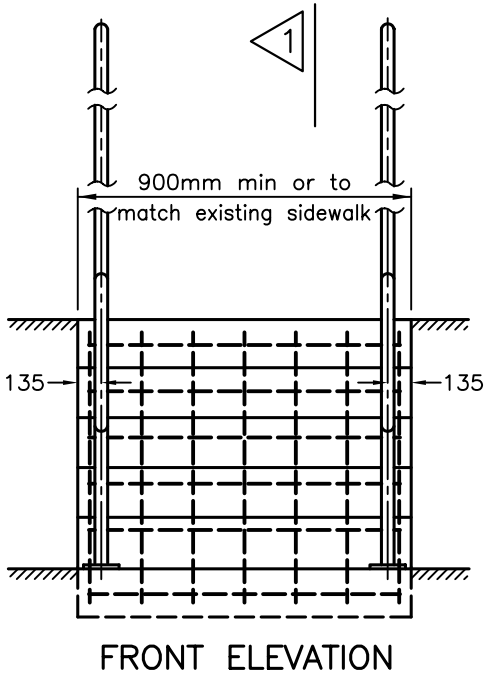
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2000 | Rev 0

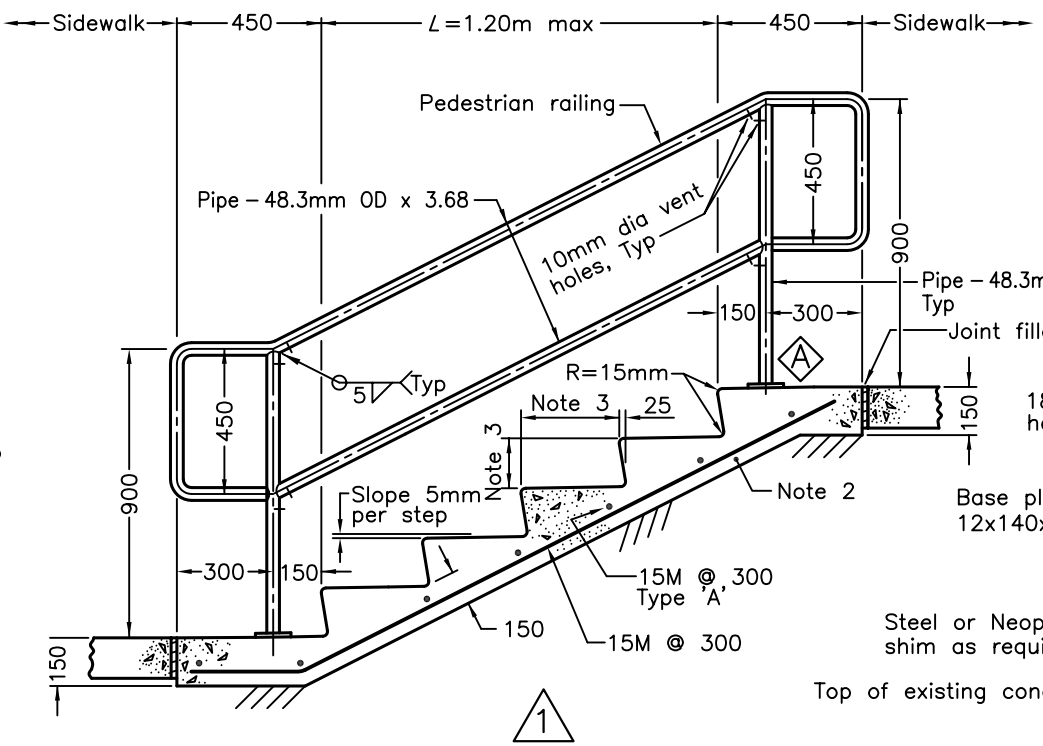
# CONCRETE STEPS

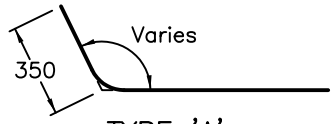
## SLAB ON GRADE WITH FOOTINGS

OPSD – 512.010

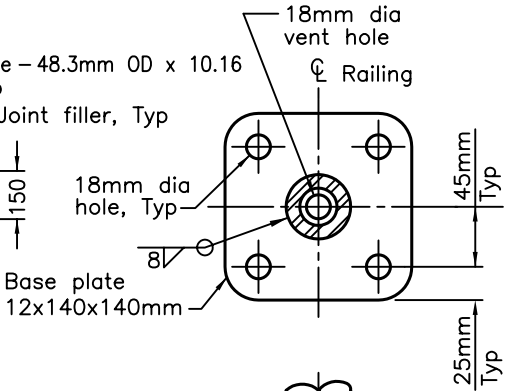


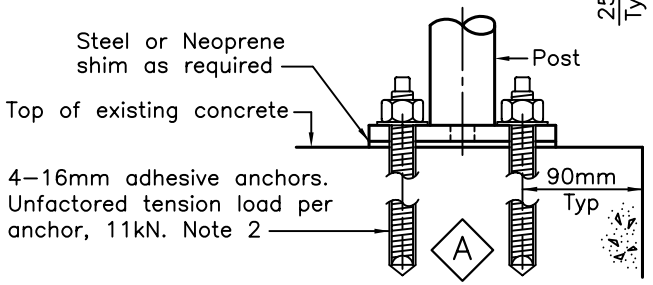

FRONT ELEVATION




TYPE 'A'
REINFORCING BARS
DETAILS




## NOTES:

1 Adhesive anchor installation and embedment depth shall be as per manufacturer's requirements. The embedment depth shall not be greater than 80% of concrete thickness.

2 Concrete cover to reinforcing steel 70±10mm.

3 Steps shall have a uniform run of not less than 250mm but not more than 355mm, and a uniform rise of not less than 125mm but not more than 200mm.

A Number of steps as specified.

B The difference in elevation between the adjacent ground level and steps shall not exceed 600mm.

C Class of concrete to be 30MPa.

D Reinforcing steel shall be according to CAN/CSA–G30.18–M92 (R1998) Grade 400.

E Threaded rod for adhesive anchors shall be equivalent to ASTM A325.

F Pipe shall be according to ASTM Specification A53 Grade 'B'.

G Steel plate shall be according to CSA G40.20/G40.21–98 Grade 300W.

H All pedestrian railing components to be hot dip galvanized after fabrication in conformance with CAN/CSA–G164–M92 (R1998).

I All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

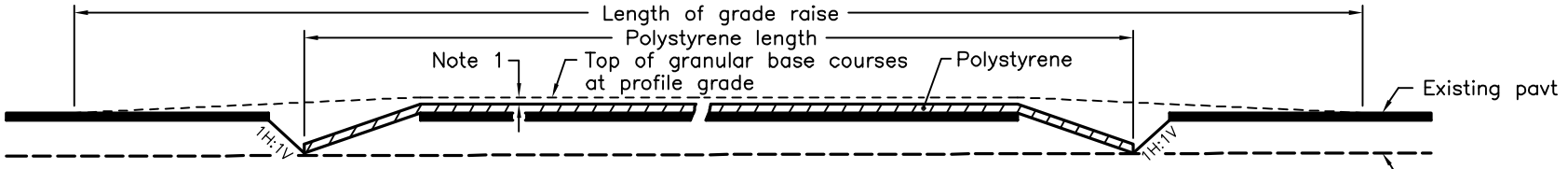
# CONCRETE STEPS

## SLAB ON GRADE

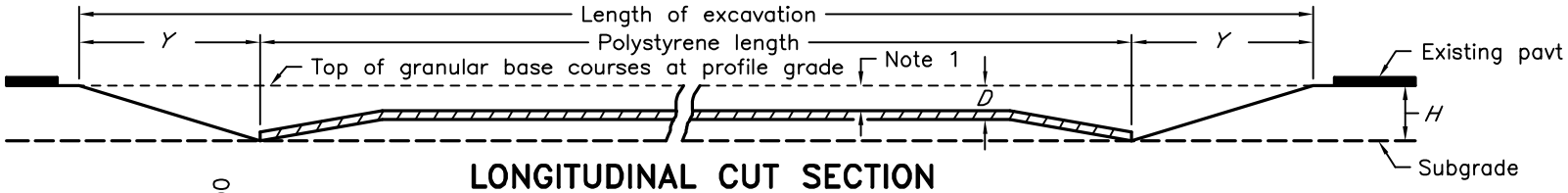
Nov 2000 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD – 512.011




LONGITUDINAL GRADE RAISE SECTION




LONGITUDINAL CUT SECTION

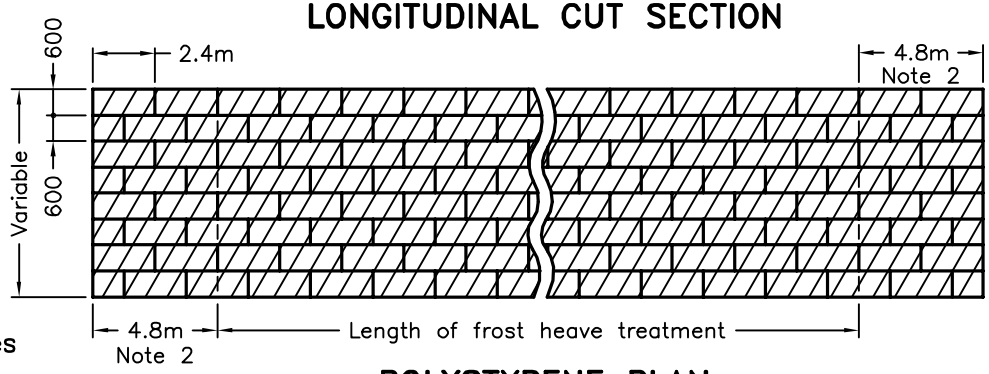
## NOTES:

1 Minimum cover for protection from construction traffic:

| Min polystyrene comp. strength | Min depth of cover |
|---|---|
| 275kPa | 300mm |
| 400kPa | 225mm |

2 Taper to top of subgrade for a length of 4.8m.

A All dimensions are in millimetres unless otherwise shown.




POLYSTYRENE PLAN

## LEGEND:

25mm polystyrene thickness

*D* = Depth to bottom of polystyrene below profile grade

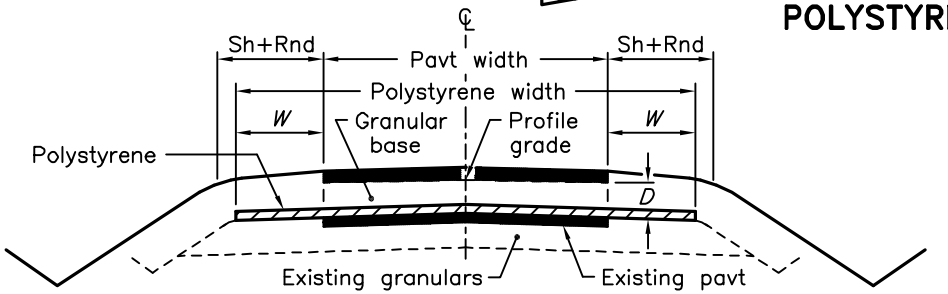
*H* = Depth of existing granular courses

*W* = Shoulder width or 1.8m whichever is the lesser

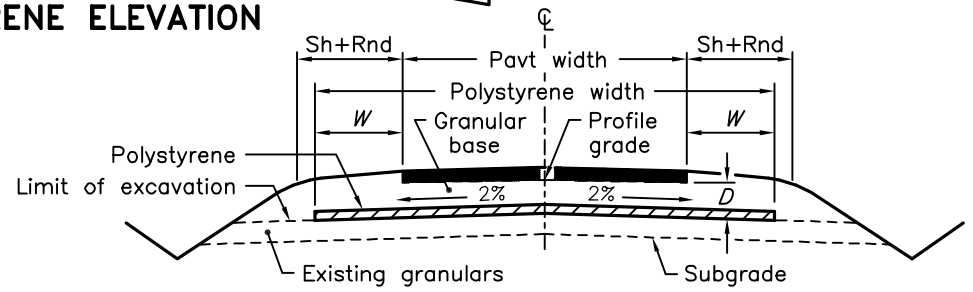
*Y* = Length of excavation taper = *4H*



POLYSTYRENE ELEVATION




TRANSVERSE GRADE RAISE SECTION




TRANSVERSE CUT SECTION

ONTARIO PROVINCIAL STANDARD DRAWING

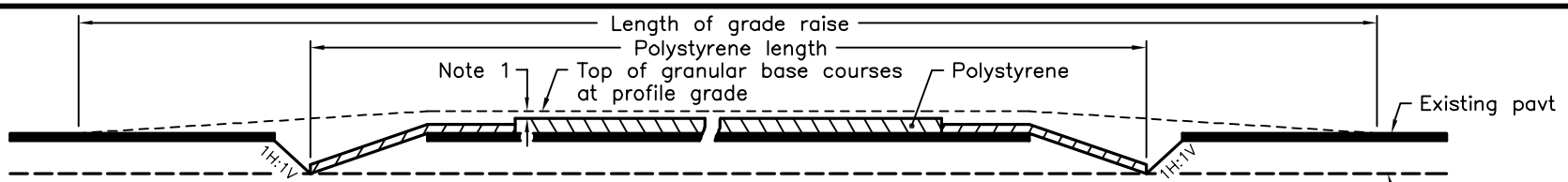
Nov 2010 | Rev 1

# EXTRUDED EXPANDED POLYSTYRENE FROST HEAVE TREATMENT

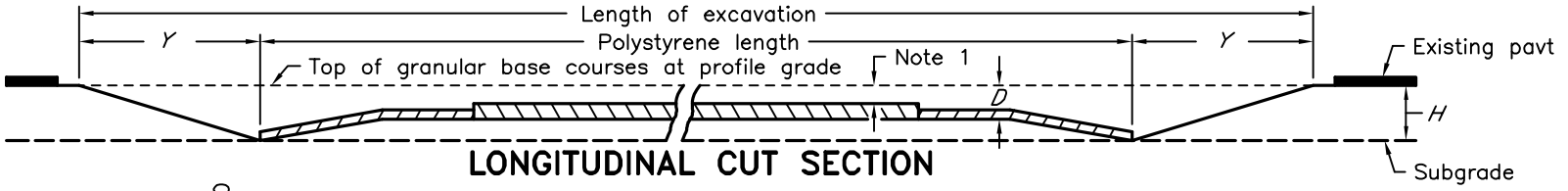
25mm THICKNESS

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 514.010




LONGITUDINAL GRADE RAISE SECTION




LONGITUDINAL CUT SECTION

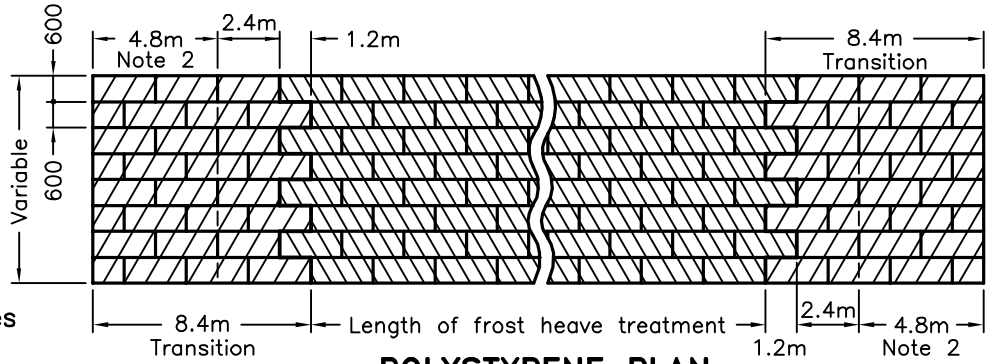
## NOTES:

1 Minimum cover for protection from construction traffic:

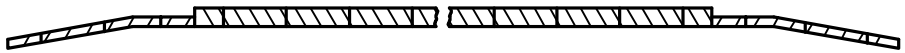
| Min polystyrene comp. strength | Min depth of cover |
|---|---|
| 275kPa | 300mm |
| 400kPa | 225mm |

2 Taper to top of subgrade for a length of 4.8m.

A All dimensions are in millimetres unless otherwise shown.




POLYSTYRENE PLAN



POLYSTYRENE ELEVATION

## LEGEND:

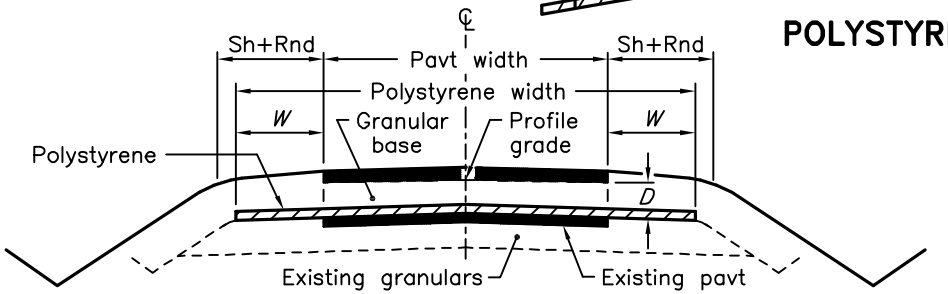
- 25mm polystyrene thickness
- 40mm polystyrene thickness

*D* = Depth to bottom of polystyrene below profile grade

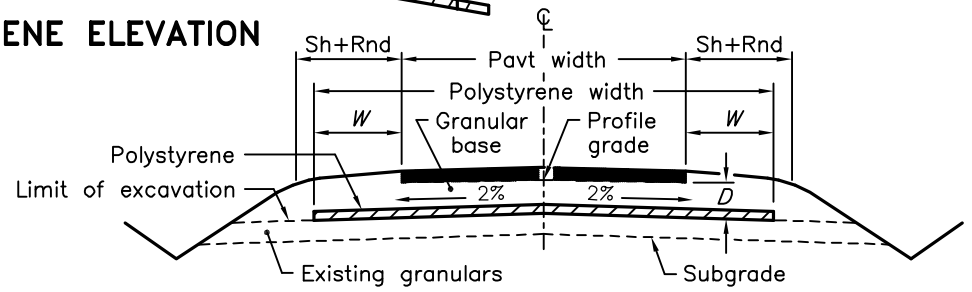
*H* = Depth of existing granular courses

*W* = Shoulder width or 1.8m whichever is the lesser

*Y* = Length of excavation taper = *4H*

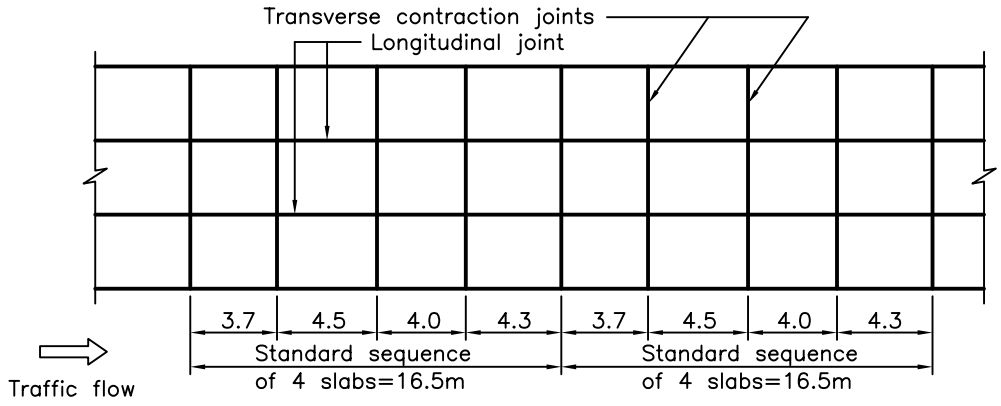



TRANSVERSE GRADE RAISE SECTION

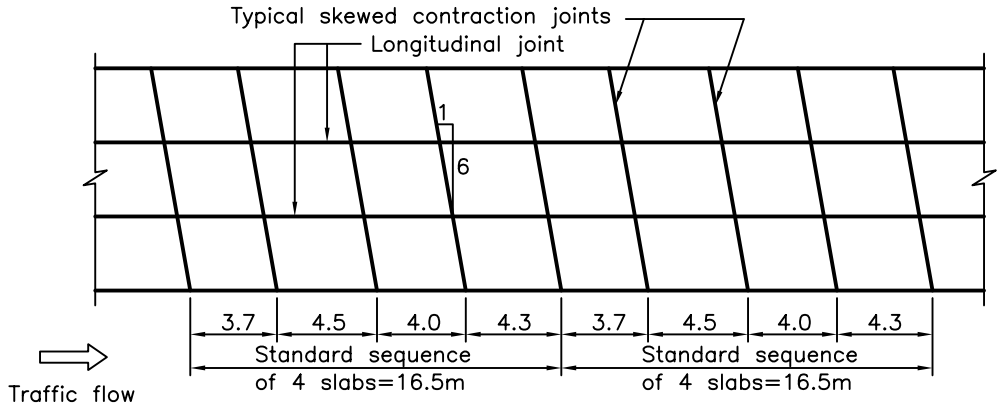



TRANSVERSE CUT SECTION

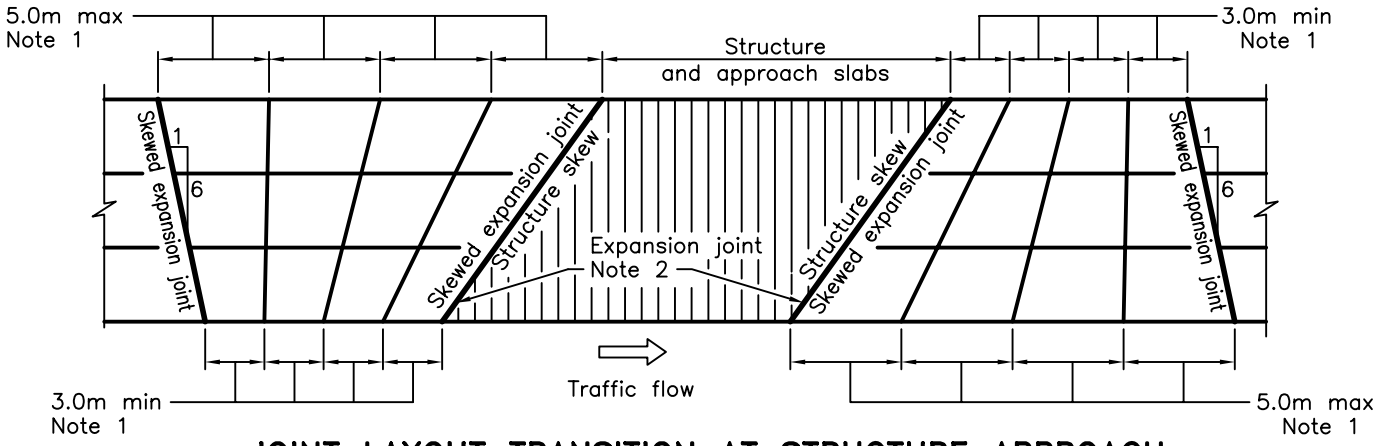
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| EXTRUDED EXPANDED POLYSTYRENE FROST HEAVE TREATMENT 40mm THICKNESS | | | |
| | OPSD 514.020 | | |




## RIGHT ANGLE JOINT




## SKEWED JOINT




## JOINT LAYOUT TRANSITION AT STRUCTURE APPROACH

NOTES:

1 The transverse joint adjacent to the skewed expansion joint shall be placed so the slab length is not shorter than 3.0m nor longer than 5.0m.

2 Expansion joints shall be placed at each end of both structure approach slabs.

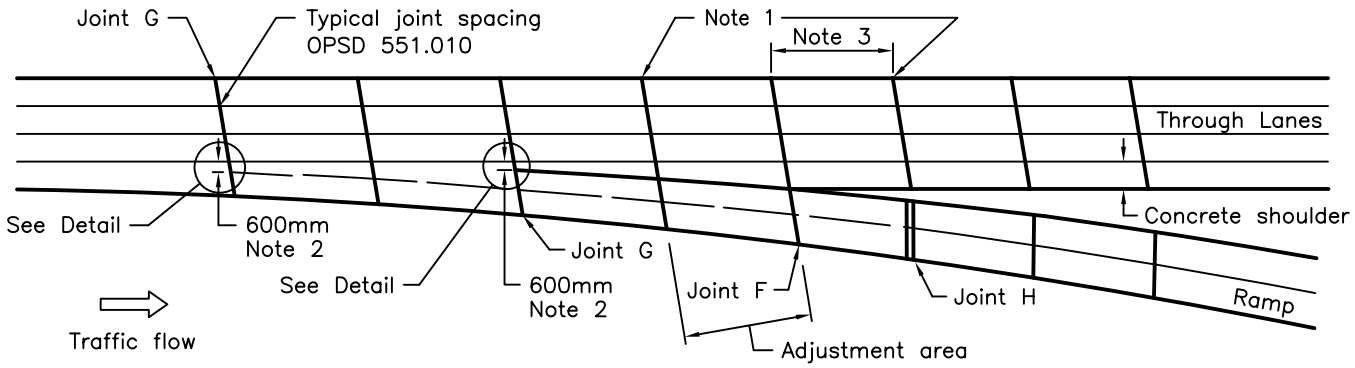
A All joints shall be according to OPSD 552.010 or OPSD 552.020.

B Construction joints shall be right angled joints located a minimum of 2.0m from adjacent transverse joints.

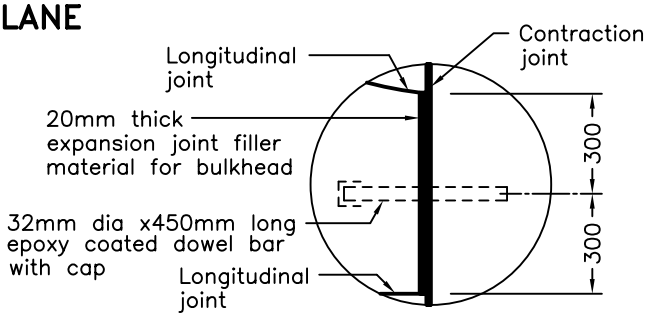
C Transverse joints shall be extended to include the full width of the concrete shoulders and curb with gutter.

D All dimensions are in metres unless otherwise shown.

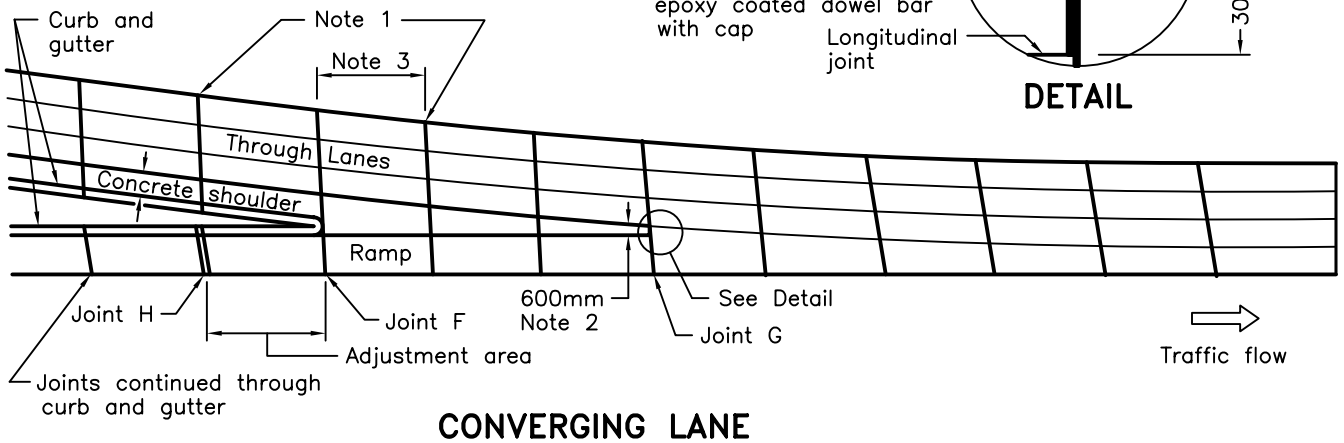
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 1 |
|---|---|---|---|
| CONCRETE AND COMPOSITE PAVEMENT JOINT SPACING | | | |
| | OPSD 551.010 | | |



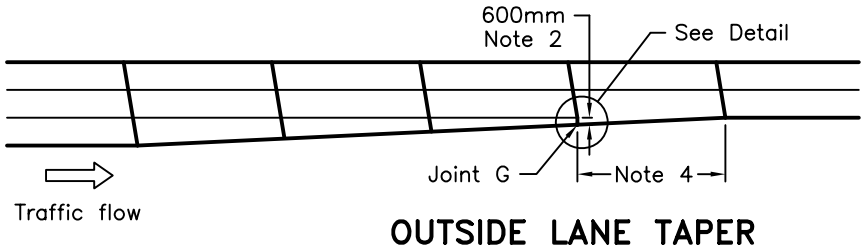

## DIVERGING LANE




## DETAIL




## CONVERGING LANE




## OUTSIDE LANE TAPER

NOTES:

1 Joint F is fixed at the end of the bullnose. Adjust the location of the joint immediately previous to Joint F, based on the side from which paving is approaching, so that the slabs on each side of the last joint are not shorter than 3.0m nor longer than 5.0m. Where the ramp is concrete pavement, Joint H shall be an expansion joint.

2 Joint G location shall be fixed to that of the closest joint to give a taper width of not less than 600mm. The taper from 0 to 600mm wide shall be constructed as an integral part of the first lane to be placed.

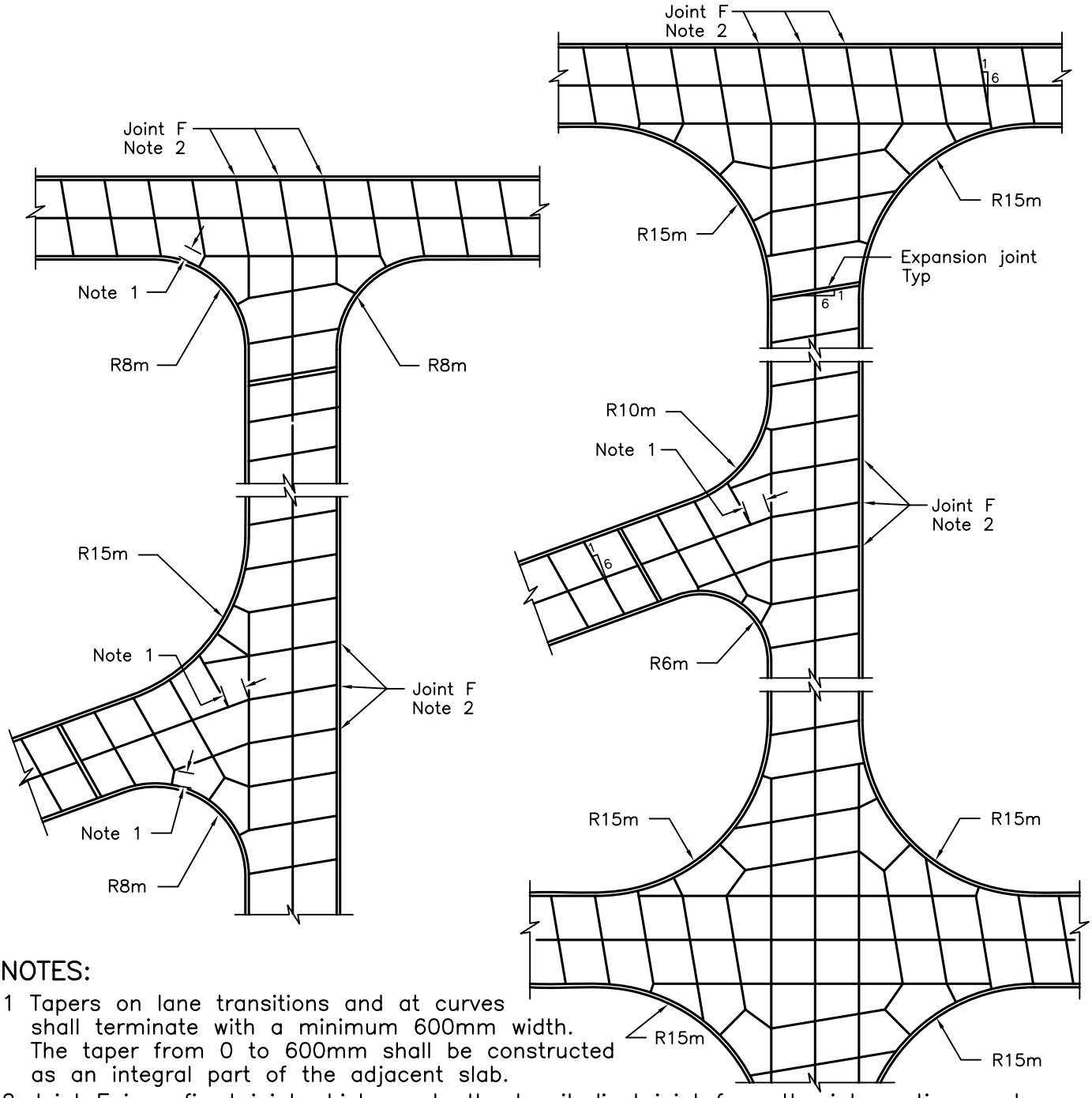
3 When paving in the opposite direction, this area shall be the adjustment area.

4 Taper to be run out in one slab length.

A All joints shall be according to OPSD 552.010 or 552.020.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 1 |
|---|---|---|---|
| CONCRETE AND COMPOSITE PAVEMENT JOINT LAYOUT AT CONVERGING OR DIVERGING LANES | | | |
| | OPSD 551.020 | | |




## NOTES:

1 Tapers on lane transitions and at curves shall terminate with a minimum 600mm width. The taper from 0 to 600mm shall be constructed as an integral part of the adjacent slab.

2 Joint F is a fixed joint which meets the longitudinal joint from the intersecting road. Joints immediately adjacent to the fixed joint are adjustment joints.

A Expansion joints shall be located immediately beyond the radius of the intersecting roads.

B All joints shall be according to OPSD 552.010 or 552.020.

C All joints shall be adjusted so that the slabs on either side of the joint have a minimum length of 3.0m and maximum length of 5.0m.

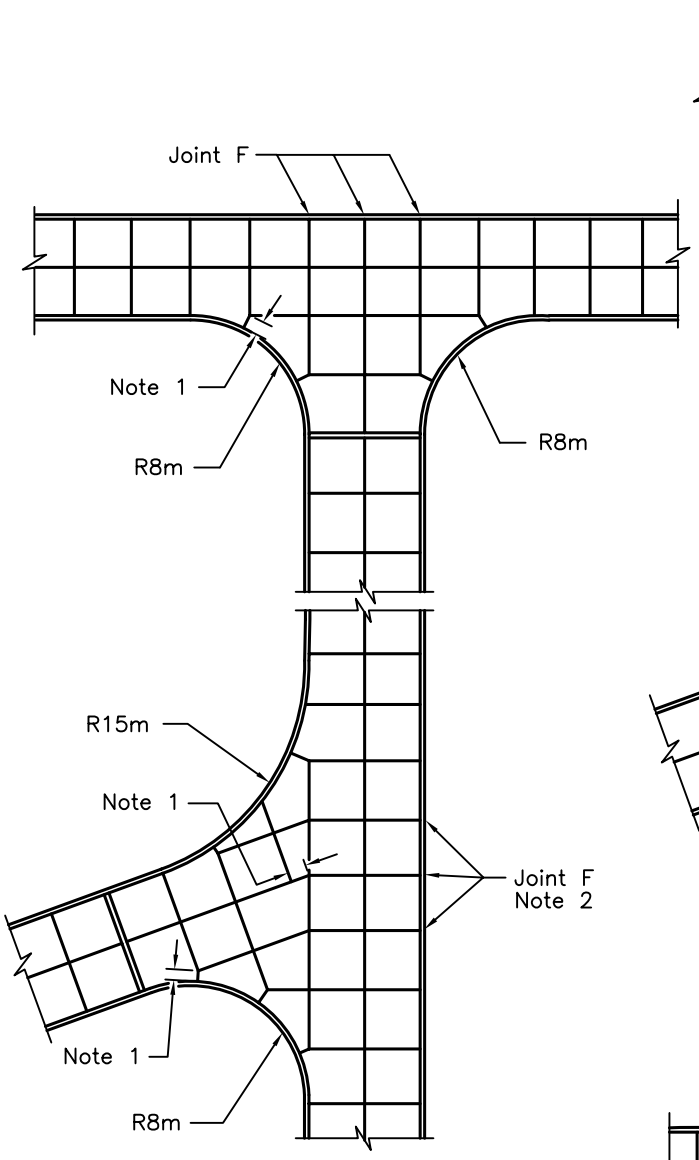
D Standard maximum joint spacing is 4.5m.

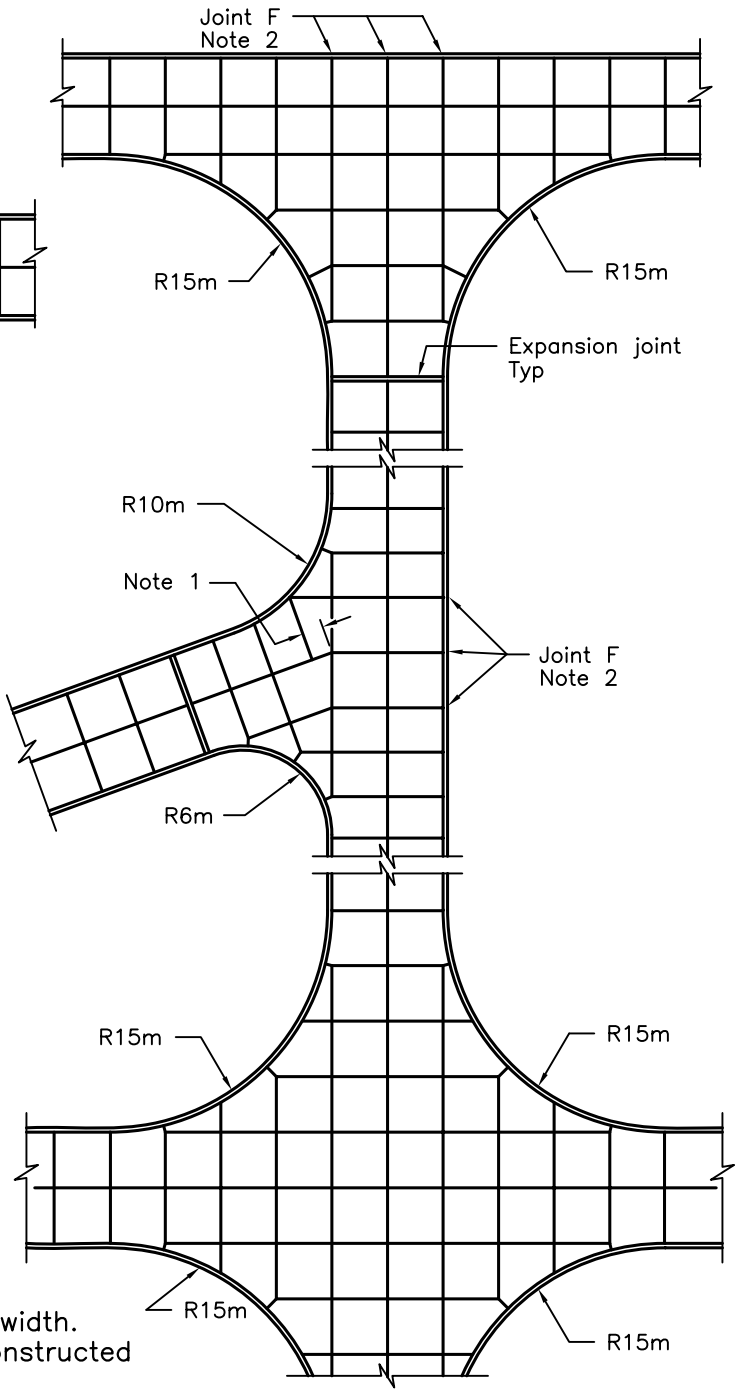
E Pavement joints shall be sawn through curb and gutter.

F Angles less than 60° between joints shall be avoided.

G All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 2 |
|---|---|---|---|
| CONCRETE AND COMPOSITE PAVEMENT<br>SKEWED JOINT LAYOUT<br>AT INTERSECTIONS | | | |
| | OPSD 551.030 | | |




NOTES:

1 Tapers on lane transitions and at curves shall terminate with a minimum 600mm width. The taper from 0 to 600mm shall be constructed as an integral part of the adjacent slab.

2 Joint F is a fixed joint which meets the longitudinal joint from the intersecting road. Joints immediately adjacent to the fixed joint are adjustment joints.

A Expansion joints shall be located immediately beyond the radius of the intersecting roads.

B All joints shall be according to OPSD 552.010 or 552.020.

C All joints shall be adjusted so that the slabs on either side of the joint have a minimum length of 3.0m and maximum length of 5.0m.

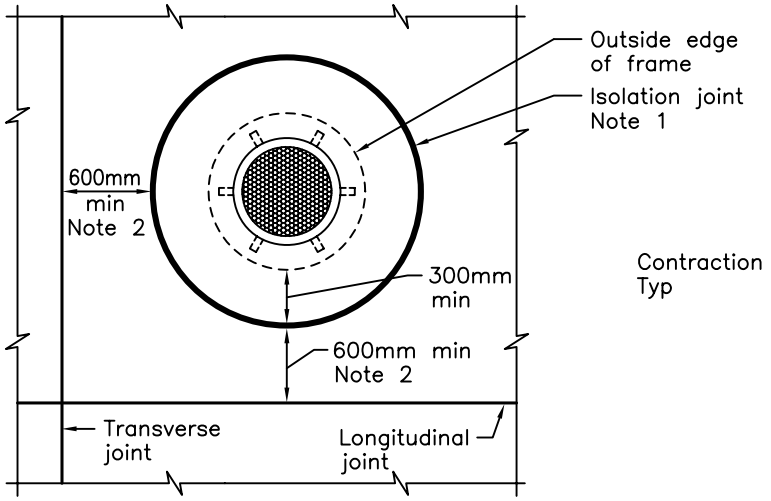
D Standard maximum joint spacing is 4.5m.

E Pavement joints shall be sawn through curb and gutter.

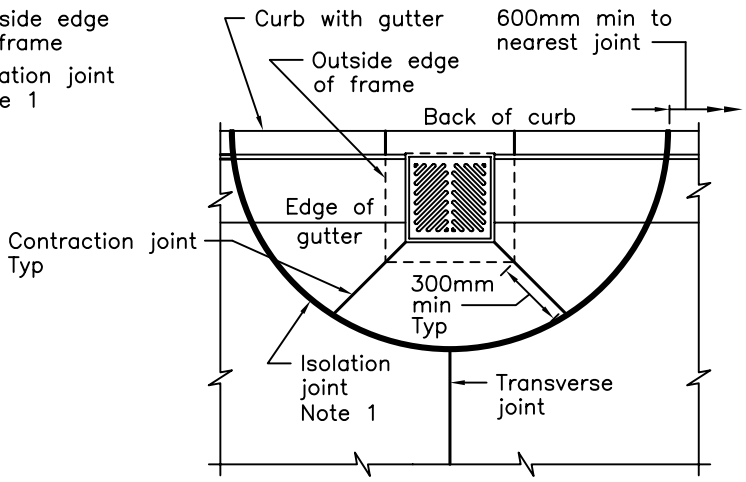
F Angles less than 60° between joints shall be avoided.

G All dimensions are in millimetres unless otherwise shown.

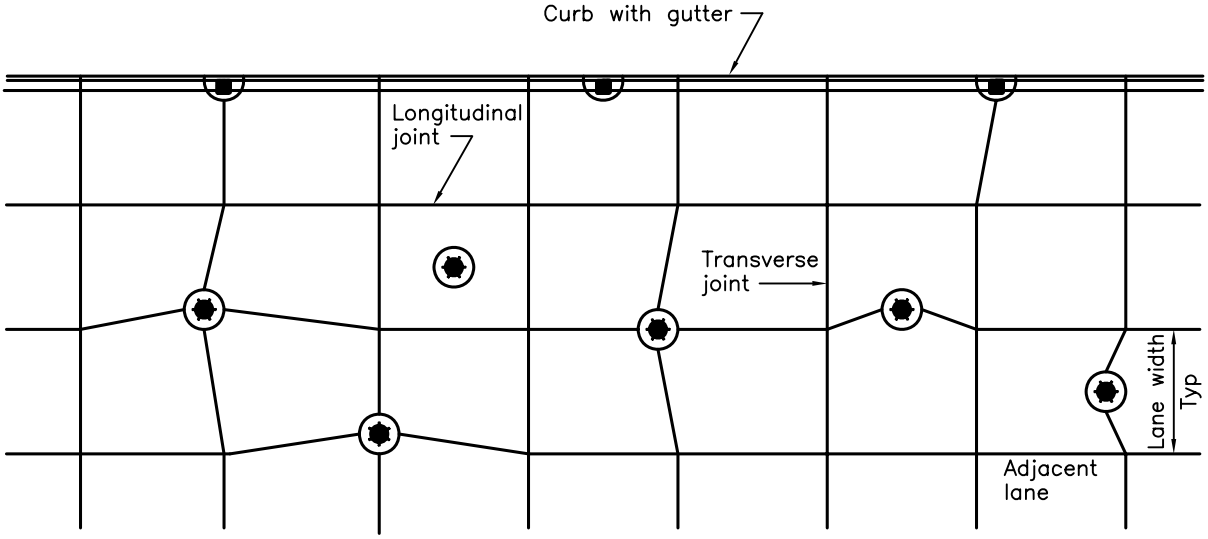
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 2 |
|---|---|---|---|
| CONCRETE AND COMPOSITE PAVEMENT<br>RIGHT ANGLE JOINT LAYOUT<br>AT INTERSECTIONS | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 551.031 | | |




ISOLATION WITHIN A SLAB




ISOLATION ADJACENT TO CURB




TYPICAL ADJUSTMENTS OF JOINTING AT UTILITY ISOLATION
NOTE 2

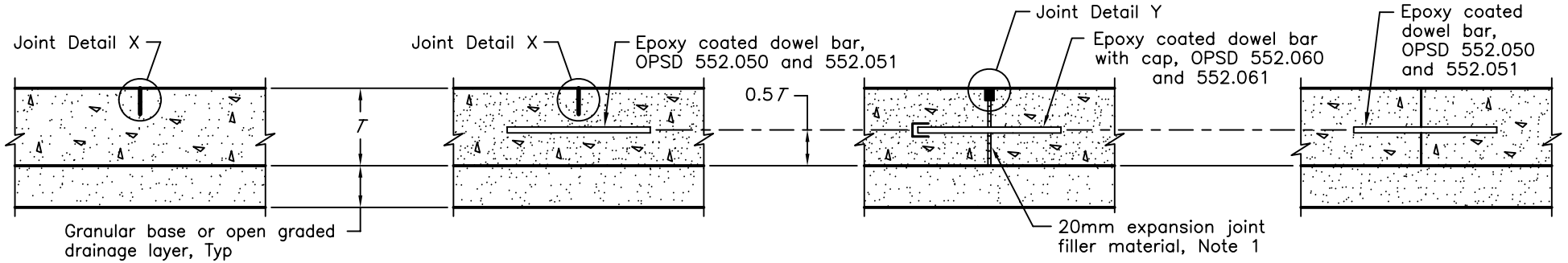
NOTES:

1 Isolation joint shall consist of 12mm expansion joint filler material placed full depth and flush with concrete surface.

2 When a longitudinal or transverse joint is within 600mm of an isolation joint, adjust the longitudinal or transverse joint accordingly.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 2 |
|---|---|---|---|
| CONCRETE AND COMPOSITE PAVEMENT UTILITY ISOLATION | | | |
| | OPSD 551.032 | | |

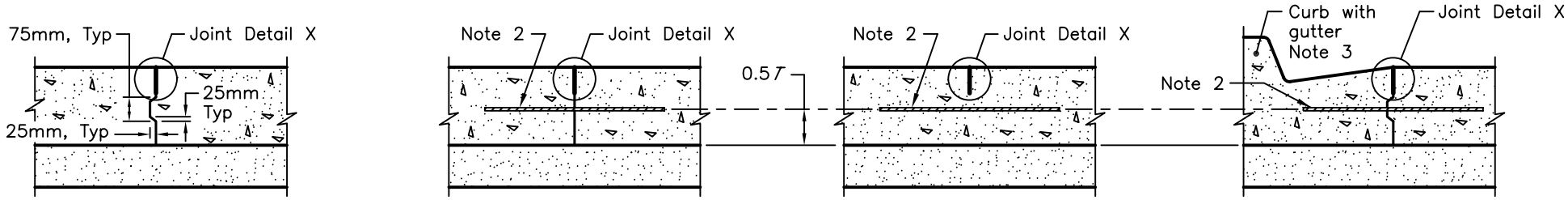



**CONTRACTION JOINT**
WITHOUT DOWEL BAR

**CONTRACTION JOINT**

**EXPANSION JOINT**

**CONSTRUCTION JOINT**




**LONGITUDINAL KEYWAY JOINT**
WITHOUT TIE BAR

**LONGITUDINAL JOINT**
SINGLE LANE PAVING

**LONGITUDINAL JOINT**
MULTI–LANE PAVING

**LONGITUDINAL JOINT**
CONCRETE SLAB ADJACENT TO CURB WITH GUTTER

NOTES:

1 Field cut 20mm thick expansion joint filler material the width of pavement plus shoulder and depth of concrete slab less the depth of reservoir.

2 Use 15x760mm epoxy coated deformed tie bars spaced at 600mm OC at 0.5*T*.

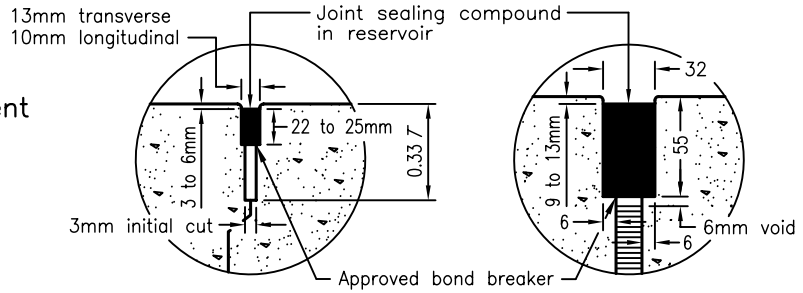
3 Depth of curb with gutter to be extended to coincide with bottom of concrete slab.

A Paving width shall not exceed 4.5m without a longitudinal joint. Where paving width is greater than 4.5m, the longitudinal joints shall be located at the lane delineations.

B All dimensions are in millimetres unless otherwise shown.

LEGEND:

*T* – Concrete slab thickness




**DETAIL X** **DETAIL Y**

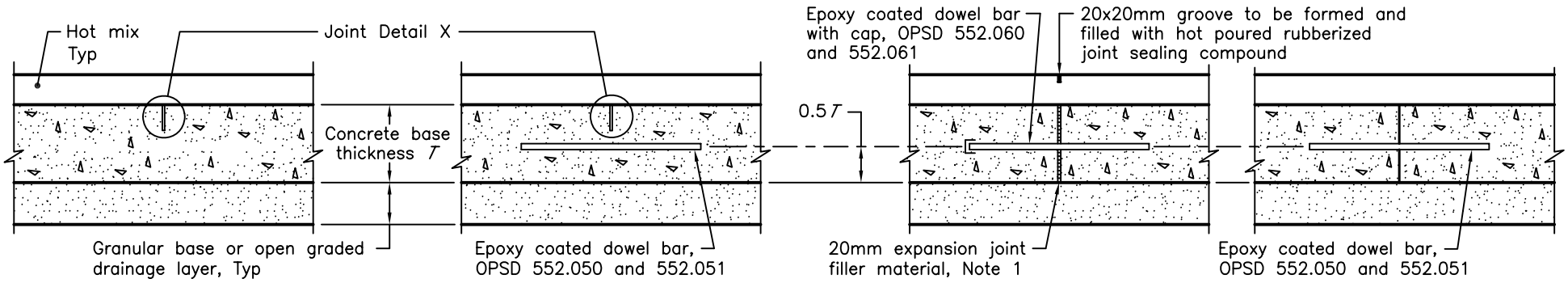
**JOINT DETAILS**
RESERVOIR CUT TYPE

ONTARIO PROVINCIAL STANDARD DRAWING

# CONCRETE PAVEMENT JOINT DETAILS

Nov 2008 | Rev 1

OPSD 552.010

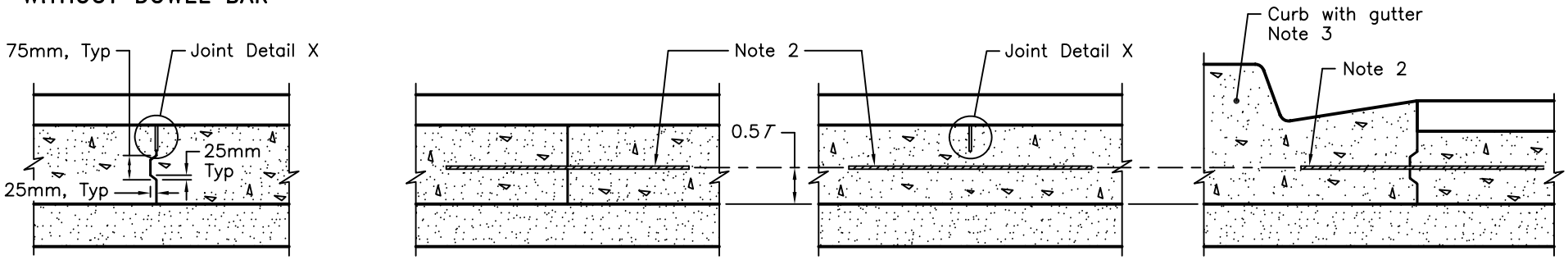



**CONTRACTION JOINT**
WITHOUT DOWEL BAR

**CONTRACTION JOINT**

**EXPANSION JOINT**

**CONSTRUCTION JOINT**




**LONGITUDINAL KEYWAY JOINT**
WITHOUT TIE BAR

**LONGITUDINAL JOINT**
SINGLE LANE PAVING

**LONGITUDINAL JOINT**
MULTI–LANE PAVING

**LONGITUDINAL JOINT**
CONCRETE BASE ADJACENT
TO CURB WITH GUTTER

NOTES:

1 Field cut 20mm thick expansion joint filler material the width of pavement plus shoulder and depth of concrete base.

2 Use 15x760mm epoxy coated deformed tie bars spaced at 600mm OC at 0.5*T*.

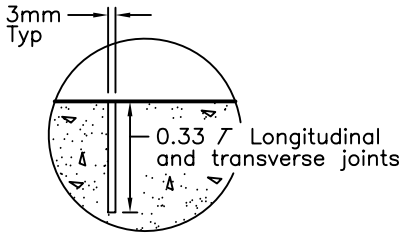
3 Depth of curb with gutter to be extended to coincide with bottom of concrete slab.

A Paving width shall not exceed 4.5m without a longitudinal joint. Where paving width is greater than 4.5m, the longitudinal joints shall be located at the lane delineations.

B All dimensions are in millimetres unless otherwise shown.

LEGEND:

*T* – Concrete base thickness



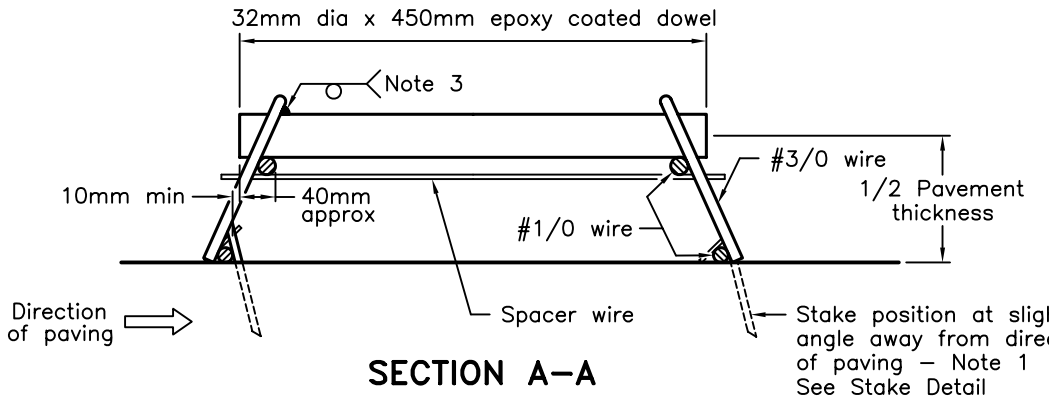

**JOINT DETAIL X**

ONTARIO PROVINCIAL STANDARD DRAWING

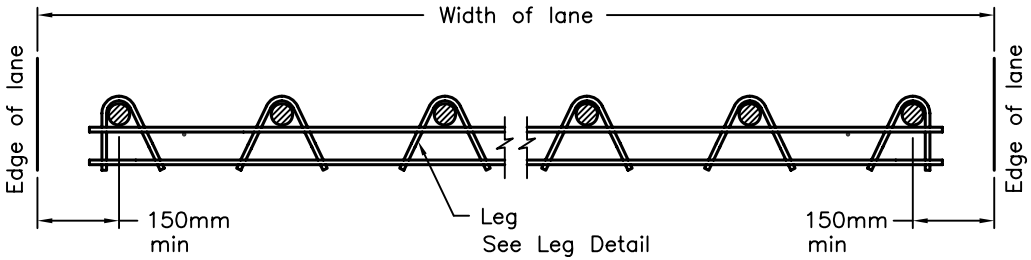
# COMPOSITE PAVEMENT JOINT DETAILS

Nov 2008 | Rev 1

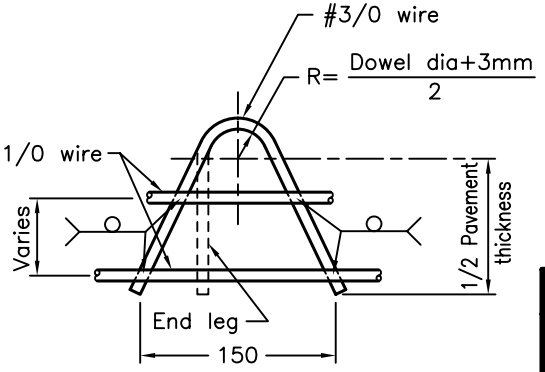
OPSD 552.020



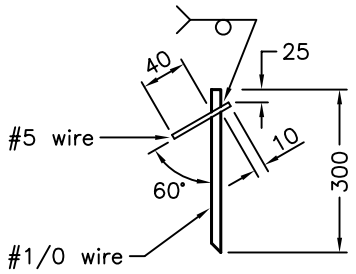

SECTION A–A



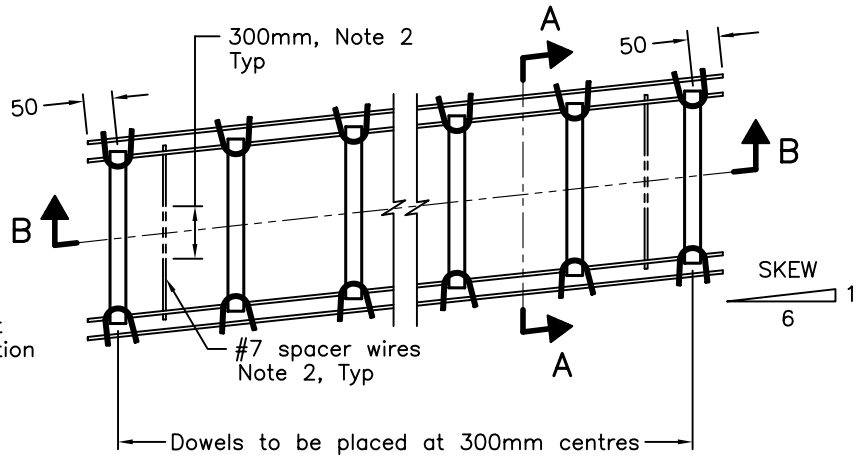

SECTION B–B




LEG DETAIL




STAKE DETAIL




PLAN

NOTES:

1 A minimum of 3 stakes shall be uniformly spaced per side per lane.

2 Spacer wire shall be cut in two places and the mid section removed after staking assembly is in position. Section removed shall be a minimum length of 300mm.

3 Arc or resistance spot weld, alternate ends of adjacent dowels only, top or bottom of dowel bar.

A At bridge approaches the skew shall match the approach slab skew.

B Load transfer device shall be shop coated with RC–250, Tectyl 506, or Protec 6116–DS Amber.

C Load transfer devices not required in shoulders or gore areas.

D All dimensions are in millimetres unless otherwise shown.

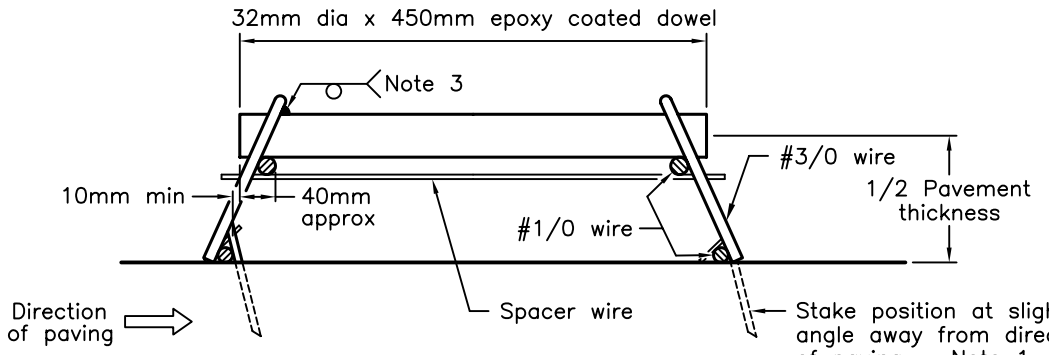
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 | Rev 2

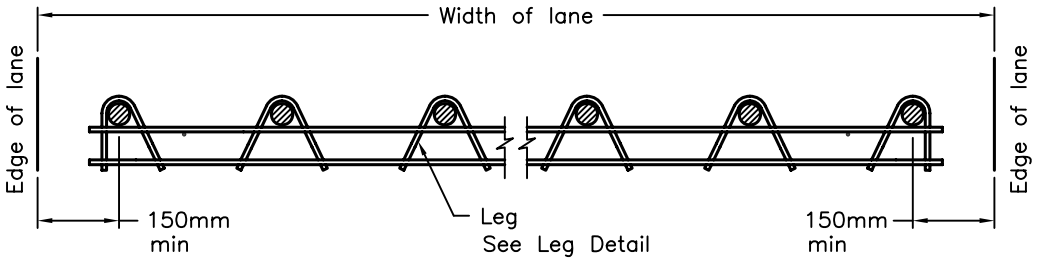
# LOAD TRANSFER DEVICE
# SKEWED CONTRACTION JOINT
## CONCRETE OR COMPOSITE PAVEMENT

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

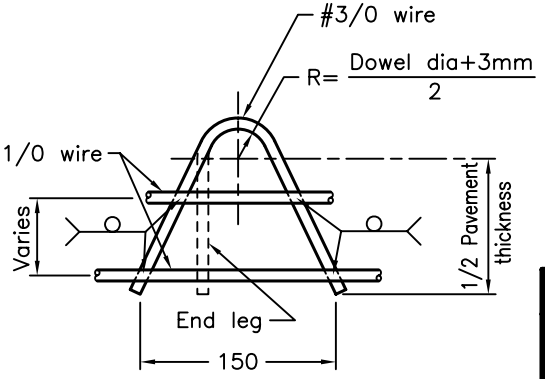
OPSD 552.050



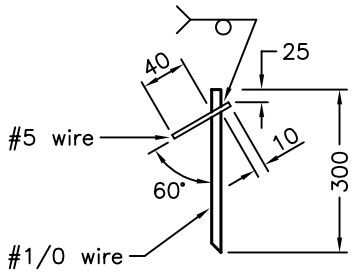

SECTION A–A



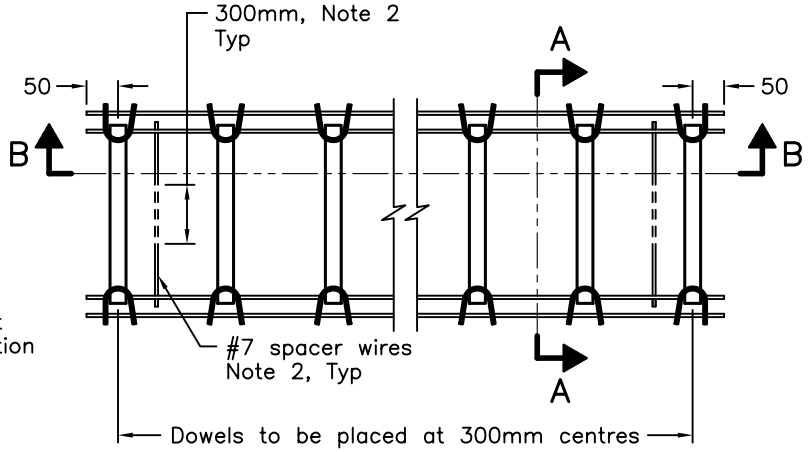

SECTION B–B




LEG DETAIL




STAKE DETAIL




PLAN

NOTES:

1 A minimum of 3 stakes shall be uniformly spaced per side per lane.

2 Spacer wire shall be cut in two places and the mid section removed after staking assembly is in position. Section removed shall be a minimum length of 300mm.

3 Arc or resistance spot weld, alternate ends of adjacent dowels only, top or bottom of dowel bar.

A At bridge approaches the load transfer device shall match the skew of the approach slab.

B Load transfer device shall be shop coated with RC–250, Tectyl 506, or Protect 6116–DS Amber.

C Load transfer devices not required in shoulders or gore areas.

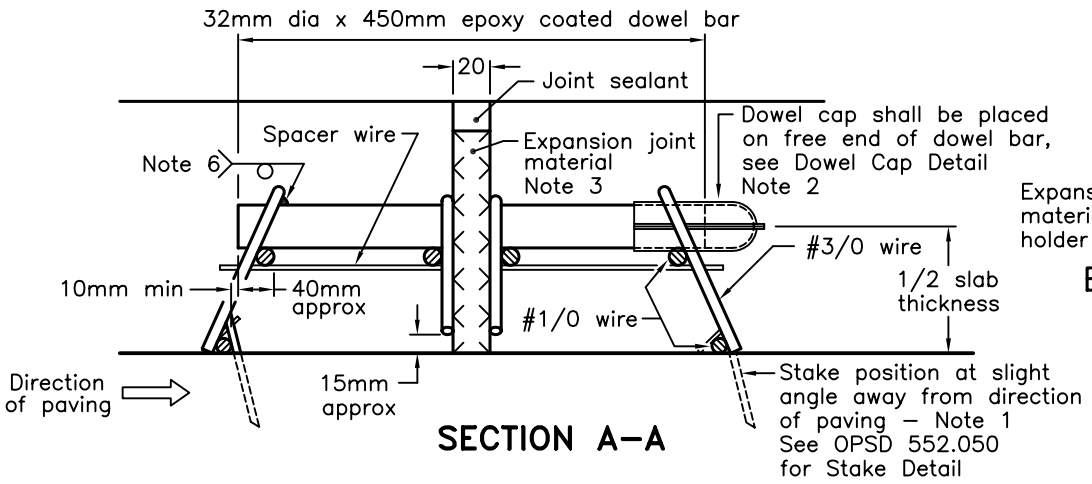
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 2

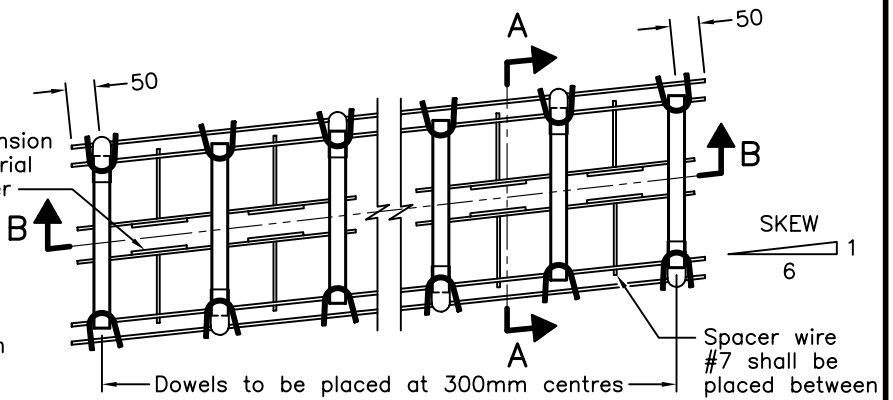
# LOAD TRANSFER DEVICE
# RIGHT ANGLE CONTRACTION JOINT
CONCRETE OR COMPOSITE PAVEMENT

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

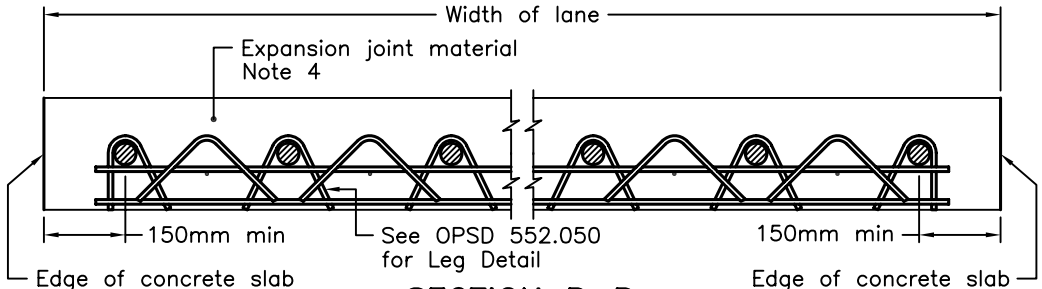
OPSD 552.051



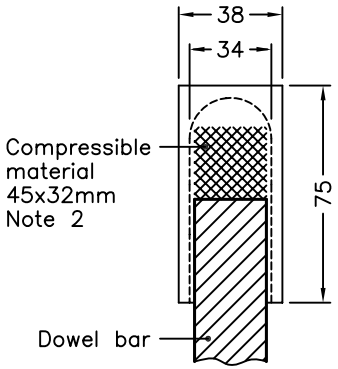

## SECTION A–A




## PLAN




## SECTION B–B




## DOWEL CAP DETAIL

## NOTES:

1 A minimum of 3 stakes shall be uniformly spaced per side per lane.

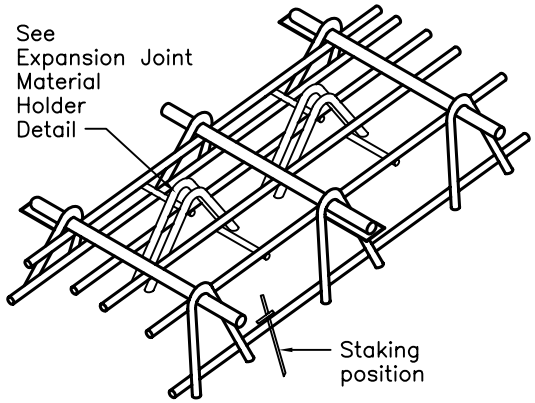
2 The compressible cap material shall be a non–absorptive, closed cell polyethylene foam.

3 The expansion joint material shall be machined punched with 35mm diameter holes to accommodate the dowels.

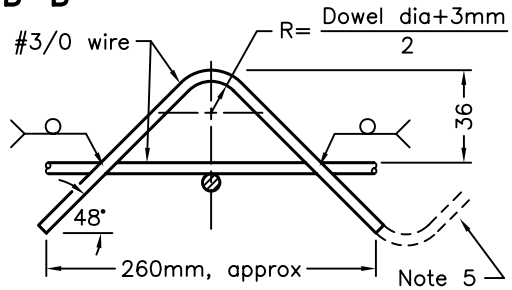
4 Expansion joint material to extend for the full width of the concrete slab.

5 Expansion joint material holder may be continuous or broken as shown.

6 Arc or resistance spot weld, alternate ends of adjacent dowels only, top or bottom of dowel bar.




## ISOMETRIC VIEW
WITHOUT EXPANSION JOINT MATERIAL




## EXPANSION JOINT MATERIAL HOLDER DETAIL

A At bridge approaches the skew of the device shall match the approach slab skew.

B Load transfer device shall be shop coated with RC–250, Tectyl 506, or Protec 6116–DS Amber.

C Load transfer devices not required in shoulders or gore areas, however, expansion joint material shall extend through the shoulder, gore areas, and curb and gutter to edge of concrete slab.

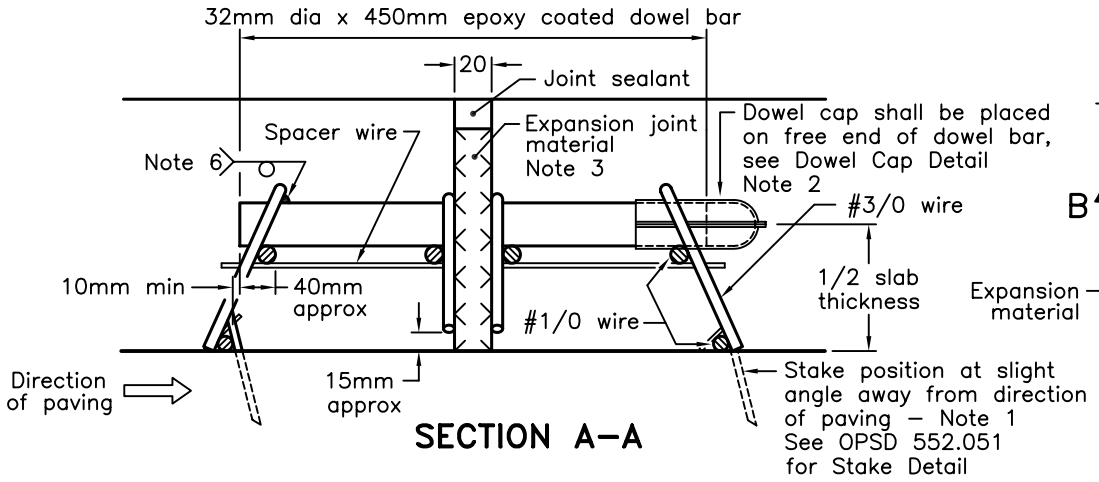
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 2

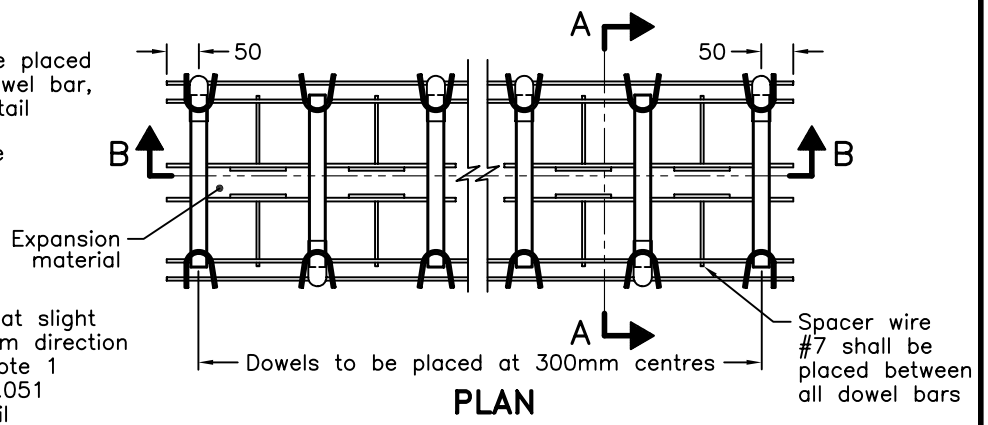
# LOAD TRANSFER DEVICE
# SKEWED EXPANSION JOINT
CONCRETE OR COMPOSITE PAVEMENT

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

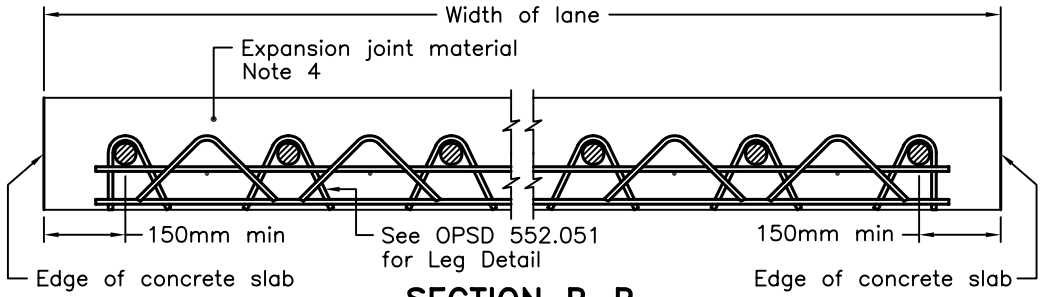
**OPSD 552.060**



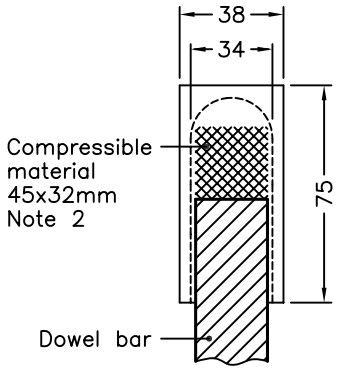

## SECTION A–A




## PLAN




## SECTION B–B




## DOWEL CAP DETAIL

## NOTES:

1 A minimum of 3 stakes shall be uniformly spaced per side per lane.

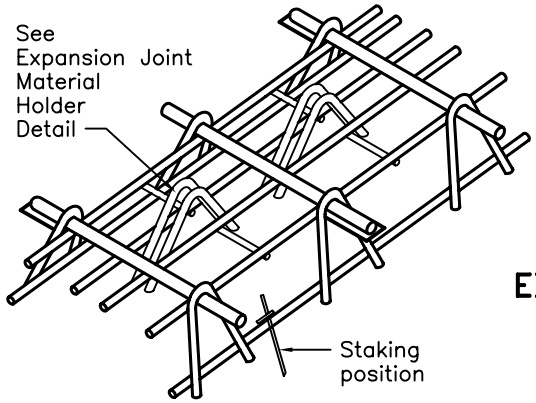
2 The compressible cap material shall be a non–absorptive, closed cell polyethylene foam.

3 The expansion joint material shall be machined punched with 35mm diameter holes to accommodate the dowels.

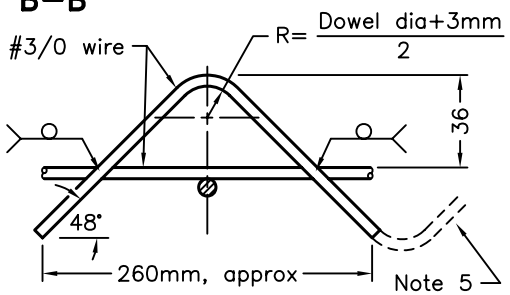
4 Expansion joint material to extend for the full width of the concrete slab.

5 Expansion joint material holder may be continuous or broken as shown.

6 Arc or resistance spot weld, alternate ends of adjacent dowels only, top or bottom of dowel bar.




## ISOMETRIC VIEW
WITHOUT EXPANSION JOINT MATERIAL




## EXPANSION JOINT MATERIAL HOLDER DETAIL

A At bridge approaches the skew of the device shall match the approach slab skew.

B Load transfer device shall be shop coated with RC–250, Tectyl 506, or Protec 6116–DS Amber.

C Load transfer devices not required in shoulders or gore areas however, expansion joint material shall extend through the shoulder, gore areas, and curb and gutter to edge of concrete slab.

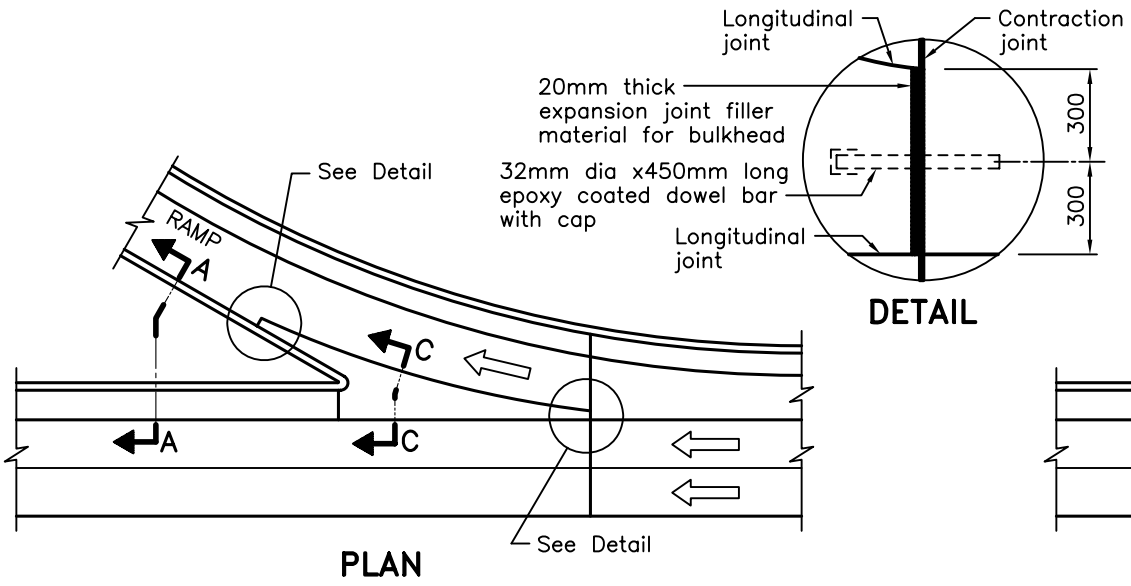
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 2

# LOAD TRANSFER DEVICE
# RIGHT ANGLE EXPANSION JOINT
CONCRETE OR COMPOSITE PAVEMENT

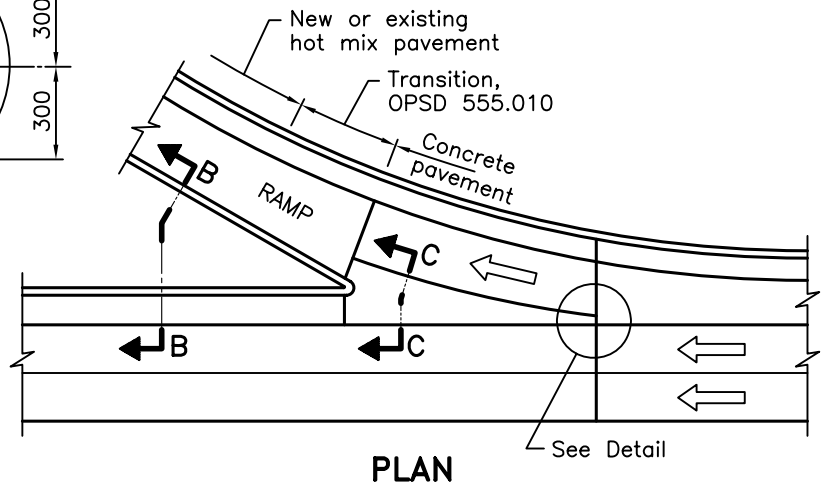
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 552.061

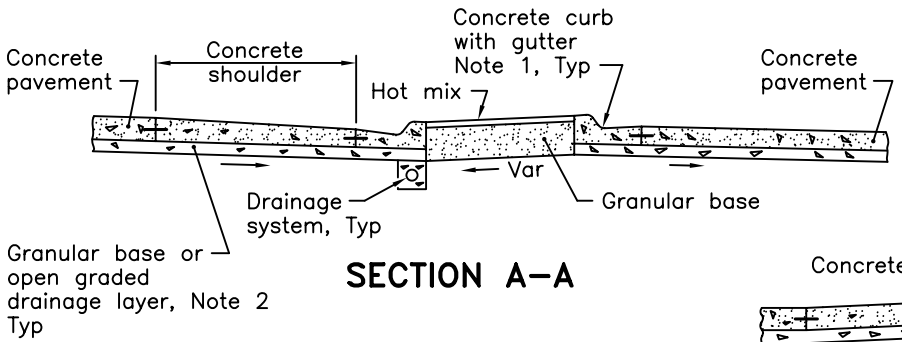



DETAIL

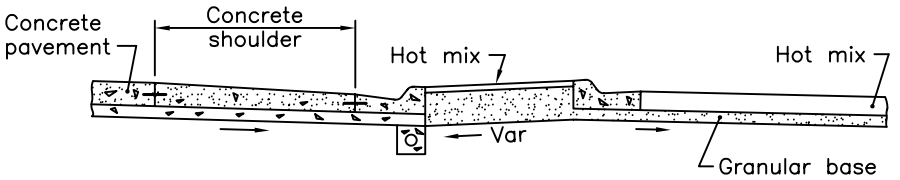
PLAN



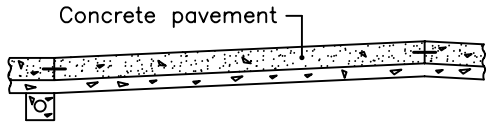

PLAN




SECTION A–A




SECTION B–B




SECTION C–C

NOTES:

1 Depth of curb with gutter to be extended to coincide with bottom of concrete slab.

2 When base is open graded drainage layer, a minimum of 100mm of Granular A material is required beneath the base.

A Exit ramp shown. Entrance ramp requires similar treatment.

B All joints shall be according to OPSD 551.020 and 552.010.

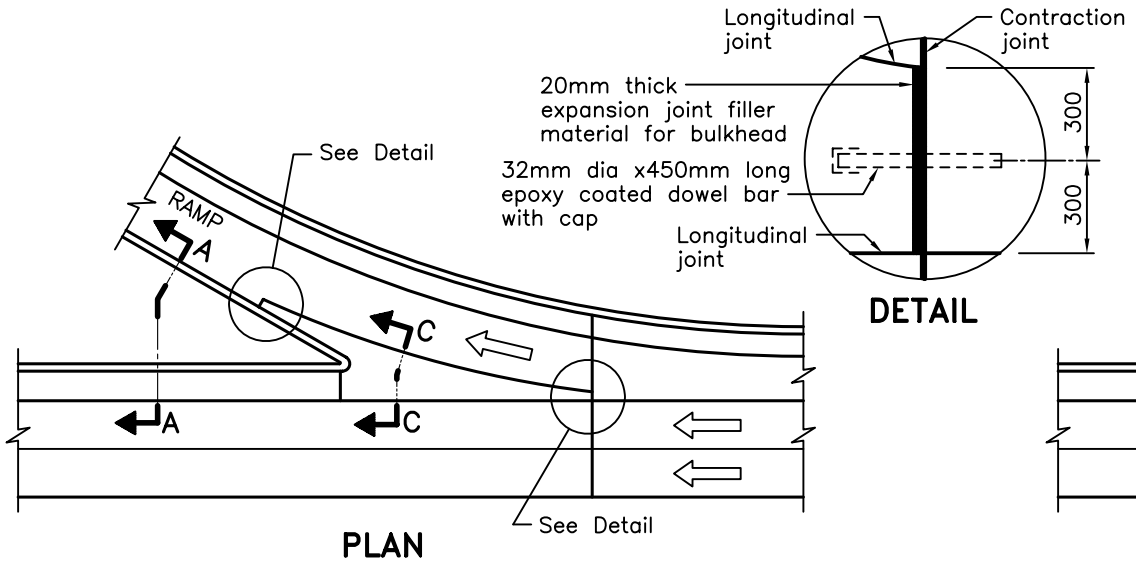
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# CONCRETE PAVEMENT IN GORE AREAS

Nov 2008 | Rev 1

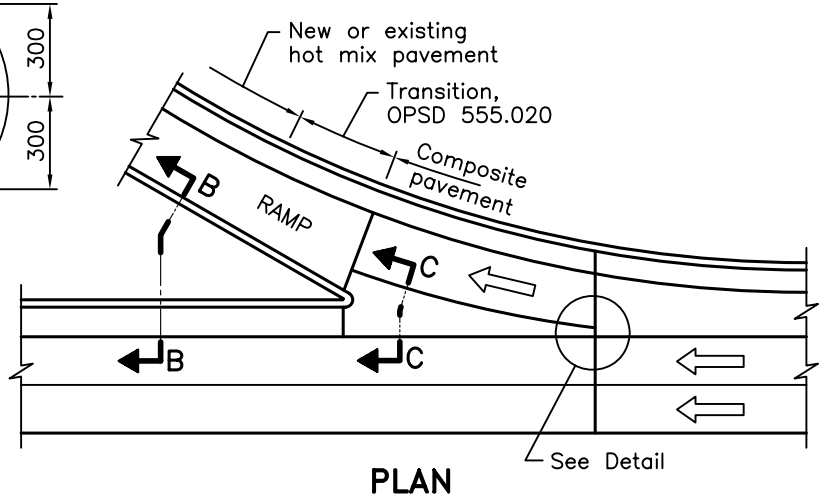
OPSD 553.010



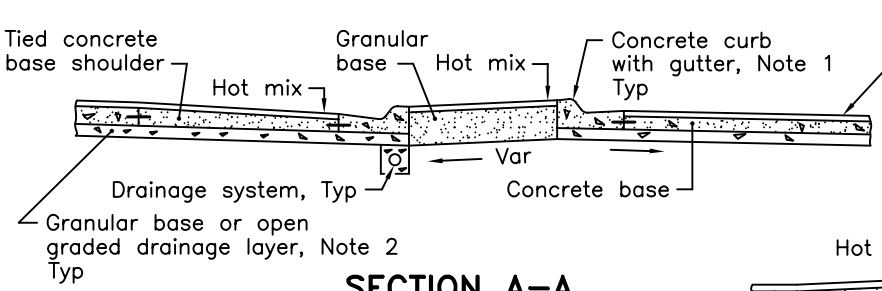

PLAN



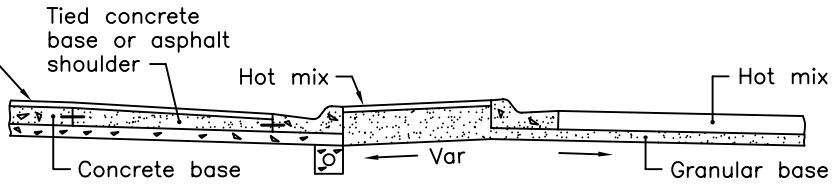

DETAIL



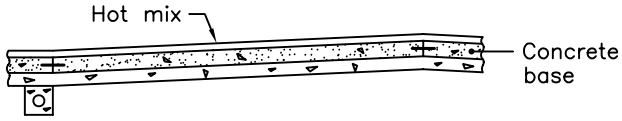

PLAN




SECTION A–A




SECTION B–B




SECTION C–C

NOTES:

1 Depth of curb with gutter to be extended to coincide with bottom of concrete slab.

2 When base is open graded drainage layer, a minimum of 100mm of Granular A material is required beneath the base.

A Exit ramp shown. Entrance ramp requires similar treatment.

B All joints shall be according to OPSD 551.020 and 552.020.

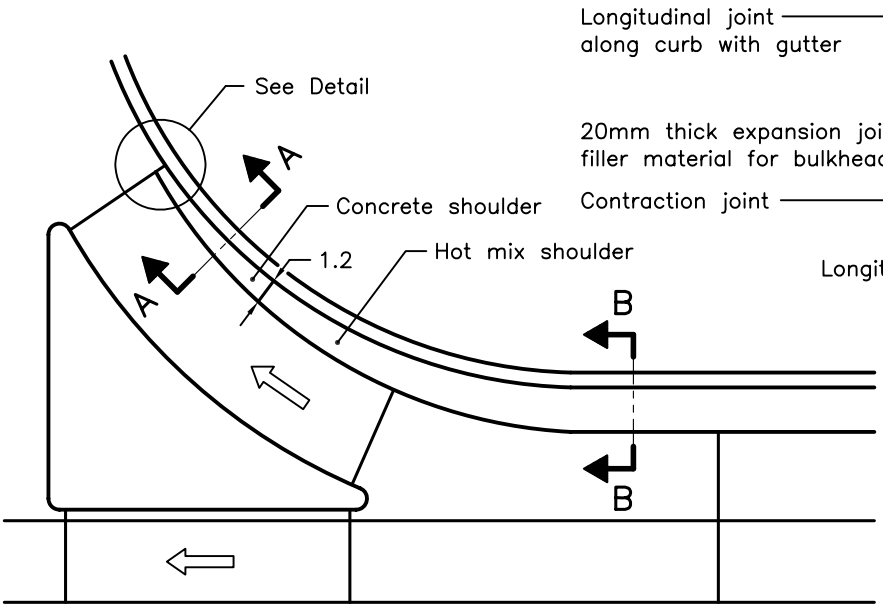
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

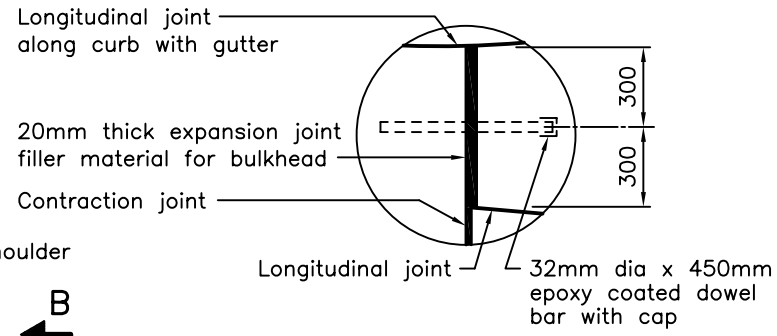
# COMPOSITE PAVEMENT IN GORE AREAS

Nov 2008 | Rev 1

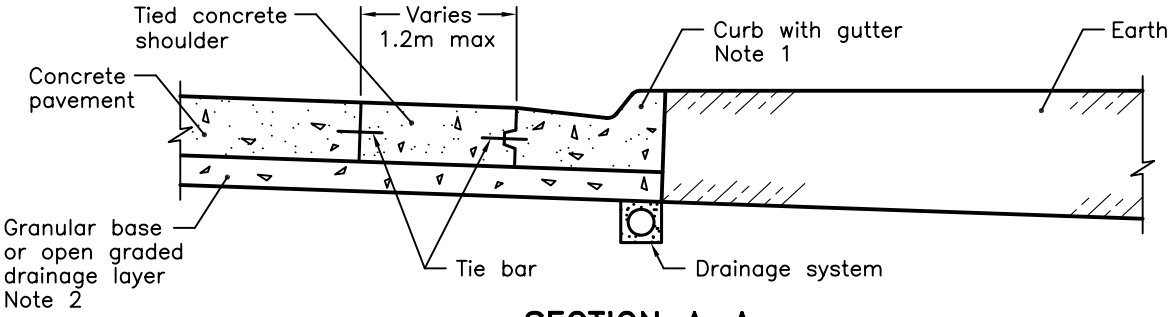
OPSD 553.020



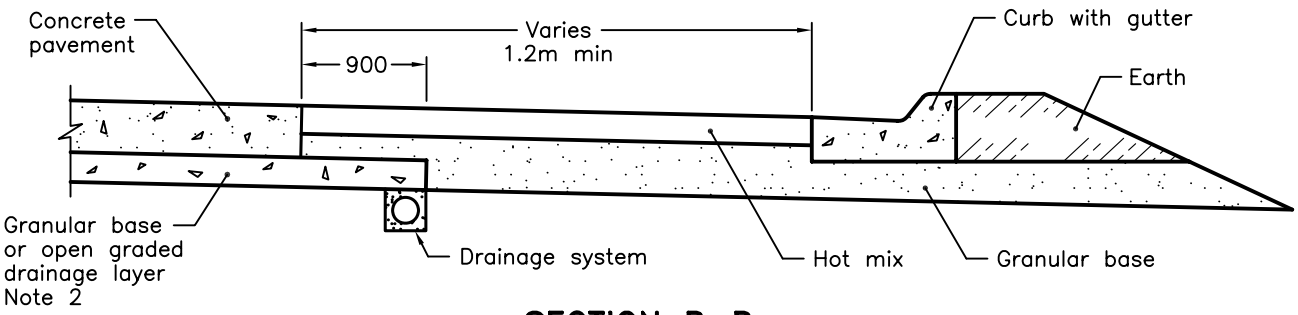

PLAN




DETAIL




SECTION A–A




SECTION B–B

NOTES:

1 Depth of curb with gutter to be extended to coincide with bottom of concrete pavement.

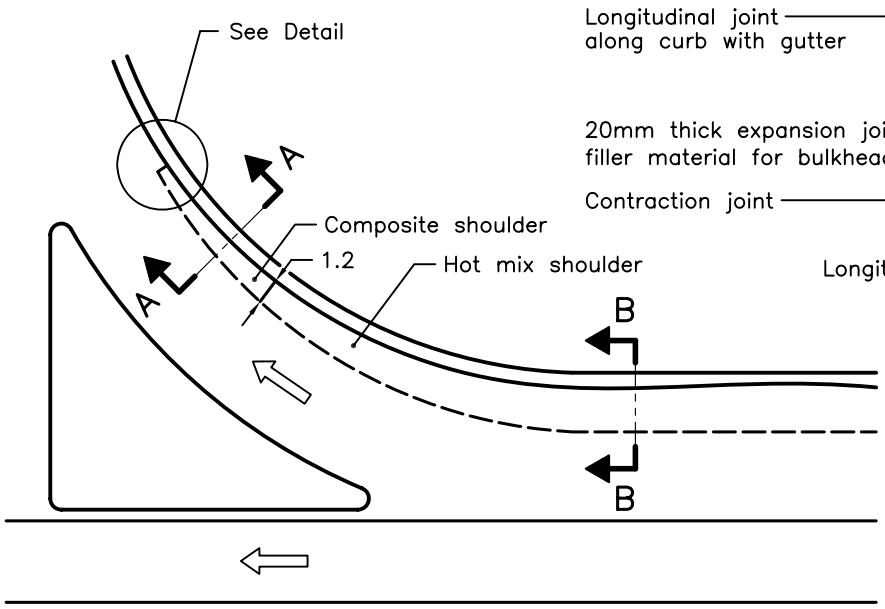
2 When base is open graded drainage layer, a minimum 100mm of Granular A material is required beneath the base.

A All concrete surfaces in contact with asphalt pavement to be treated with a tack coat prior to hot mix paving.

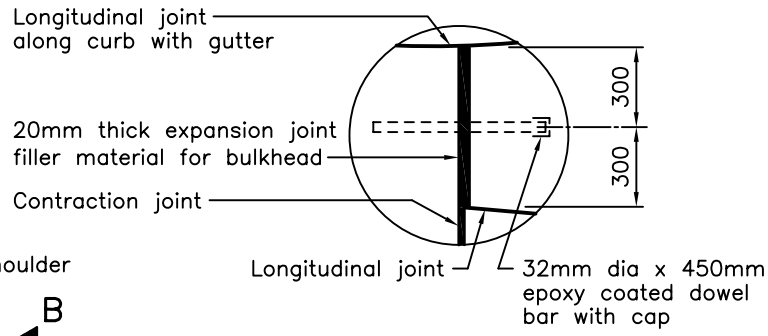
B All joints shall be according to OPSD 551.010 and 552.010.

C All dimensions are in millimetres unless otherwise shown.

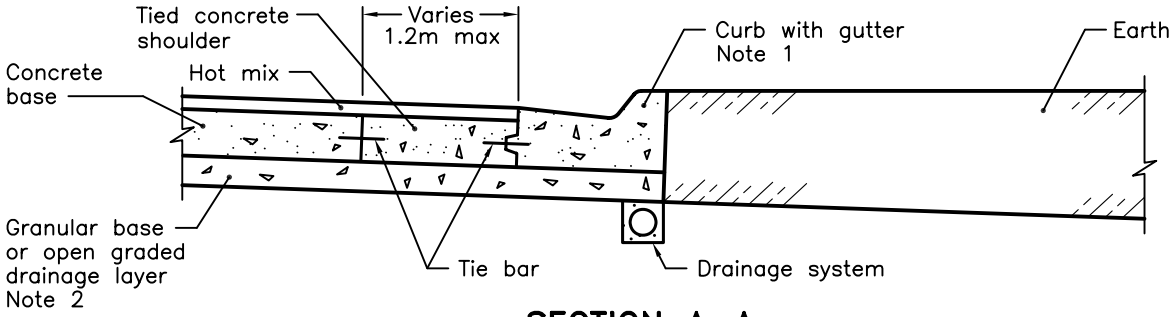
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 1 |
|---|---|---|---|
| CONCRETE PAVEMENT SHOULDER TERMINAL | | | |
| | OPSD 554.010 | | |



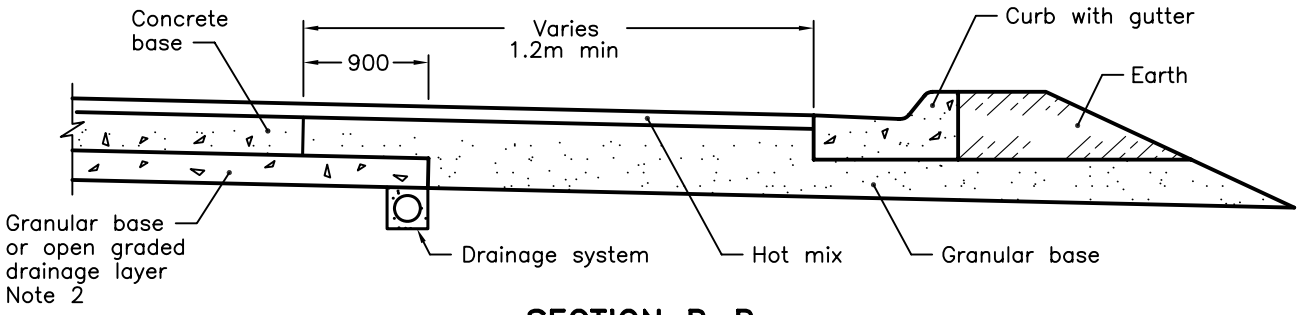

PLAN




DETAIL




SECTION A–A




SECTION B–B

NOTES:

1 Depth of curb with gutter to be extended to coincide with bottom of concrete base.

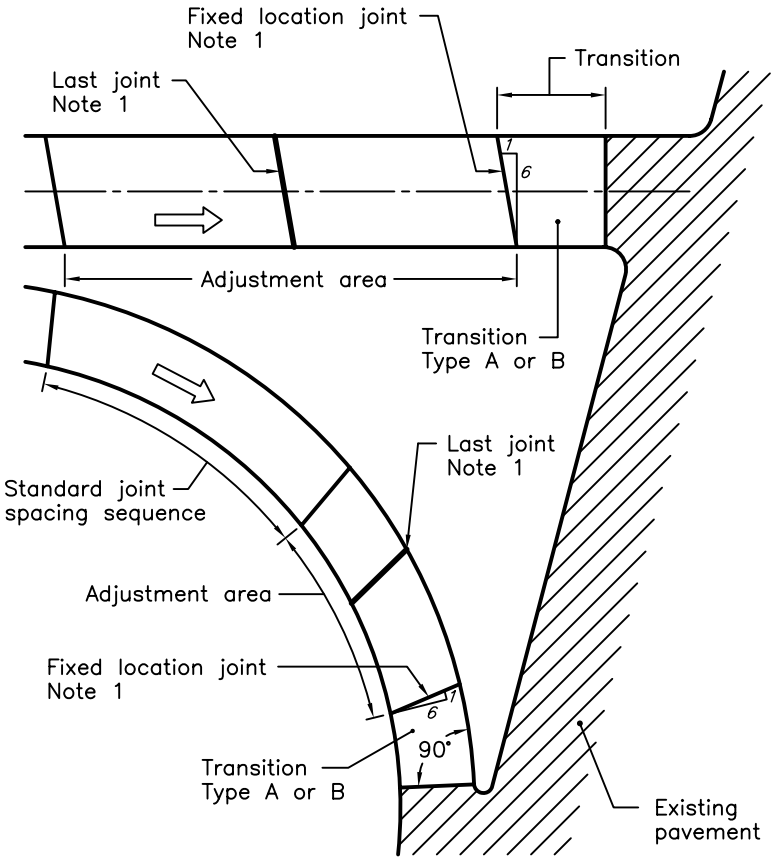
2 When base is open graded drainage layer, a minimum of 100mm of Granular A material is required beneath the base.

A All concrete surfaces in contact with hot mix pavement to be treated with a tack coat prior to hot mix paving.

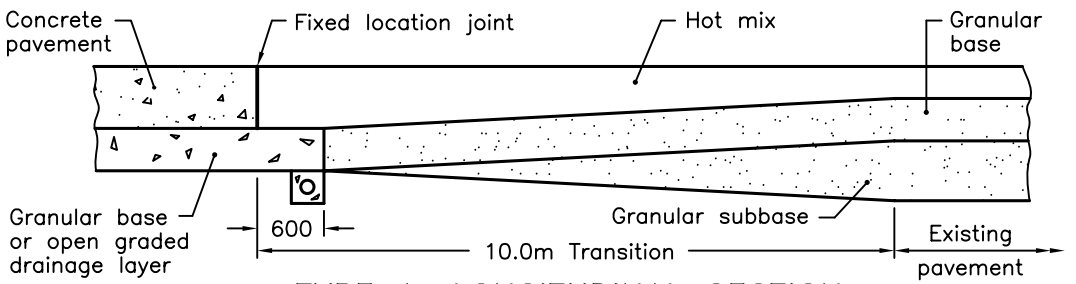
B All joints shall be according to OPSD 551.010 and 552.020.

C All dimensions are in millimetres unless otherwise shown.

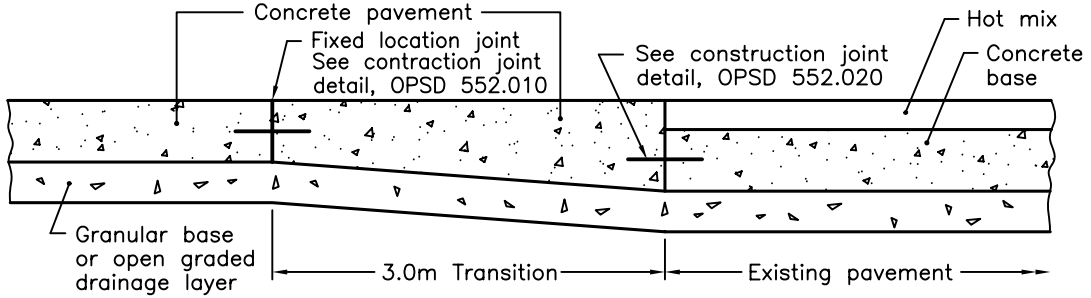
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 1 |
|---|---|---|---|
| **COMPOSITE PAVEMENT SHOULDER TERMINAL** | | | |
| | | | **OPSD 554.020** |



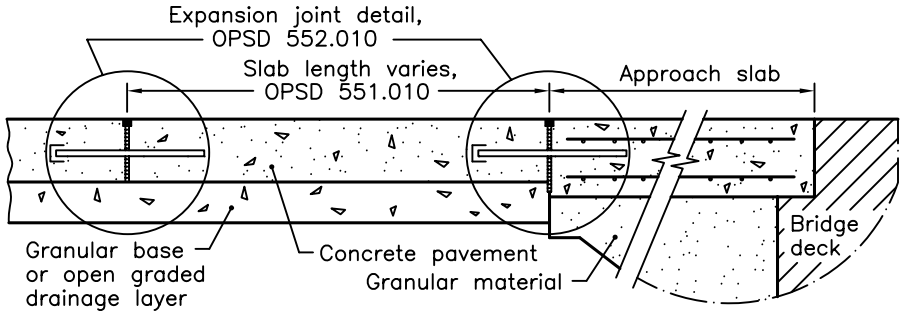

**PLAN**




**TYPE A: LONGITUDINAL SECTION**
**CONCRETE PAVEMENT TO HOT MIX PAVEMENT WITH GRANULAR BASE**




**TYPE B: LONGITUDINAL SECTION**
**CONCRETE PAVEMENT TO COMPOSITE PAVEMENT**




**TYPE C: LONGITUDINAL SECTION**
**CONCRETE PAVEMENT TO STRUCTURE APPROACHES**

NOTES:

1 Adjust the position of the last joint immediately previous to the fixed location joint, so that the slabs on each side of this last joint are not shorter than 3.0m, nor longer than 5.0m. Last joint to be an expansion joint for Type B section.

A When base is open graded drainage layer, a minimum 100mm of Granular A material is required beneath it.

B For details of approach slab see bridge drawing.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

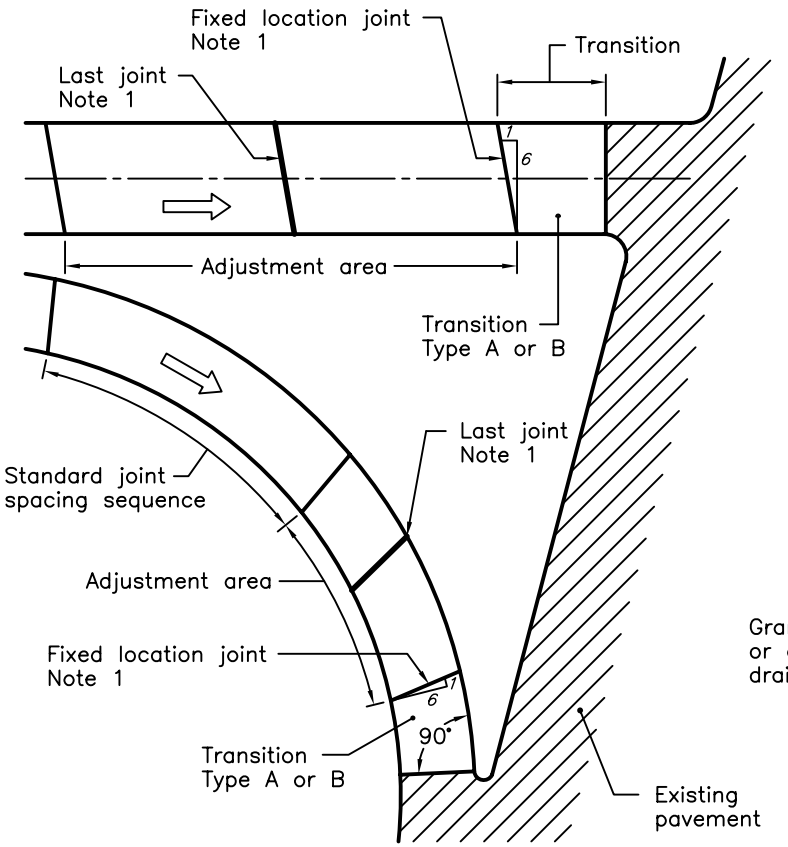
# CONCRETE PAVEMENT

APPROACH TREATMENT TO
HOT MIX AND COMPOSITE PAVEMENTS AND
STRUCTURE APPROACHES

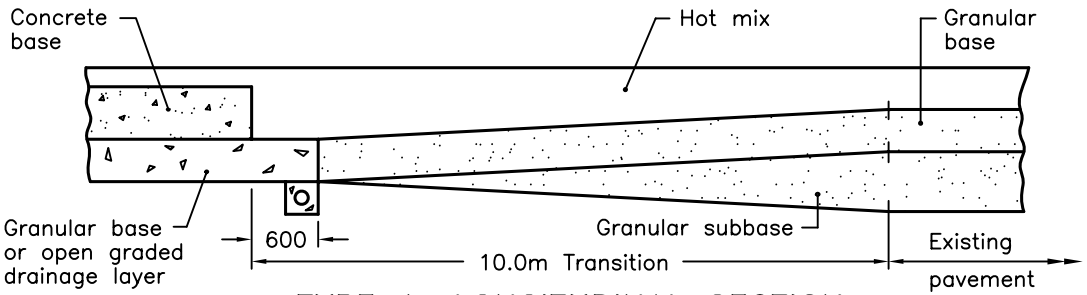
Nov 2008 | Rev 1

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

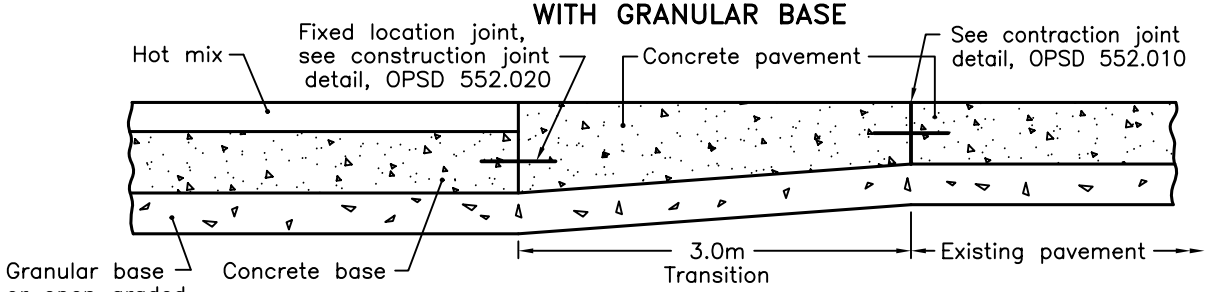
**OPSD 555.010**



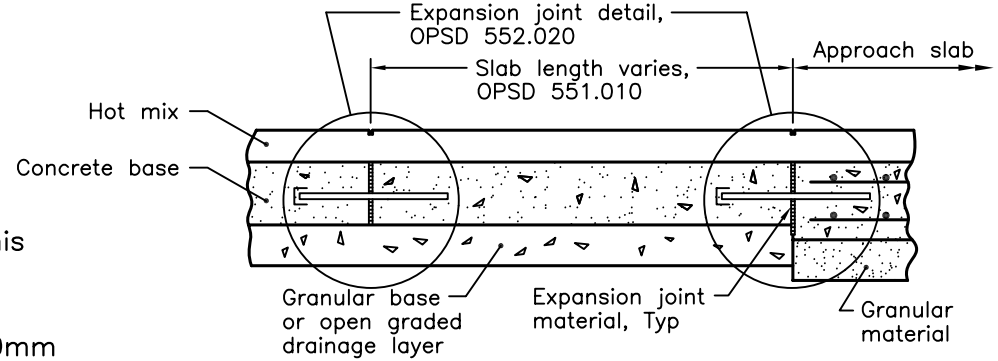

**PLAN**




**TYPE A: LONGITUDINAL SECTION**
**COMPOSITE PAVEMENT TO HOT MIX PAVEMENT WITH GRANULAR BASE**




**TYPE B: LONGITUDINAL SECTION**
**COMPOSITE PAVEMENT TO CONCRETE PAVEMENT**




**TYPE C: LONGITUDINAL SECTION**
**COMPOSITE PAVEMENT TO STRUCTURE APPROACHES**

NOTES:

1 Adjust the position of the last joint immediately previous to the fixed location joint, so that the slabs on each side of this last joint are not shorter than 3.0m, nor longer than 5.0m. Last joint to be an expansion joint for Type B section.

A When base is open graded drainage layer, a minimum of 100mm of Granular A is required beneath it.

B All concrete surfaces in contact with hot mix pavement shall be treated with a tack coat prior to hot mix paving.

C For details of approach slab see bridge drawing.

D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

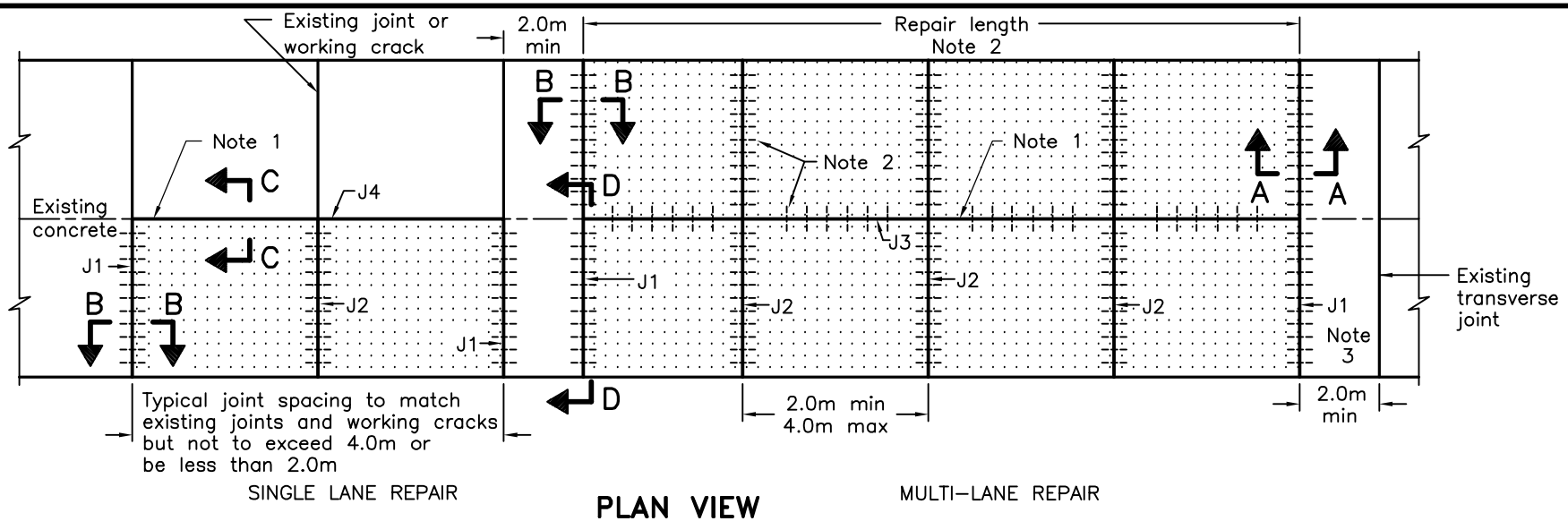
# COMPOSITE PAVEMENT

APPROACH TREATMENT TO
HOT MIX AND CONCRETE PAVEMENTS AND
STRUCTURE APPROACHES

Nov 2008 | Rev 1

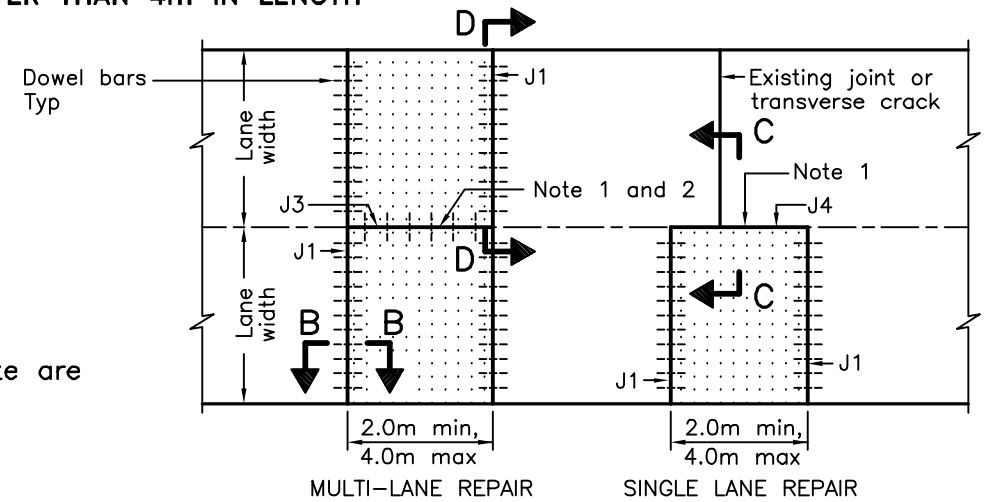
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 555.020




**PLAN VIEW**

**CONCRETE REPAIR GREATER THAN 4m IN LENGTH**




**PLAN VIEW**

**CONCRETE REPAIR 4m OR LESS IN LENGTH**

NOTES:

1 Tie bars are required at longitudinal joints except where the new concrete abuts existing concrete. Prior to placing new concrete, exposed longitudinal joints shall be treated with a bond breaker.

2 All dowel bar and tie bar sections shown for new concrete are according to OPSD 552.010 and 552.020.

3 Alternative J5 expansion joint when specified.

A This OPSD to be read in conjunction with OPSD 560.020 and 560.030.

B All dimensions are in millimetres unless otherwise shown.

LEGEND:

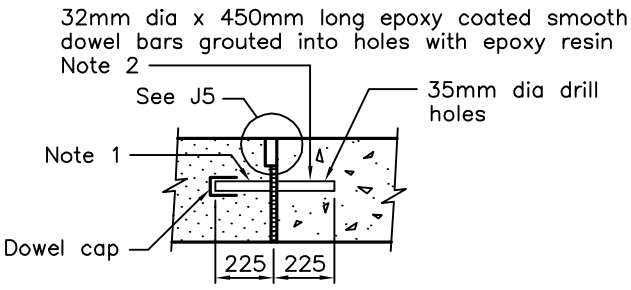
New concrete

ONTARIO PROVINCIAL STANDARD DRAWING

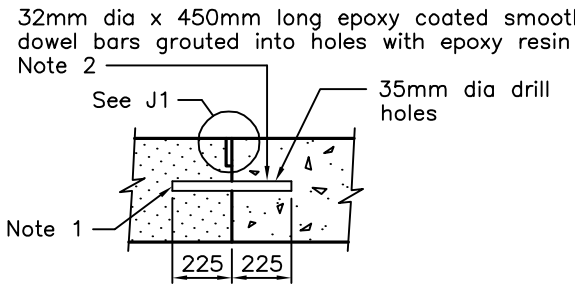
Nov 2010 | Rev 5

# COMPOSITE OR EXPOSED CONCRETE PAVEMENTS
# FULL DEPTH CONCRETE SLAB REPAIR LAYOUT

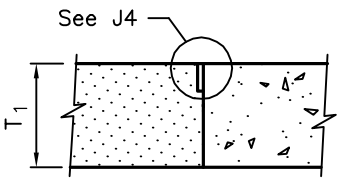
OPSD 560.010



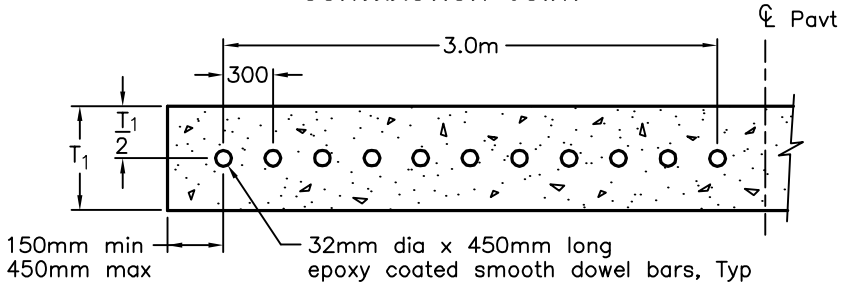

## SECTION A–A
### EXPANSION JOINT



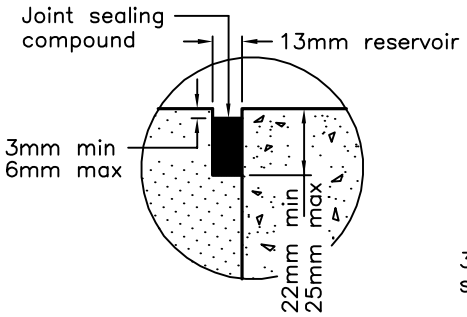

## SECTION B–B
### CONTRACTION JOINT



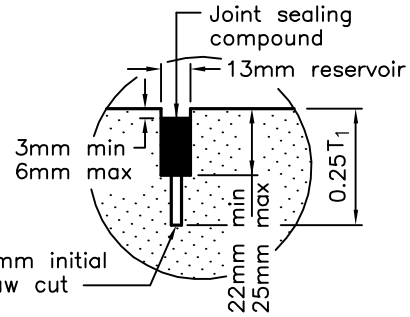

## SECTION C–C
### LONGITUDINAL JOINT



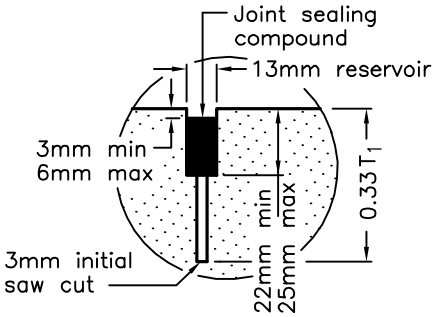

## SECTION D–D



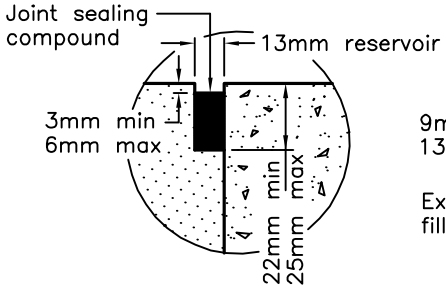

## J1, CONTRACTION JOINT



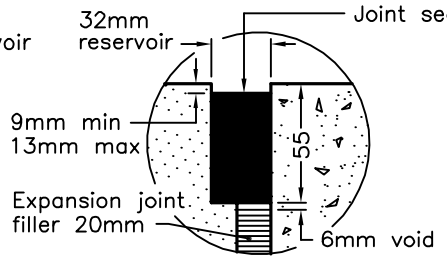

## J2, CONTRACTION JOINT



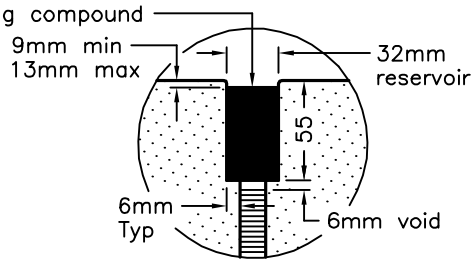

## J3, LONGITUDINAL JOINT




## J4, LONGITUDINAL JOINT




## J5, EXPANSION JOINT




## J6, EXPANSION JOINT

## NOTES:

1 The free end of dowel bars shall be coated with an approved bond breaking material immediately prior to placing concrete.

2 The epoxy resin shall envelop the bar within the drill hole and shall be set prior to placing the concrete.

A Waxed building paper or equivalent bond breaker required at all joints.

B This standard to be read in conjunction with OPSD 560.010.

C Grout retention disks shall be used on all bars.

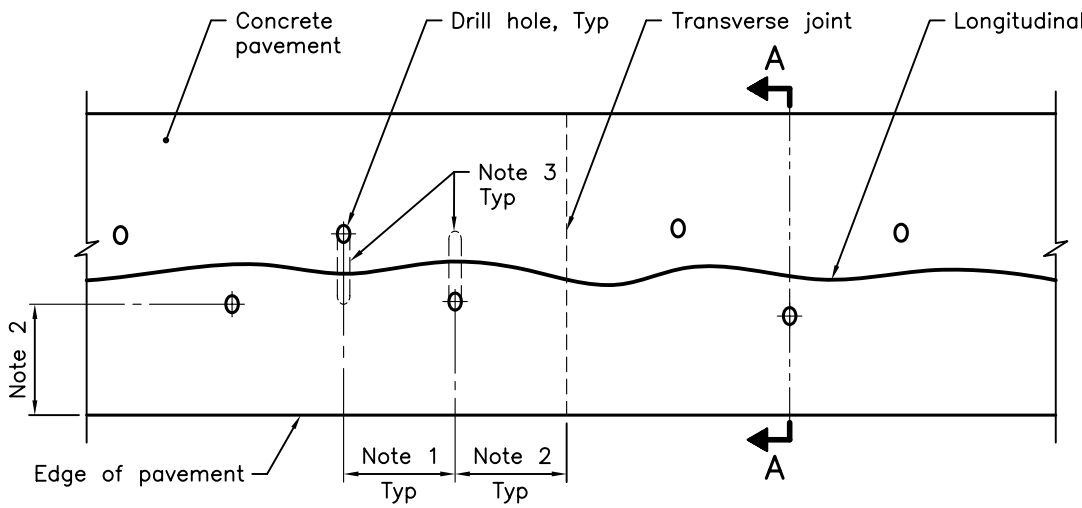
D All dimensions are in millimetres unless otherwise shown.

## LEGEND:

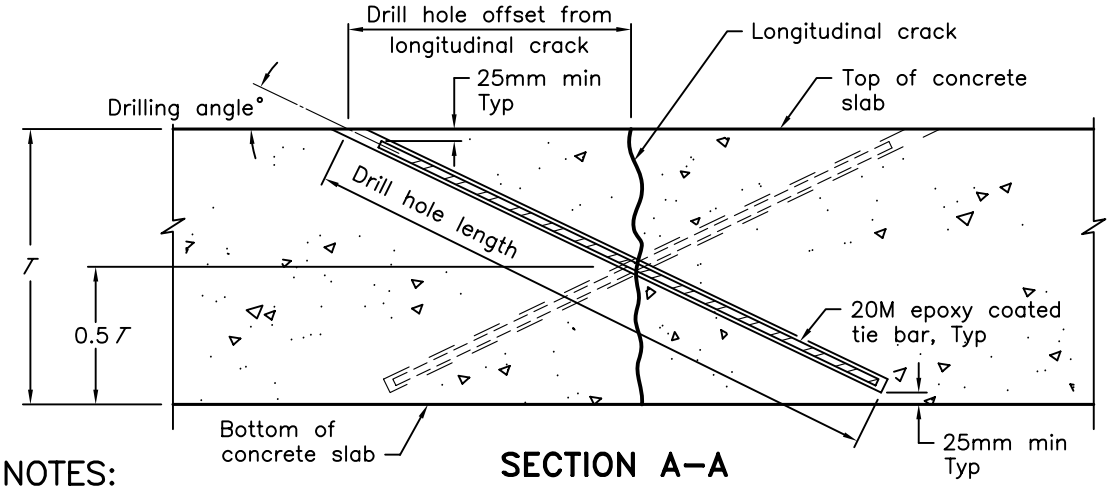
New concrete

$T_1$ = Thickness of concrete

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| EXPOSED CONCRETE PAVEMENT<br>FULL DEPTH CONCRETE SLAB REPAIR<br>JOINT DETAILS | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 560.020 | | |




**PLAN**




**SECTION A–A**

| Cross–Stitching Drill Hole and Tie Bar Requirements | | | | |
|---|---|---|---|---|
| *T* | Drilling Angle | Drill Hole Offset from Longitudinal Crack | Drill Hole Length | Length of Tie Bar |
| 200 | 35 | 140 | 280 | 220 |
| 210 | 35 | 145 | 300 | 240 |
| 220 | 35 | 150 | 310 | 250 |
| 230 | 35 | 155 | 330 | 270 |
| 240 | 35 | 160 | 350 | 290 |
| 250 | 35 | 170 | 370 | 310 |
| 260 | 35 | 175 | 380 | 320 |
| 270 | 35 | 180 | 400 | 340 |
| 280 | 35 | 190 | 420 | 360 |
| 290 | 35 | 195 | 430 | 370 |
| 300 | 45 | 140 | 360 | 310 |
| 310 | 45 | 145 | 380 | 330 |
| 320 | 45 | 150 | 390 | 340 |
| 330 | 45 | 155 | 410 | 360 |
| 340 | 45 | 160 | 420 | 370 |
| 350 | 45 | 165 | 430 | 380 |
| 360 | 45 | 170 | 450 | 400 |

NOTES:

1 Tie bars shall be spaced at 600mm centre to centre.
2 Tie bars shall not be placed within 600mm of a transverse joint, longitudinal joint, or the edge of pavement.
3 Holes shall be drilled perpendicular to the face of the longitudinal crack.

A All dimensions are in millimetres unless otherwise shown.

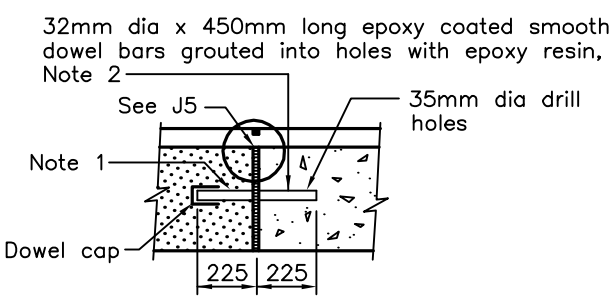
LEGEND:

*T* – Concrete pavement thickness

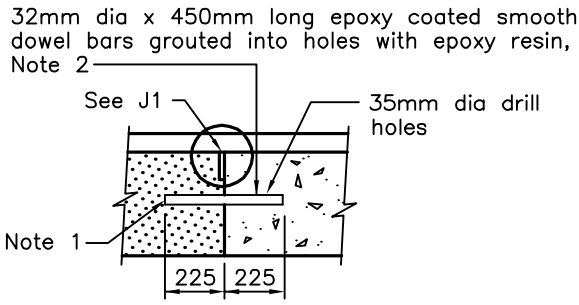
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 0

# CONCRETE PAVEMENT AND CONCRETE BASE CROSS–STITCHING LONGITUDINAL CRACKS

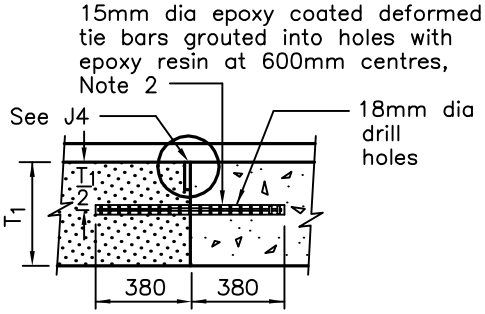
OPSD 560.025



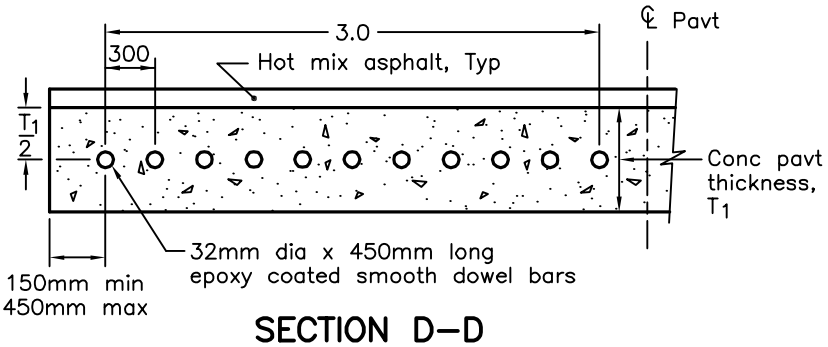

SECTION A–A
EXPANSION JOINT



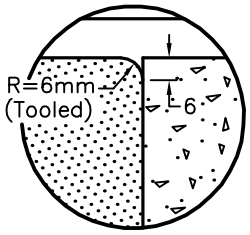

SECTION B–B
CONTRACTION JOINT



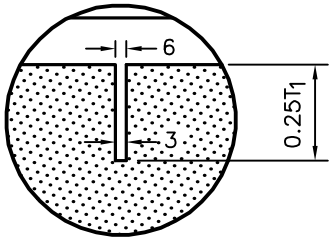

SECTION C–C
LONGITUDINAL JOINT



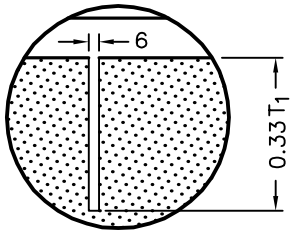

SECTION D–D



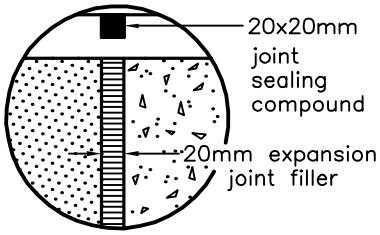

J1, CONTRACTION JOINT
J4, LONGITUDINAL JOINT



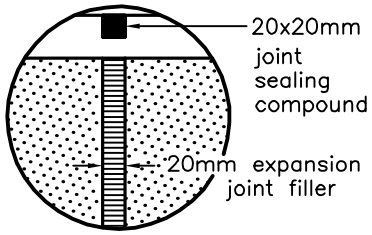

J2, CONTRACTION JOINT




J3
LONGITUDINAL JOINT




J5, EXPANSION JOINT




J6, TRANSVERSE EXPANSION JOINT

## NOTES:

1 The free end of dowel bars shall be coated with an approved bond breaking material, immediately prior to placing concrete.

2 The epoxy resin shall envelop the bar within the drill hole and shall be set prior to placing the concrete.

A This standard to be read in conjunction with OPSD 560.010.

B Grout retention disks shall be used on all bars.

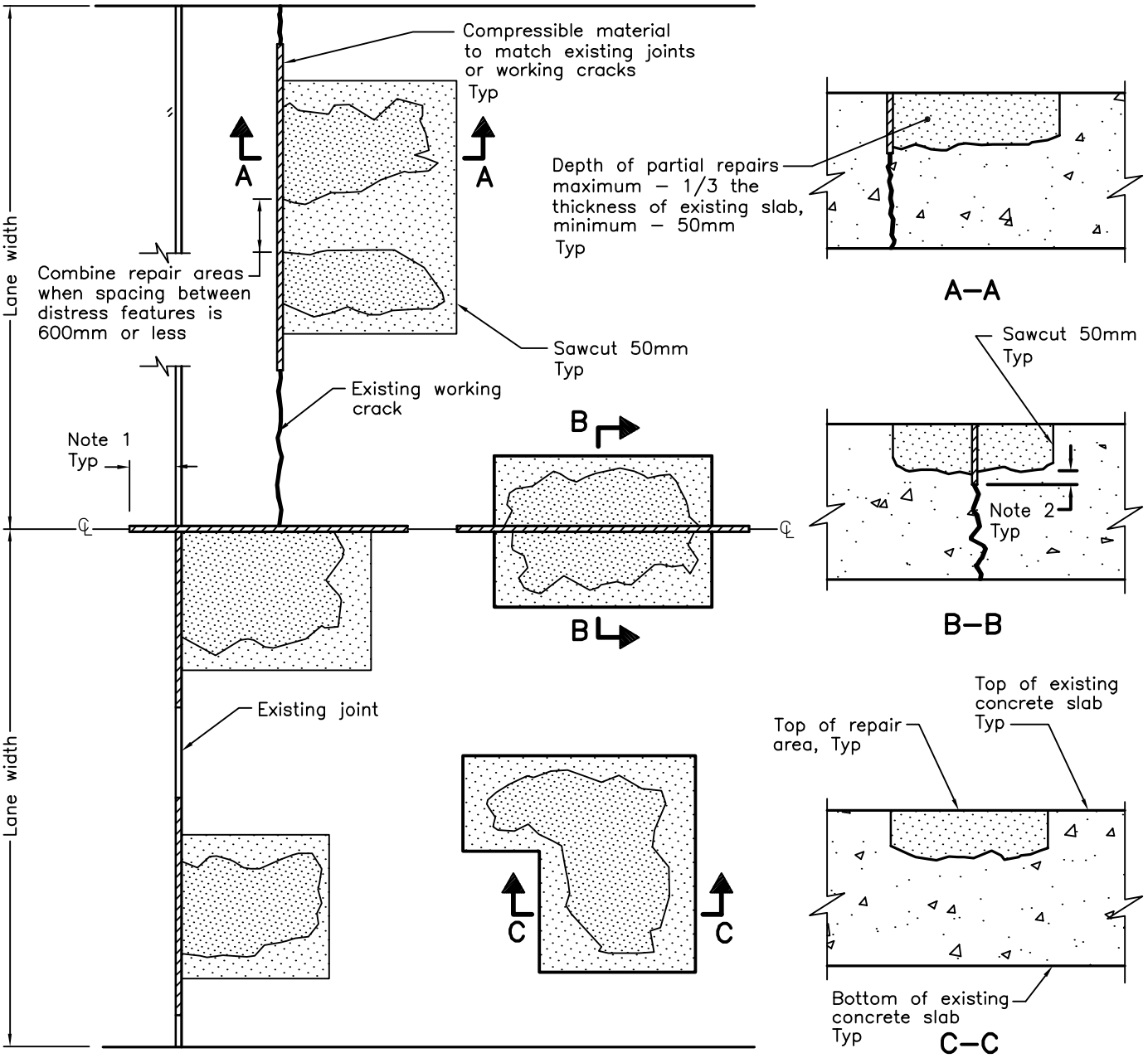
C All dimensions are in millimetres or metres unless otherwise shown.

## LEGEND:

New concrete

$T_1$ = Thickness of concrete

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| **COMPOSITE PAVEMENT**<br>FULL DEPTH CONCRETE SLAB REPAIR<br>JOINT DETAILS | | | |
| | | | **OPSD 560.030** |




PLAN VIEW
OF CONCRETE PAVEMENT SURFACE

CROSS SECTION VIEWS

NOTES:

1 Compressible material to extend 75mm beyond sawcut into existing transverse or longitudinal joints or working cracks.

2 Compressible material to extend 25mm below concrete removal areas.

A Repair areas to be screeded from centre of patch to the patch boundaries to achieve maximum bond.

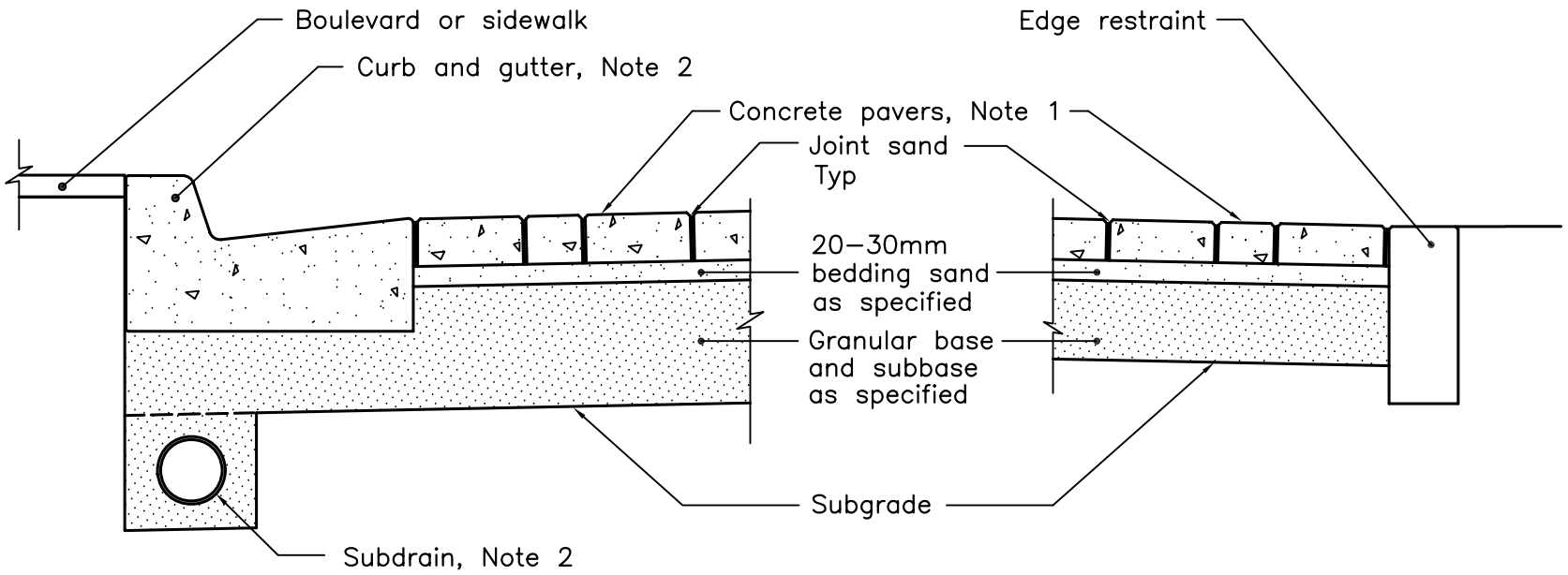
B All dimensions are in millimetres unless otherwise shown.

LEGEND:

Repair area

Surface distress

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| PARTIAL DEPTH REPAIRS IN CONCRETE PAVEMENT | | | |
| | OPSD 560.040 | | |




**VEHICULAR** **NON–VEHICULAR**

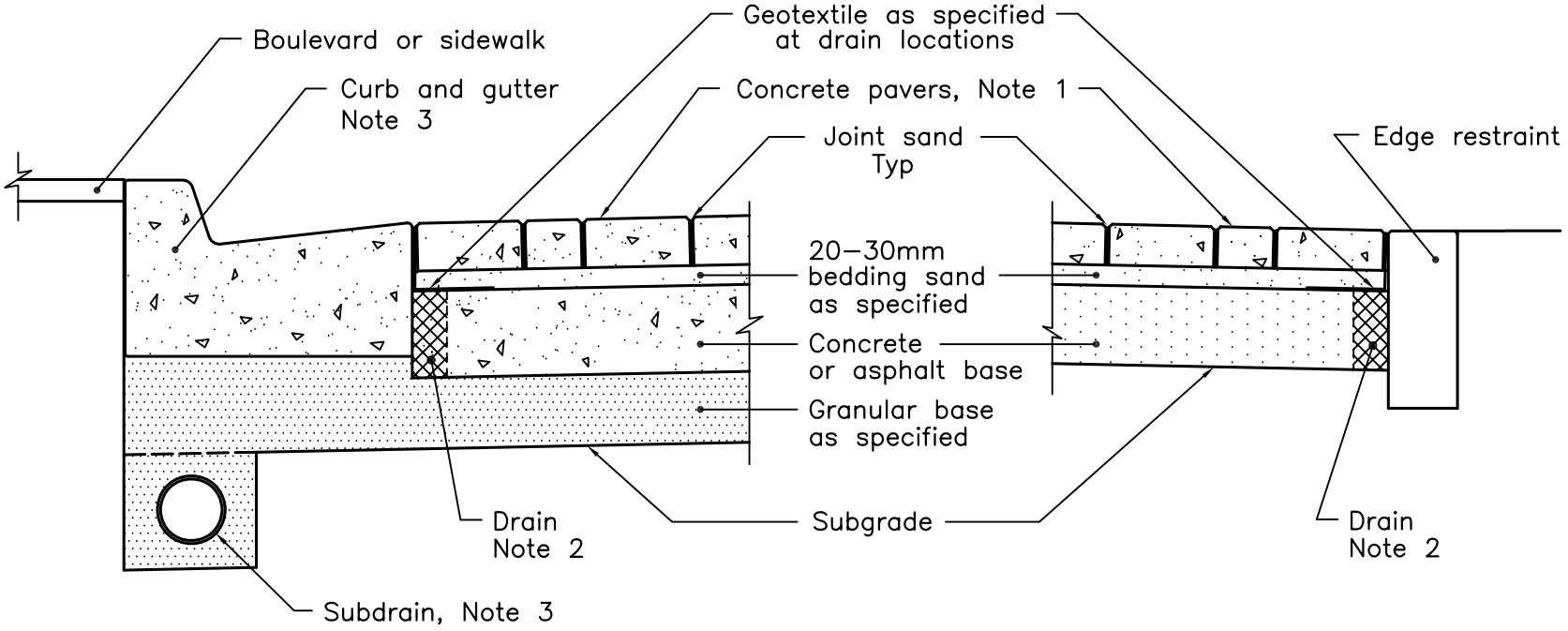
NOTES:

1 Concrete paver thickness:
  – for vehicular traffic – 80mm minimum.
  – for non–vehicular traffic – 60mm minimum.

2 This drawing is to be read in conjunction with OPSD 200 and 600 series drawings.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| **INTERLOCKING CONCRETE PAVERS ON GRANULAR BASE** | | | |
| | **OPSD 561.010** | | |




NOTES:

1 Concrete paver thickness:
  – for vehicular traffic – 80mm minimum.
  – for non–vehicular traffic – 60mm minimum.

2 Drains to be installed at low points and selected intervals through concrete or asphalt base to suit subgrade conditions.

3 This drawing to be read in conjunction with OPSD 200 and 600 Series drawings.

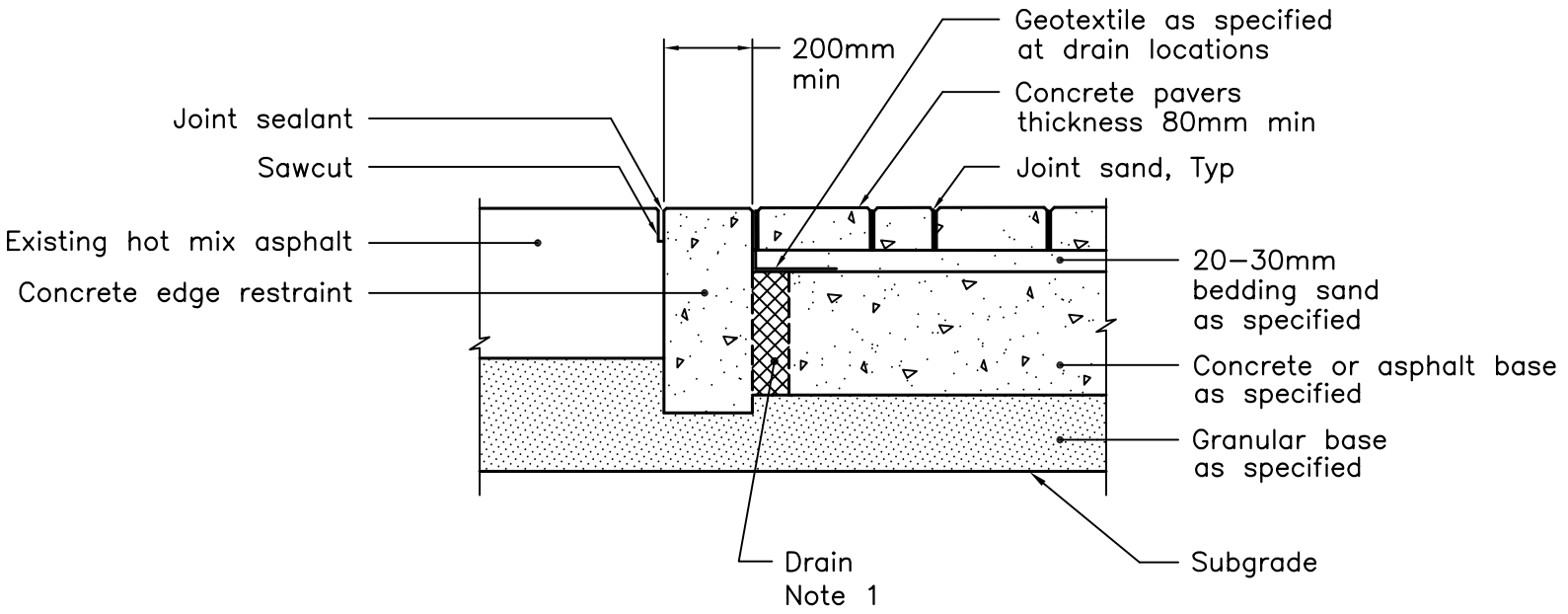
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# INTERLOCKING CONCRETE PAVERS ON CONCRETE OR ASPHALT BASE

Nov 2006 | Rev 1

OPSD 561.020

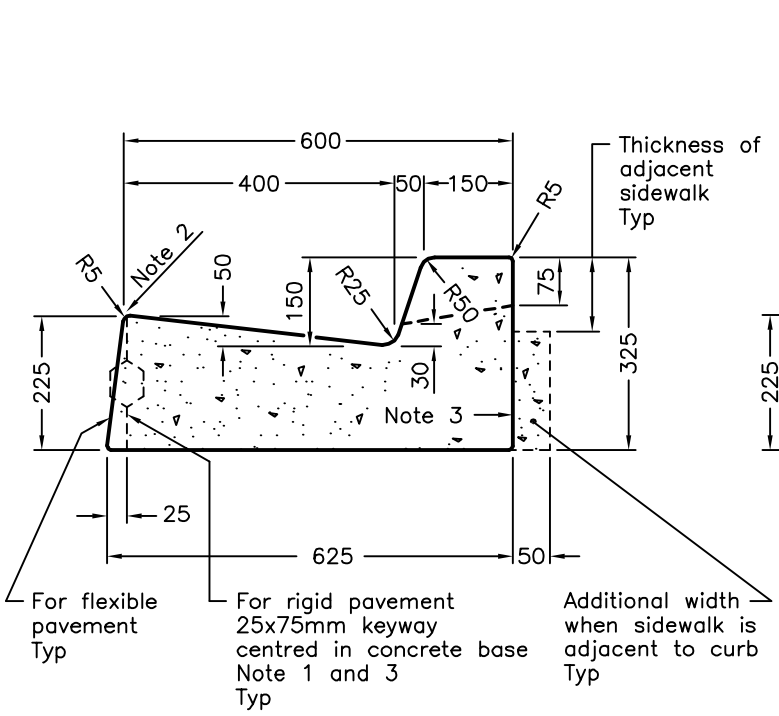



NOTES:

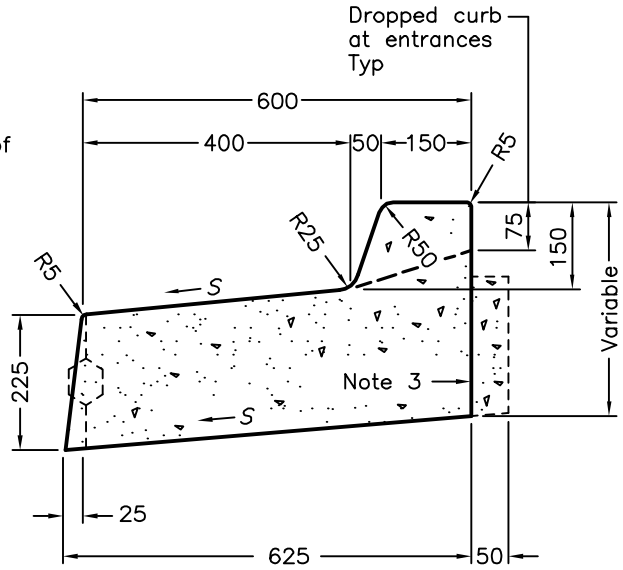
1 Drains to be installed at low points and selected intervals through concrete or asphalt base to suit subgrade conditions.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 1 |
|---|---|---|---|
| INTERLOCKING CONCRETE PAVERS FOR RETROFIT CROSSWALK INSTALLATION | | | |
| | OPSD 561.030 | | |




**TANGENT**




**SUPERELEVATED**

LEGEND:

*S* – Rate of pavement superelevation in percent, %.

NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

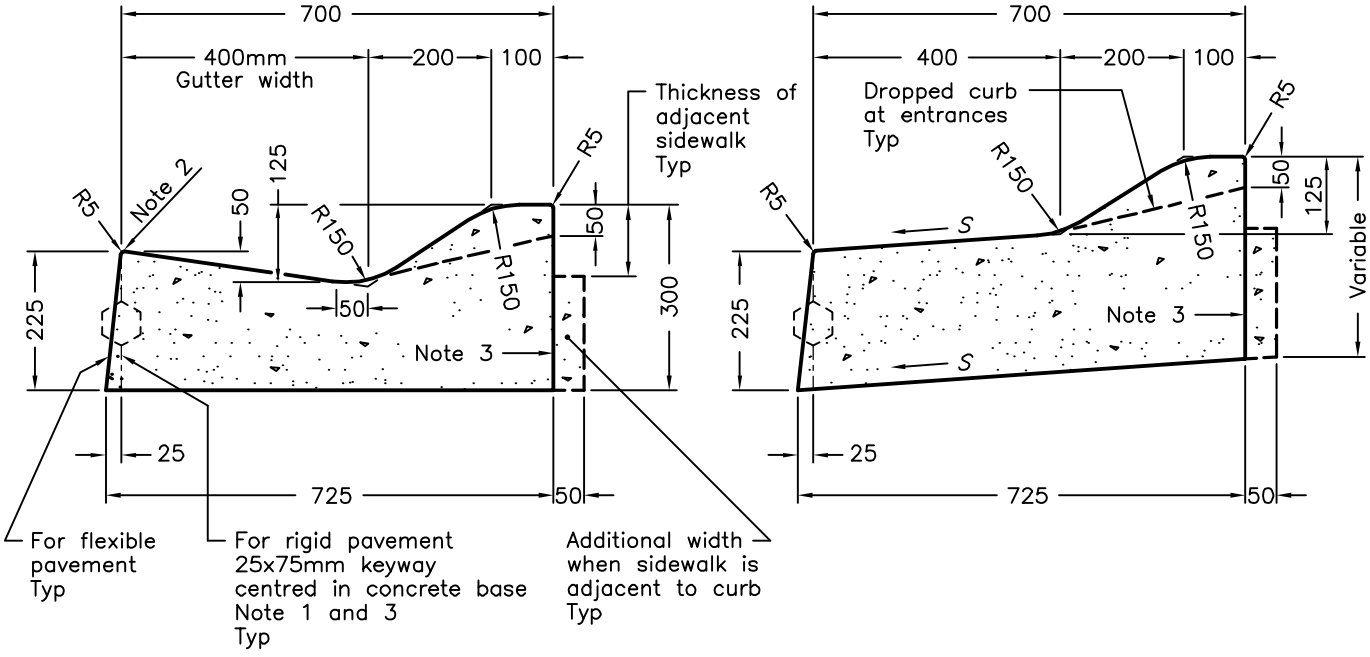
A Treatment at entrances shall be according to OPSD 351.010.

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 WIDE GUTTER | | | |
| | OPSD 600.010 | | |




**TANGENT** **SUPERELEVATED**

## LEGEND:

*S* – Rate of pavement superelevation in percent, %.

## NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

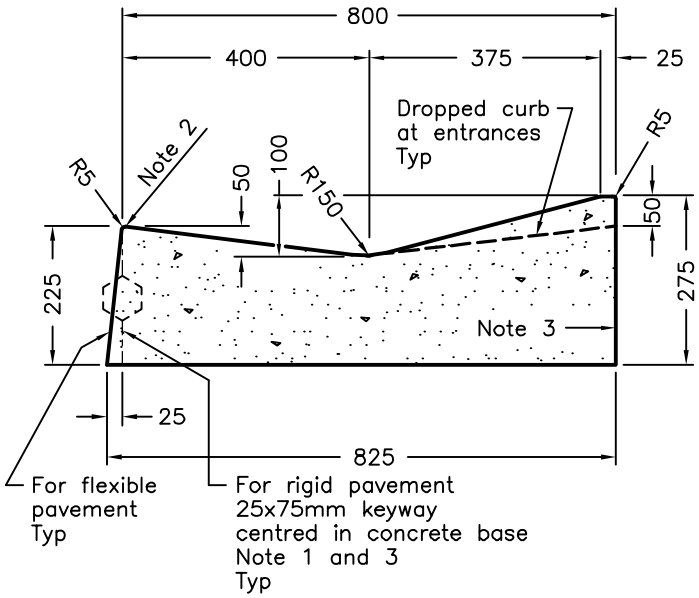
A Treatment at entrances shall be according to OPSD 351.010.

B Outlet treatment shall be according to the OPSD 610 Series.

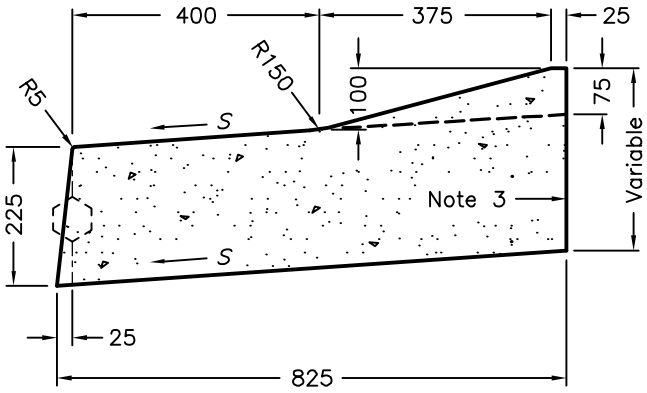
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| CONCRETE SEMI–MOUNTABLE CURB WITH WIDE GUTTER | | | |
| | OPSD 600.020 | | |




**TANGENT**




**SUPERELEVATED**

## LEGEND:

*S* – Rate of pavement superelevation in percent, %.

## NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

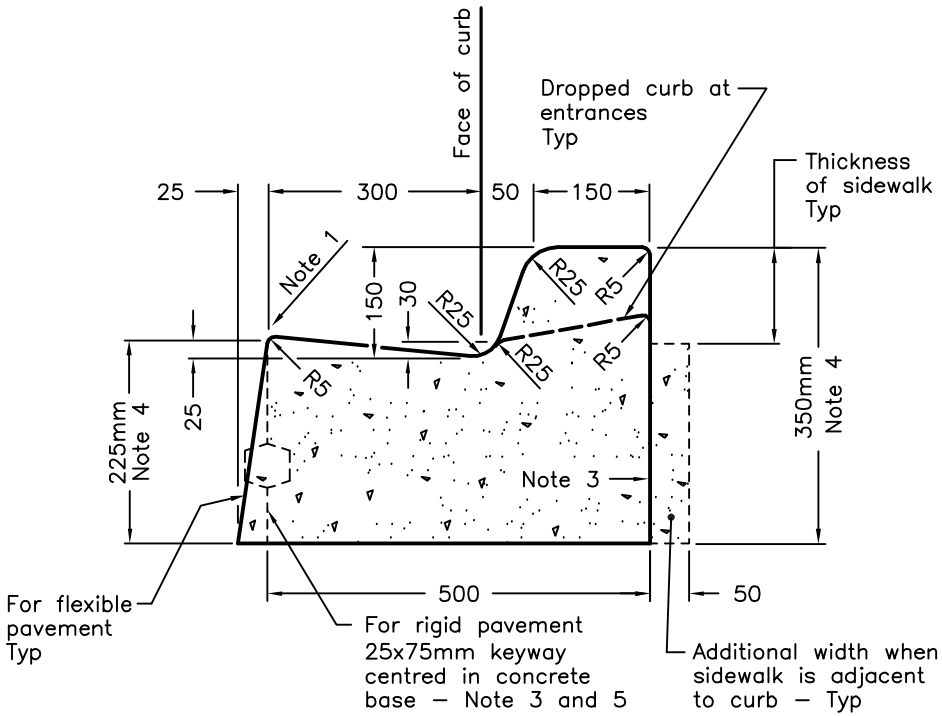
A Treatment at entrances shall be according to OPSD 351.010.

B Outlet treatment shall be according to the OPSD 610 Series.

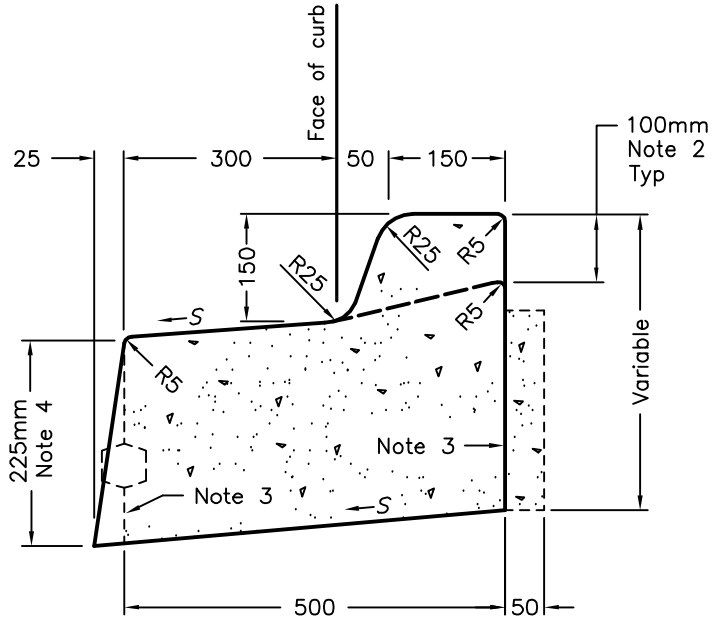
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **CONCRETE MOUNTABLE CURB WITH WIDE GUTTER** | | | |
| | **OPSD 600.030** | | |




**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.

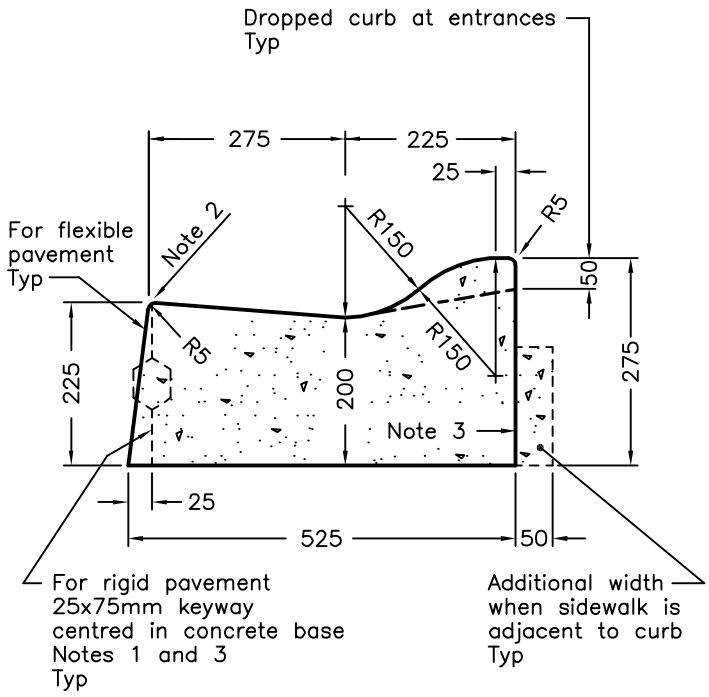
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

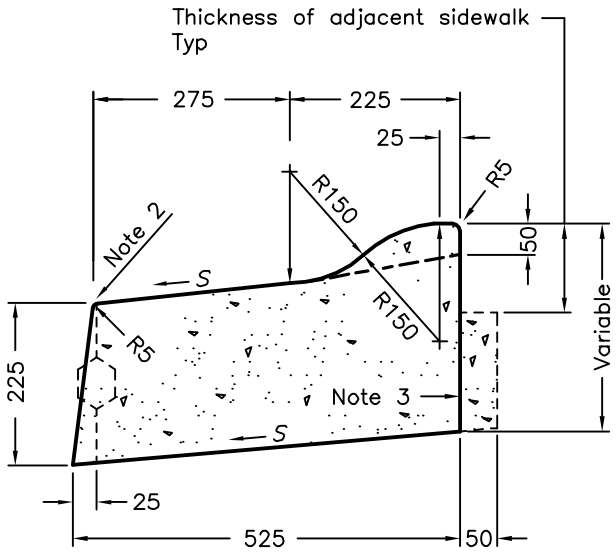
# CONCRETE BARRIER CURB WITH STANDARD GUTTER

Nov 2012 | Rev 2

OPSD 600.040




**TANGENT**




**SUPERELEVATED**

LEGEND:

*S* – Rate of pavement superelevation in percent, %.

NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

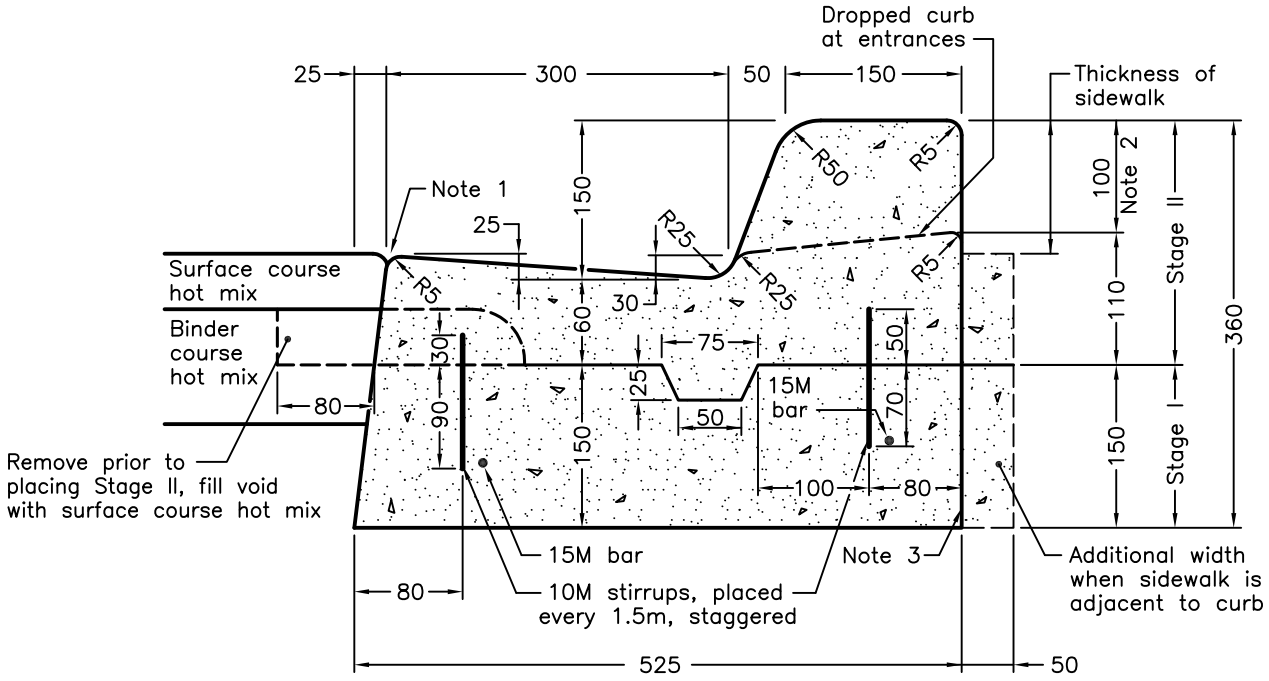
A Treatment at entrances shall be according to OPSD 351.010.

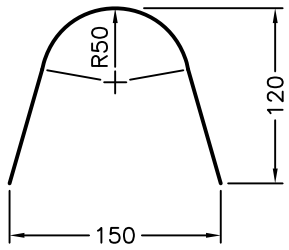
B Outlet treatment shall be according to the OPSD 610 Series.

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.

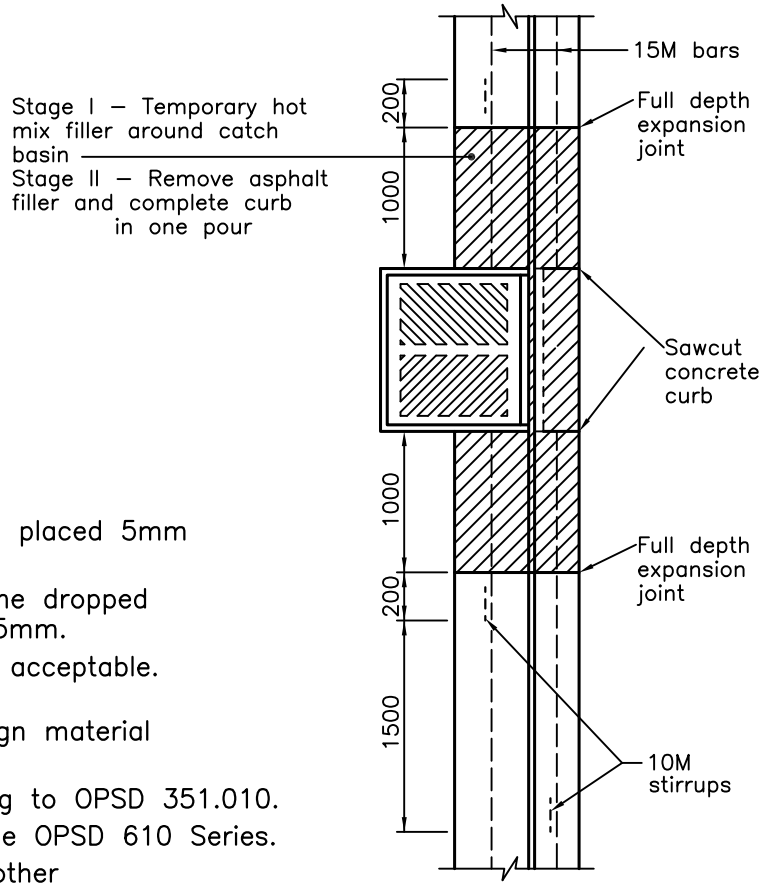
D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| CONCRETE SEMI–MOUNTABLE CURB WITH STANDARD GUTTER | | | |
| | OPSD 600.060 | | |




**STIRRUP DETAIL**




**DETAIL AT CATCH BASIN**

## 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.

A Stage I surface shall be cleaned of foreign material prior to placement of Stage II material.

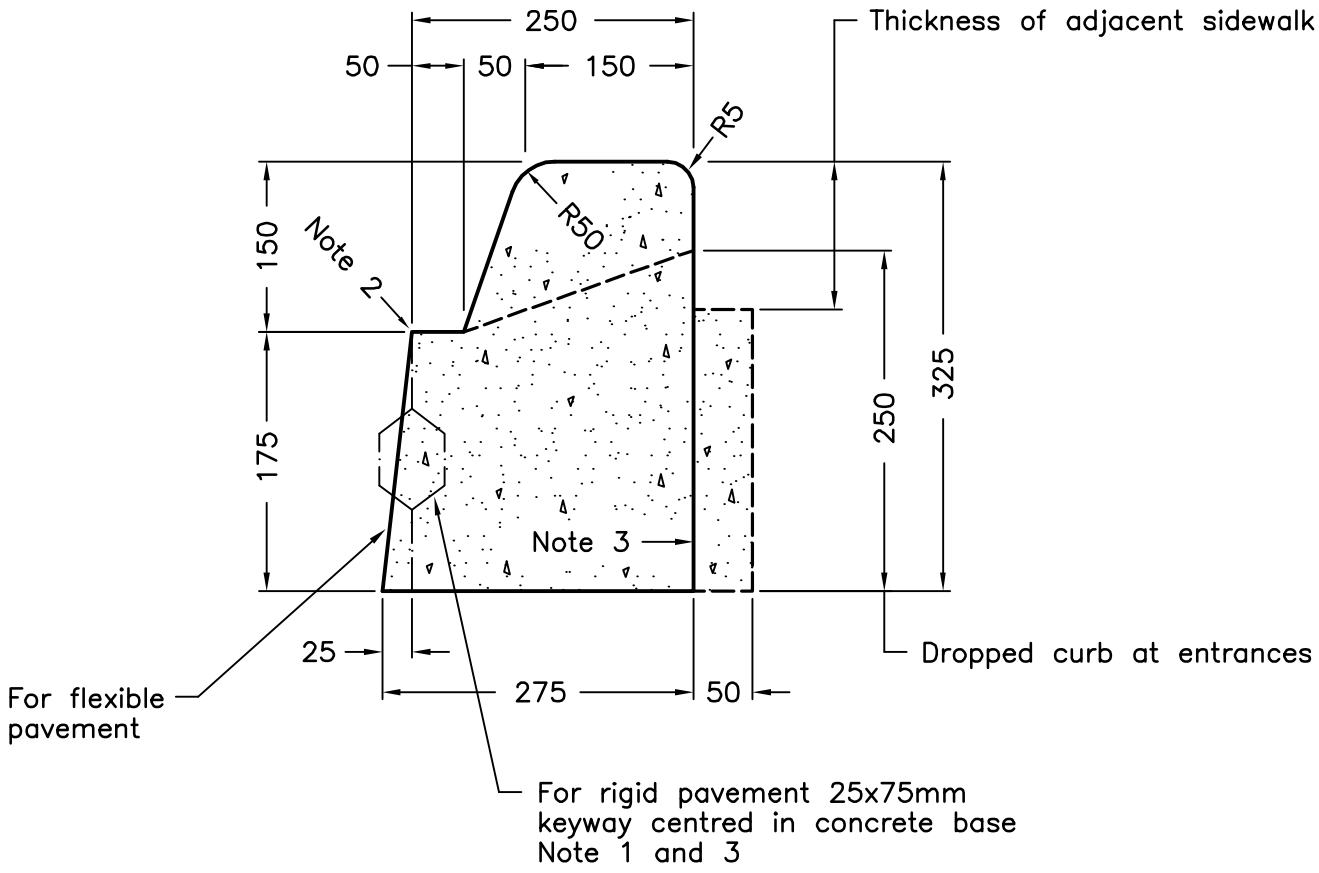
B Treatment at entrances shall be according to OPSD 351.010.

C Outlet treatment shall be according to the OPSD 610 Series.

D The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail, when it shall be according to the OPSD 900 Series.

E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **CONCRETE BARRIER CURB WITH STANDARD GUTTER**<br>TWO STAGE CONSTRUCTION | | | |
| | | | **OPSD – 600.070** |




NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

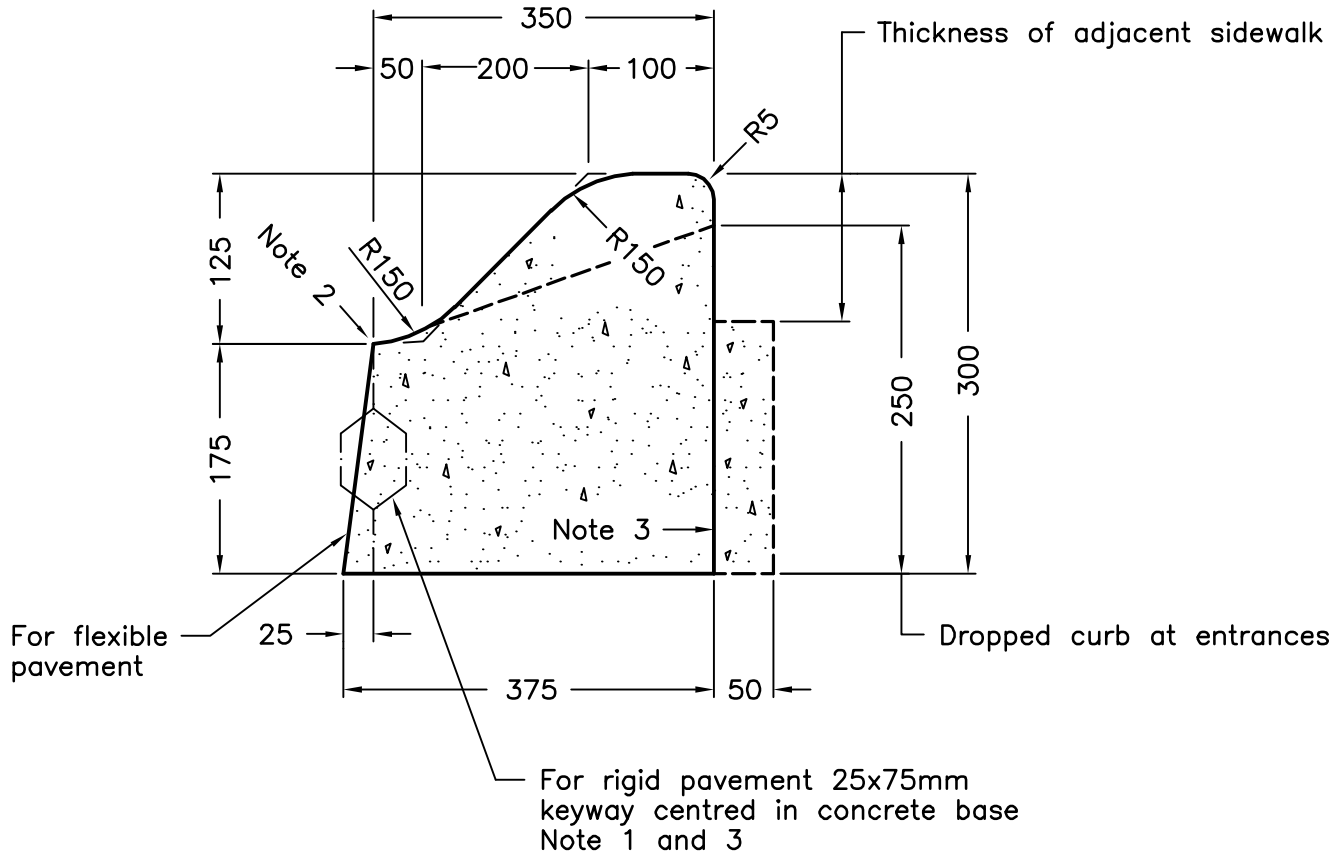
A Treatment at entrances shall be according to OPSD 351.010.

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 NARROW GUTTER | | | |
| | OPSD 600.080 | | |




NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

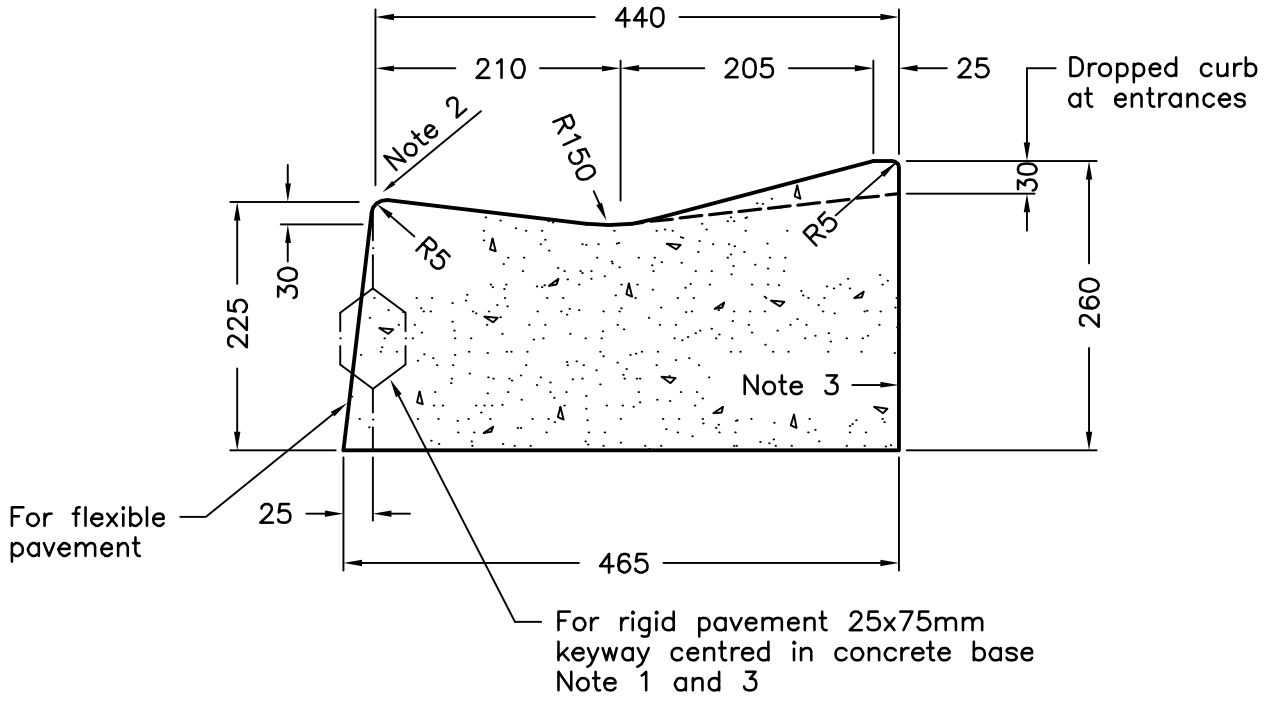
A Treatment at entrances shall be according to OPSD 351.010.

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 SEMI-MOUNTABLE CURB WITH NARROW GUTTER | | | |
| | OPSD 600.090 | | |




NOTES:

1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.

2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.

3 For slipforming procedure a 5% batter is acceptable.

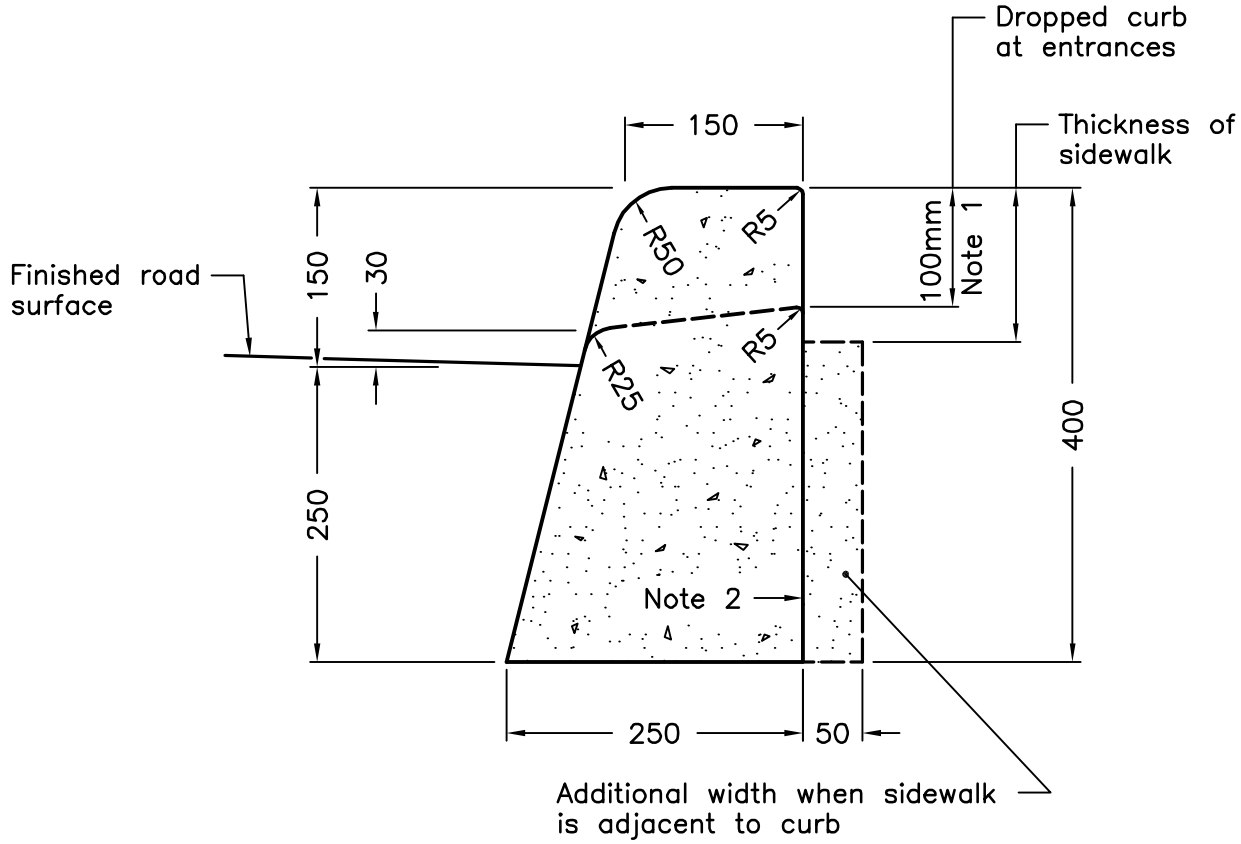
A Treatment at entrances shall be according to OPSD 351.010.

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 MOUNTABLE CURB WITH NARROW GUTTER | | | |
| | OPSD 600.100 | | |




NOTES:

1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.

2 For slipforming procedure a 5% batter is acceptable.

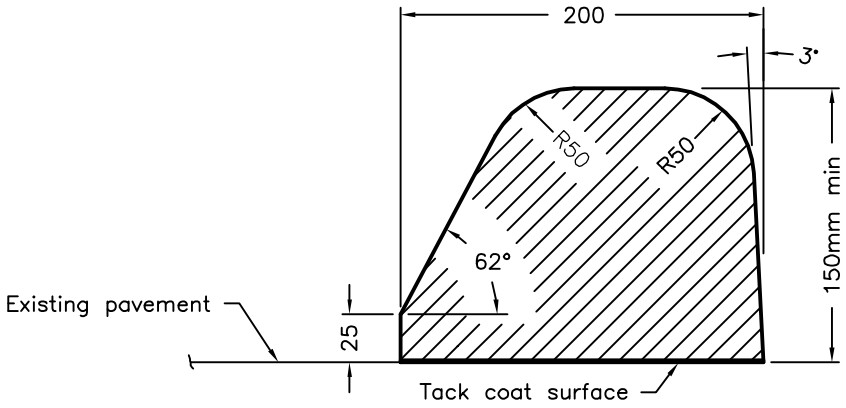
A Treatment at entrances shall be according to OPSD 351.010.

B Outlet treatment shall be according to the OPSD 610 Series.

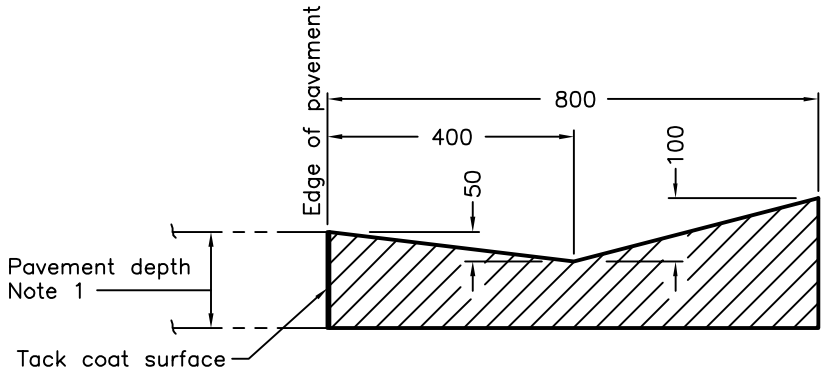
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.

D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| CONCRETE BARRIER CURB | | | |
| | OPSD 600.110 | | |




**ASPHALT BARRIER CURB**
(MACHINE LAID)



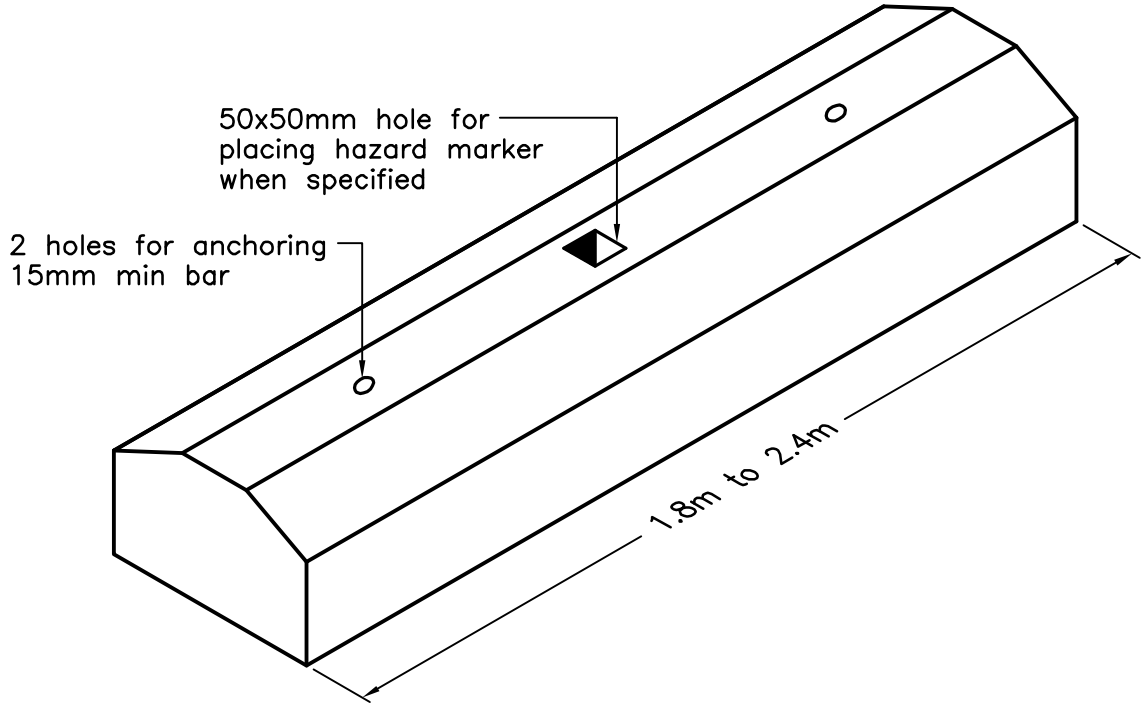

**ASPHALT MOUNTABLE CURB WITH WIDE GUTTER**

NOTES:

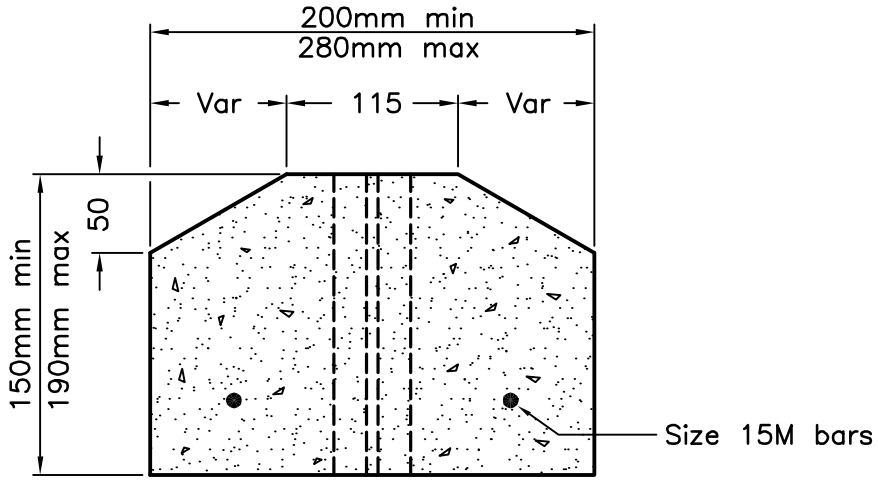
1 Depth of asphalt curb with gutter at pavement edge shall equal depth of new pavement, but in no case less than 130mm.

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** | | |




**ISOMETRIC VIEW**



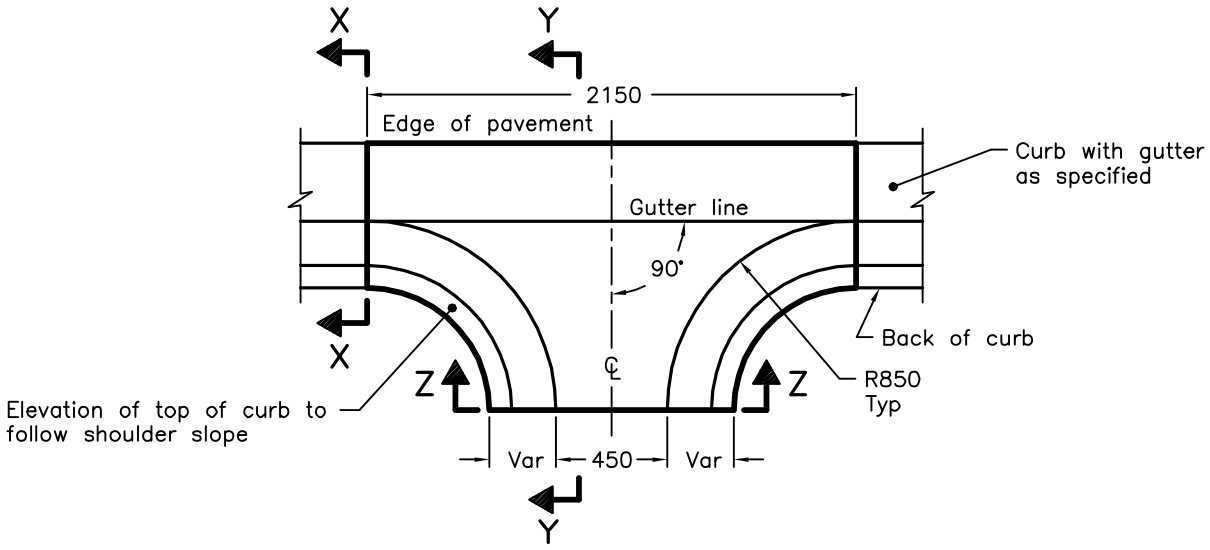

**SECTION**

NOTES:

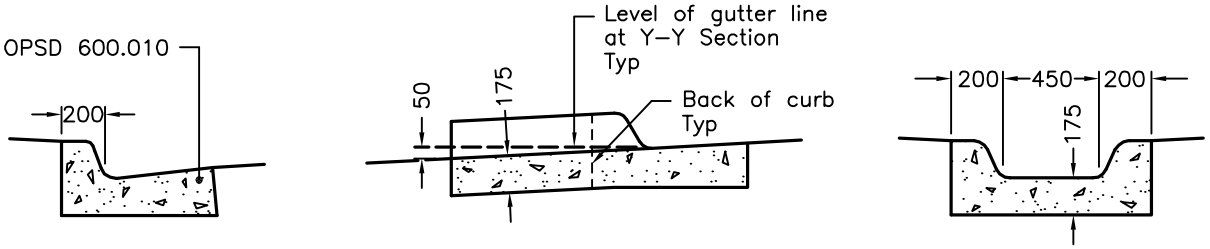
A Class of concrete shall be C2 according to CSA A23.1.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| PRECAST CONCRETE CURB | | | |
| | OPSD 603.020 | | |

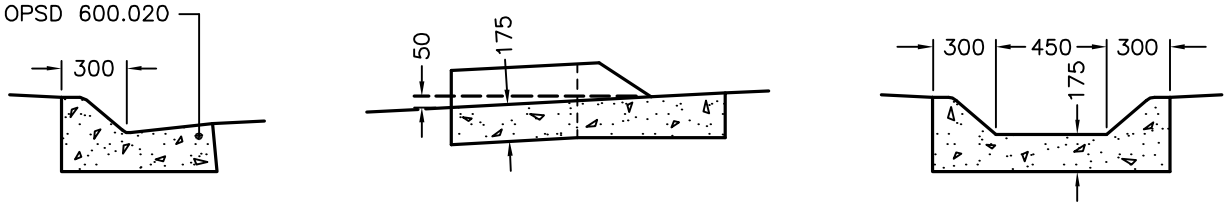



**TYPICAL PLAN VIEW**



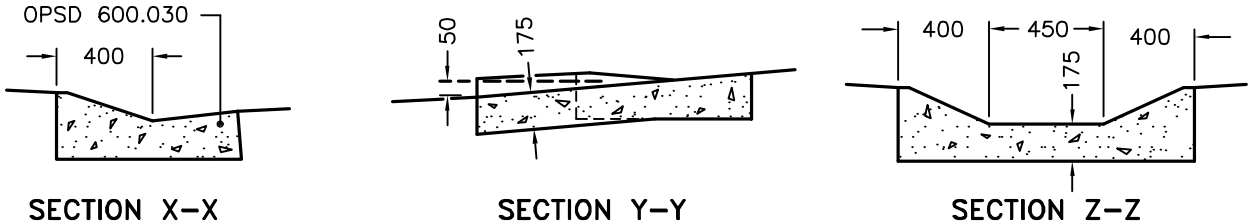

**SECTION X–X** **SECTION Y–Y** **SECTION Z–Z**

**BARRIER CURB with GUTTER**




**SECTION X–X** **SECTION Y–Y** **SECTION Z–Z**

**SEMI–MOUNTABLE CURB with GUTTER**




**SECTION X–X** **SECTION Y–Y** **SECTION Z–Z**

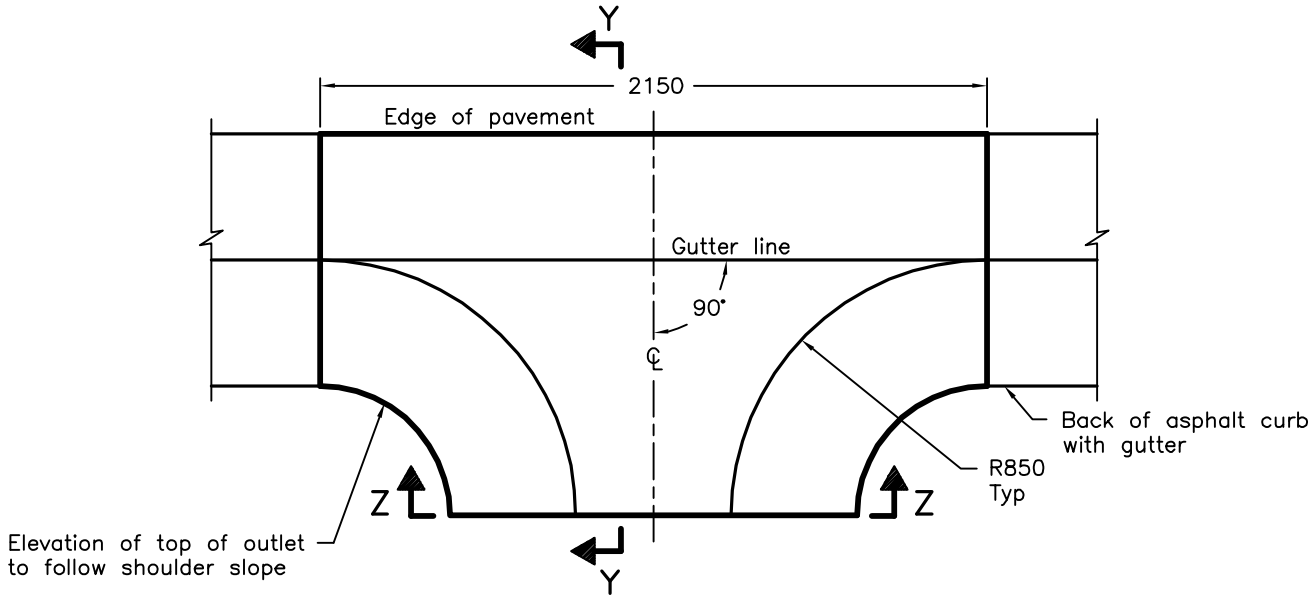
**MOUNTABLE CURB with GUTTER**

NOTES:

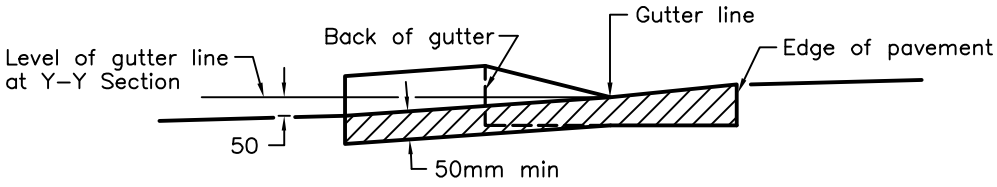
A For asphalt spillway details refer to OPSD 605.040.

B All dimensions are in millimetres unless otherwise shown.

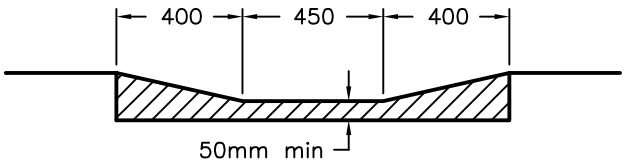
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **90° CONCRETE OUTLET**<br>FOR CONCRETE CURB WITH GUTTER | | | |
| | **OPSD 604.010** | | |




**PLAN**




**SECTION Y–Y**



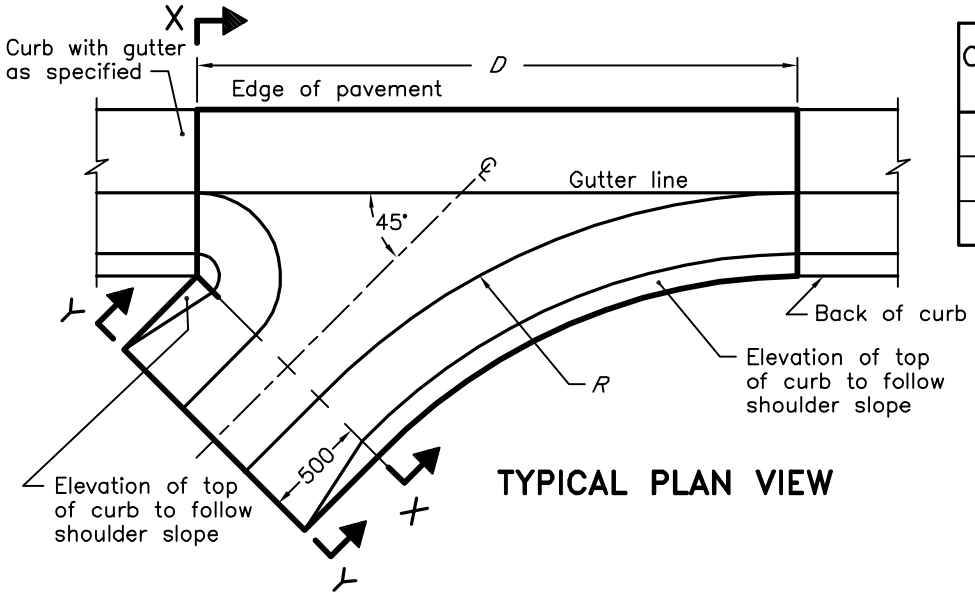

**SECTION Z–Z**

NOTES:

A For asphalt spillway details refer to OPSD 605.040.

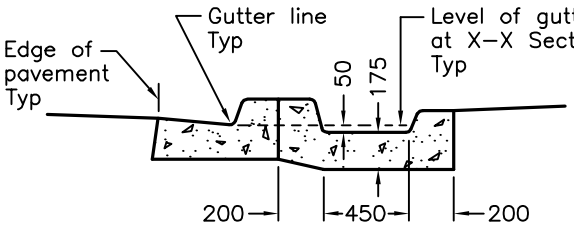
B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| **90° ASPHALT OUTLET FOR ASPHALT CURB WITH GUTTER** | | | |
| | **OPSD 604.020** | | |

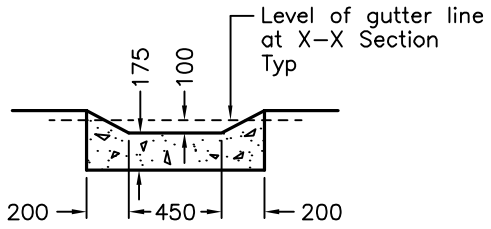



TYPICAL PLAN VIEW

| CURB with GUTTER Type | D m | R m |
|---|---|---|
| Barrier | 1.9 | 2.1 |
| Semi–Mountable | 2.5 | 2.8 |
| Mountable | 2.9 | 2.9 |

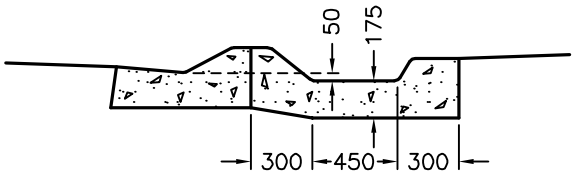



SECTION X–X

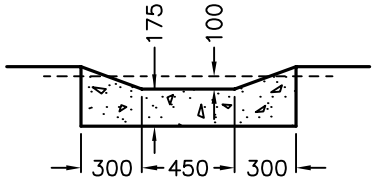



SECTION Y–Y

**BARRIER CURB with GUTTER**

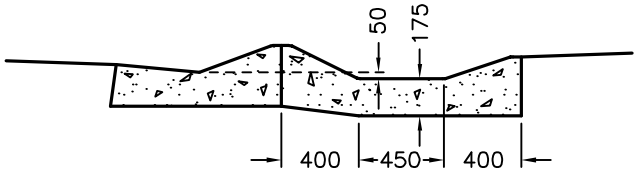



SECTION X–X

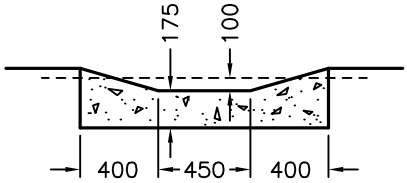



SECTION Y–Y

**SEMI–MOUNTABLE CURB with GUTTER**




SECTION X–X




SECTION Y–Y

**MOUNTABLE CURB with GUTTER**

NOTES:

A For asphalt spillway details refer to OPSD 605.040.

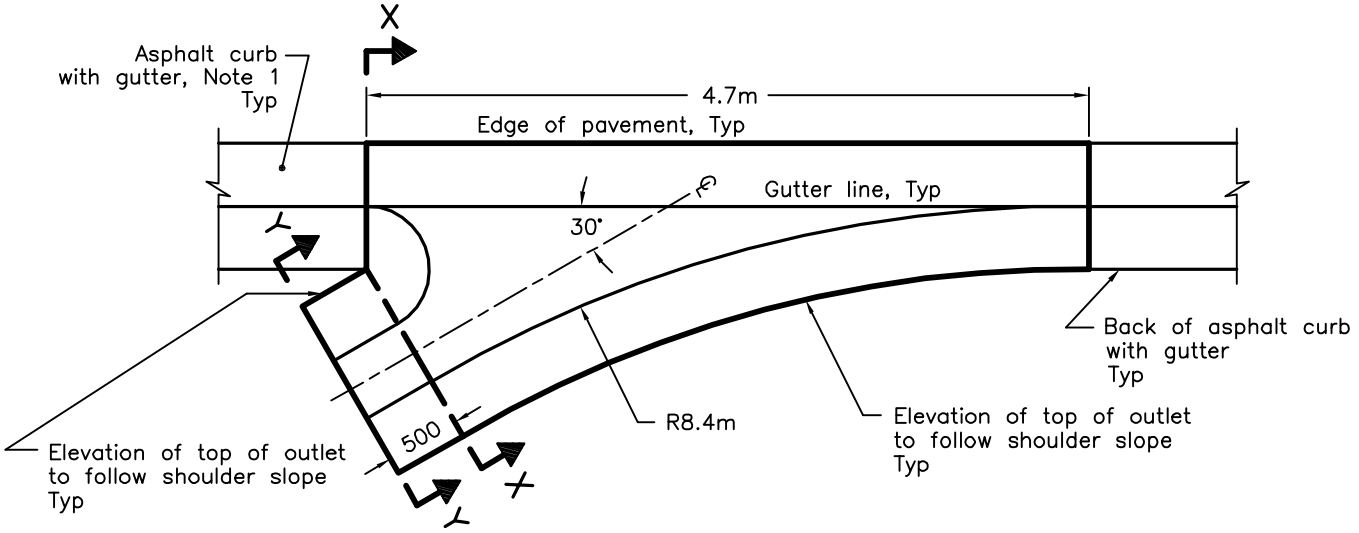
B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|

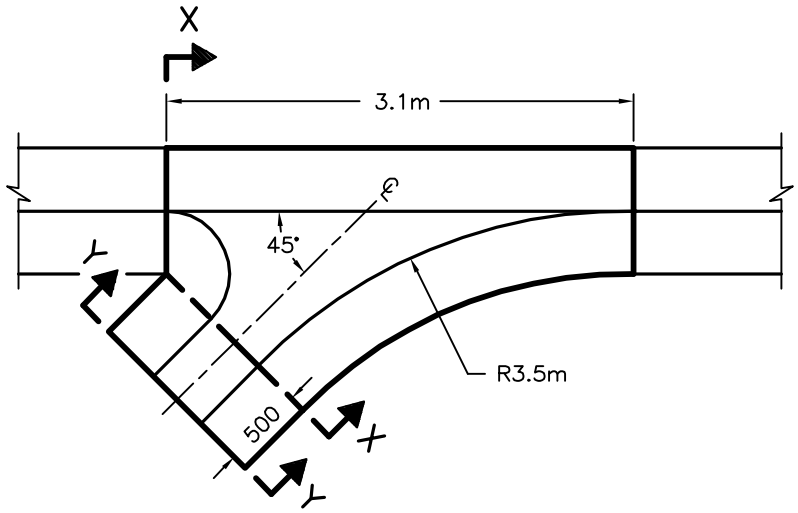
# 45° CONCRETE OUTLET

FOR CONCRETE CURB WITH GUTTER

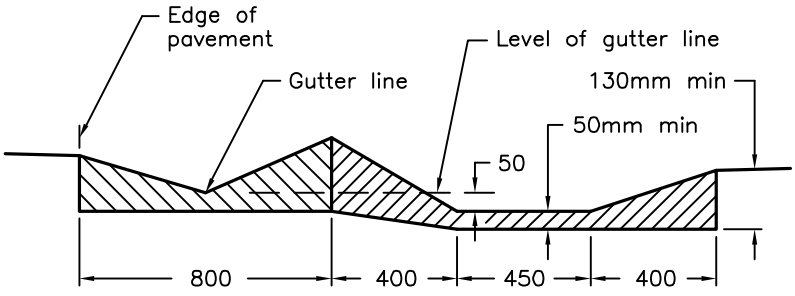
OPSD 605.010



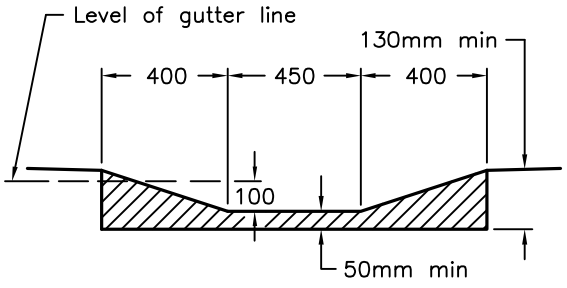

## 30° ASPHALT OUTLET




## 45° ASPHALT OUTLET




## SECTION X–X, Typ




## SECTION Y–Y, Typ

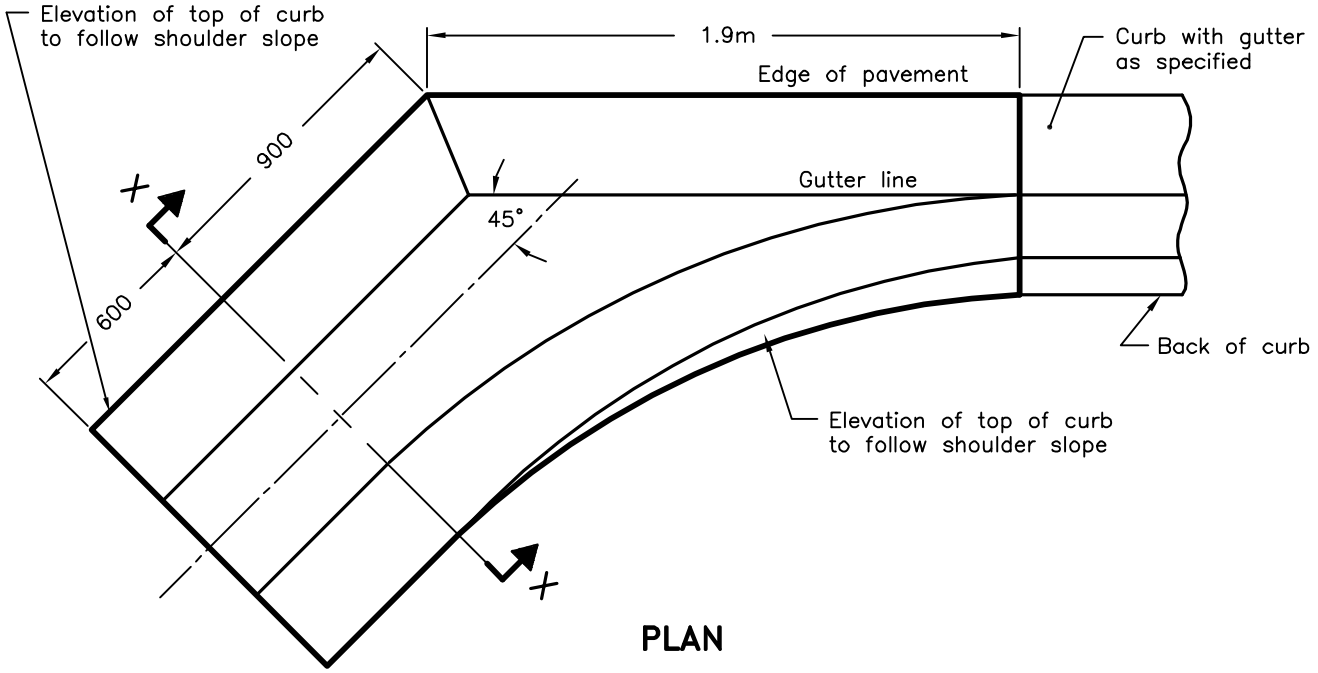
NOTES:

1 For asphalt curb with gutter refer to OPSD 601.010.

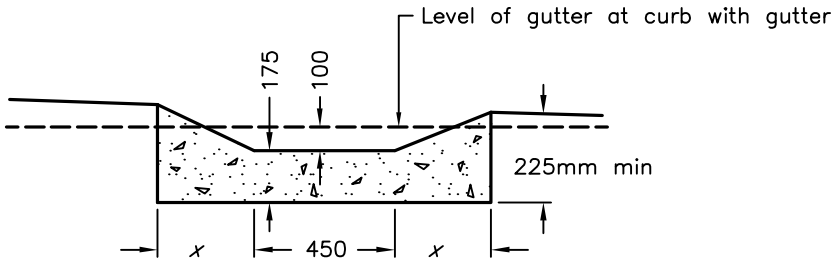
A For asphalt spillway details refer to OPSD 605.040.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| **30° AND 45° ASPHALT OUTLETS FOR ASPHALT CURB WITH GUTTER** | | | |
| | **OPSD 605.020** | | |




**PLAN**



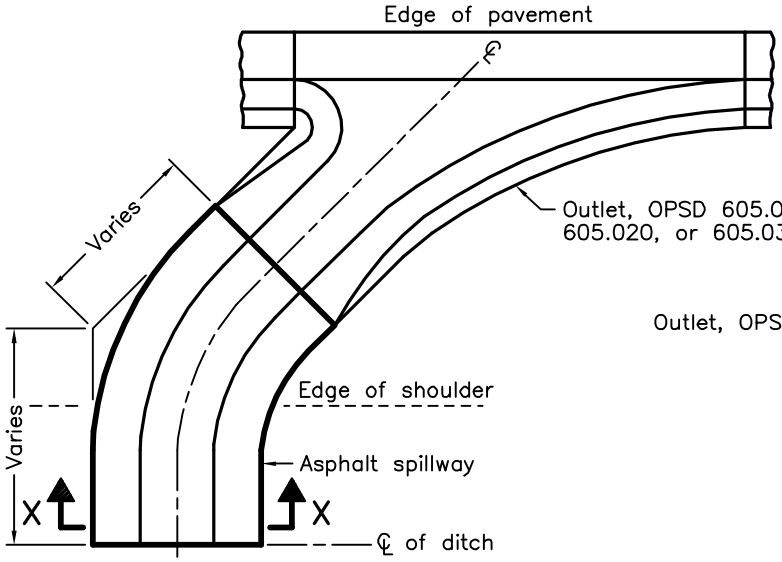

**SECTION X–X**

| CURB with GUTTER Type | *x* |
|---|---|
| Barrier | 200 |
| Semi–Mountable | 300 |
| Mountable | 400 |

NOTES:

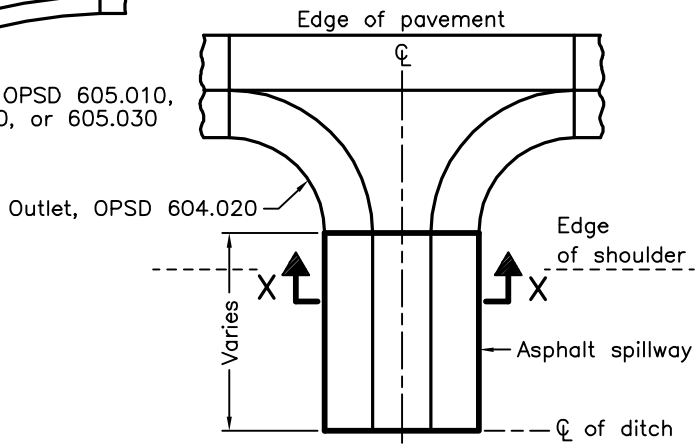
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **45° CONCRETE OUTLET**<br>FOR CONCRETE CURB WITH GUTTER<br>AT END OF RUN | | | |
| | **OPSD 605.030** | | |



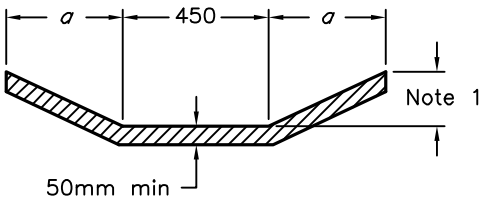

PLAN

**WITH 30° or 45° ASPHALT OR CONCRETE OUTLET**



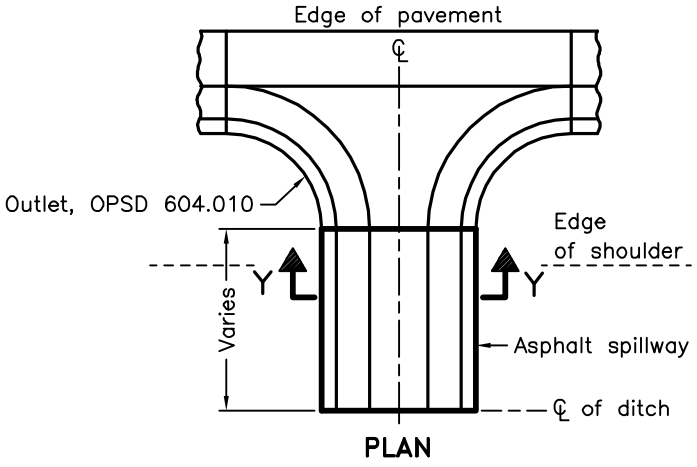

PLAN

**WITH 90° ASPHALT OUTLET**



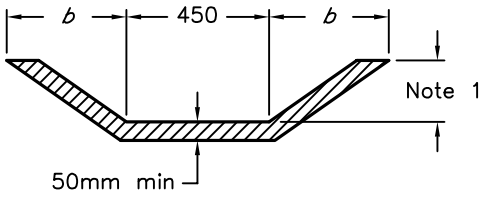

**SECTION X–X**

| Outlet OPSD | Curb with Gutter Type | *a* | *b* |
|---|---|---|---|
| 604.020<br>605.020 | Mountable | 400 | – |
| 605.010<br>605.030 | Barrier | 200 | – |
| | Semi–mountable | 300 | – |
| | Mountable | 400 | – |
| 604.010 | Barrier | – | 200 |
| | Semi–mountable | – | 300 |
| | Mountable | – | 400 |




PLAN

**WITH 90° CONCRETE OUTLET**



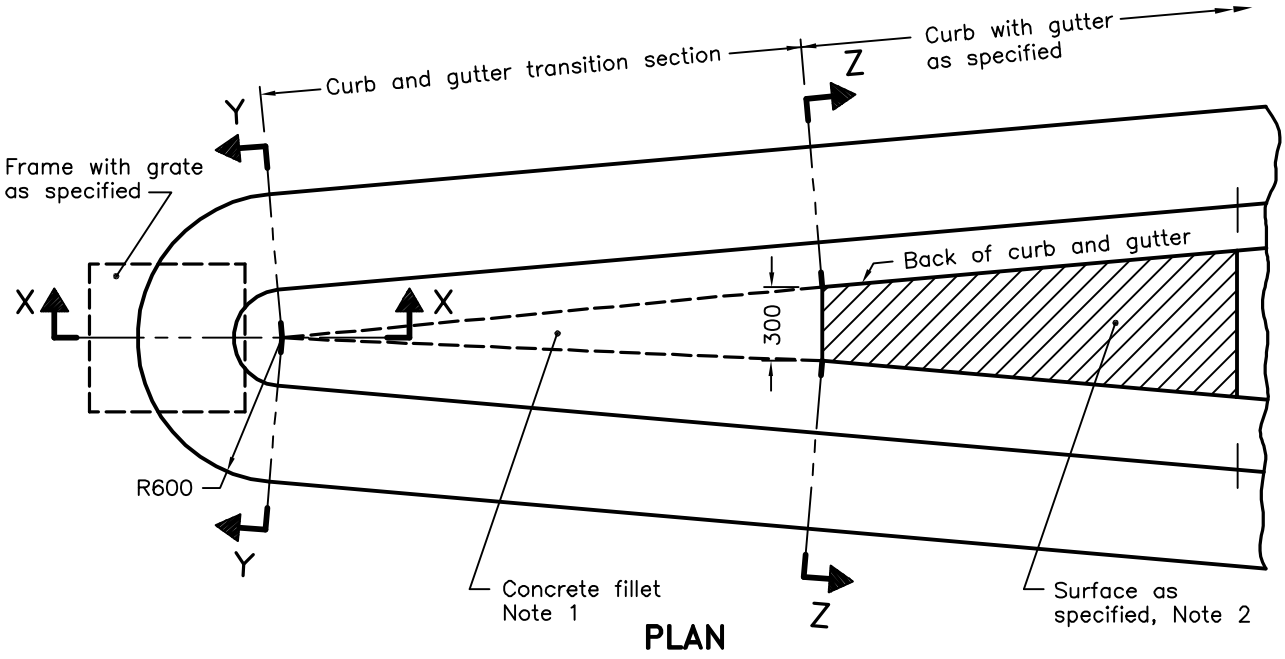

**SECTION Y–Y**

NOTES:

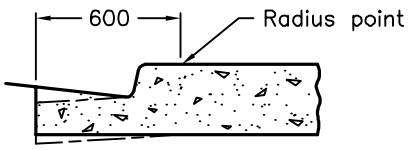
1 Depression of spillway shall coincide with outlet end of gutter outlet.

2 All dimensions are in millimetres unless otherwise shown.

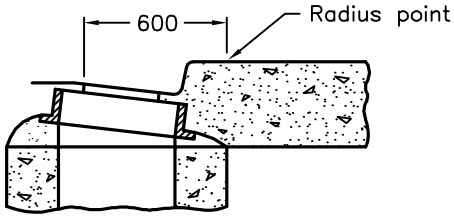
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| **ASPHALT SPILLWAYS** | | | |
| | | **OPSD 605.040** | |




**PLAN**

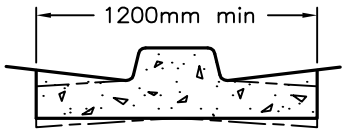



**WITHOUT CATCH BASIN**

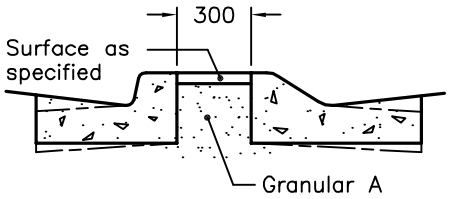



**WITH CATCH BASIN**

**SECTION X–X**




**SECTION Y–Y**




**SECTION Z–Z**

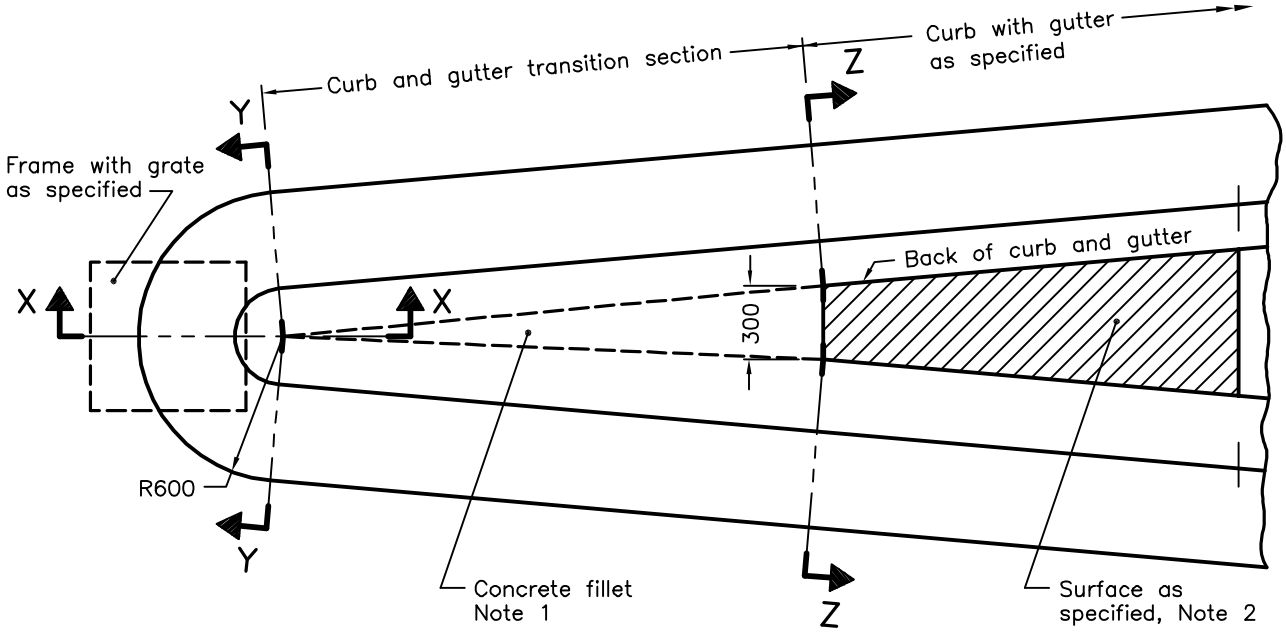
NOTES:

1 Concrete fillet shall be poured integrally with concrete curb with gutter and shall extend to a point where the back to back distance between curbs is 300mm.

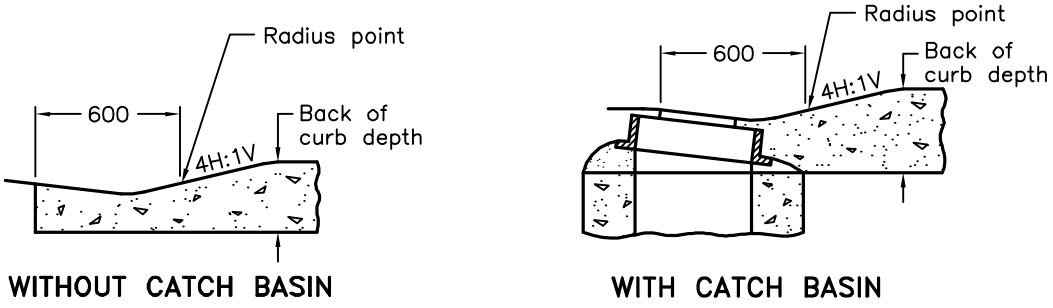
2 Surface between backs of curbs shall extend from end of fillet to point where back to back of curb width is 2.0m or as specified.

A All dimensions are in millimetres unless otherwise specified.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **600mm RADIUS BARRIER BULLNOSE** | | | |
| | **OPSD 606.010** | | |

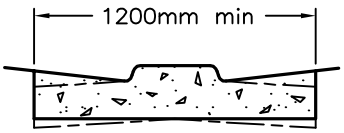



**PLAN**

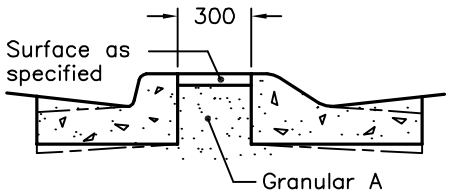



**WITHOUT CATCH BASIN** **WITH CATCH BASIN**

**SECTION X–X**




**SECTION Y–Y**




**SECTION Z–Z**

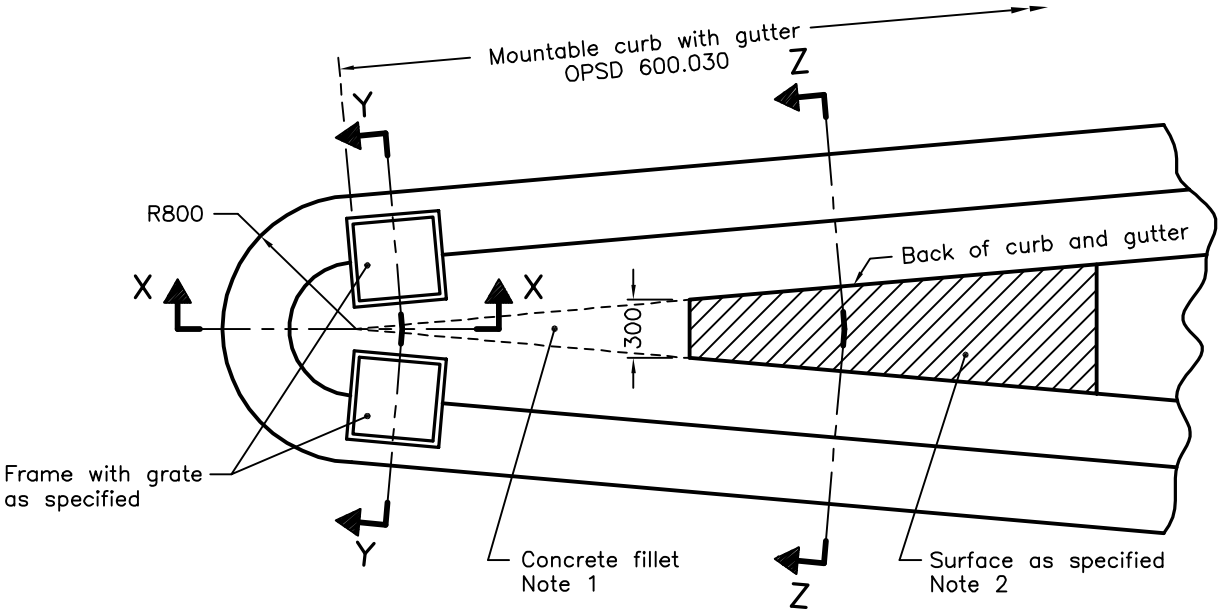
NOTES:

1 Concrete fillet shall be poured integrally with concrete curb with gutter and shall extend to a point where the back to back distance between curbs is 300mm.

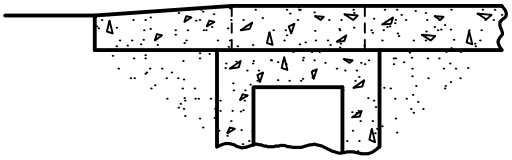
2 Surface between backs of curbs shall extend from end of fillet to point where back to back of curb width is 2.0m or as specified.

A All dimensions are in millimetres unless otherwise specified.

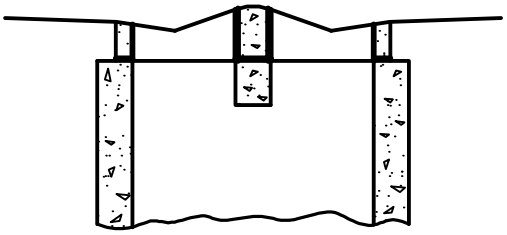
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **600mm RADIUS MOUNTABLE BULLNOSE** | | | |
| | **OPSD 606.020** | | |



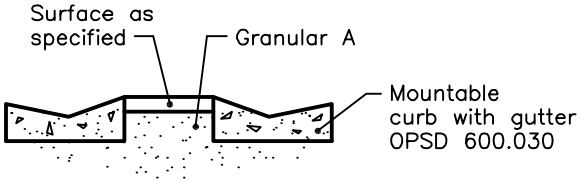

**PLAN**



**SECTION X–X**



**SECTION Y–Y**




**SECTION Z–Z**

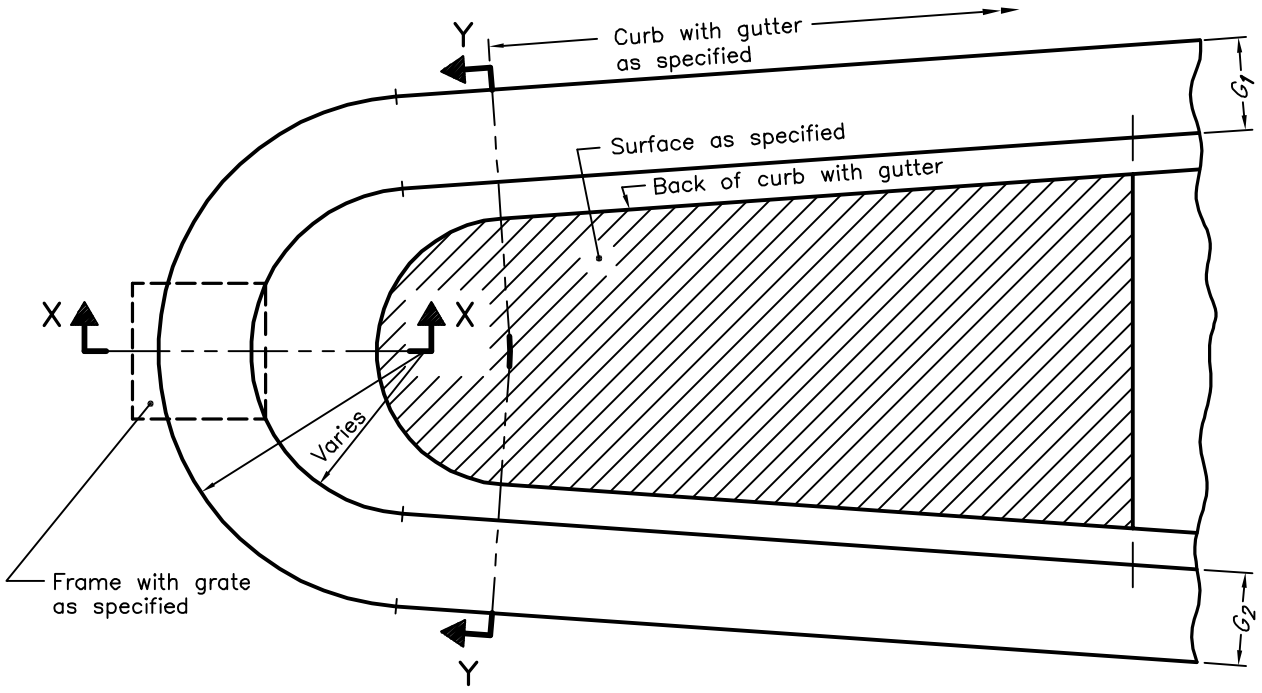
NOTES:

1 Concrete fillet shall be poured integrally with concrete curb with gutter and shall extend to a point where the back to back distance between curbs is 300mm.

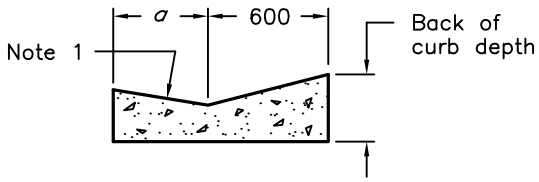
2 Surface between backs of curbs shall extend from end of fillet to point where back to back of curb width is 2.0m or as specified.

A All dimensions are in millimetres unless otherwise shown.

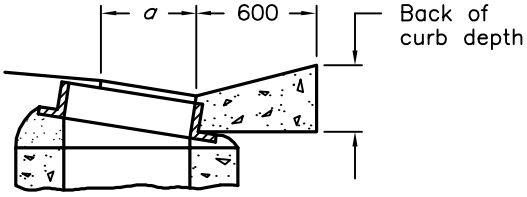
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **800mm RADIUS MOUNTABLE BULLNOSE** CURB WITH GUTTER TWIN INLET | | | |
| | **OPSD 606.030** | | |




**PLAN**

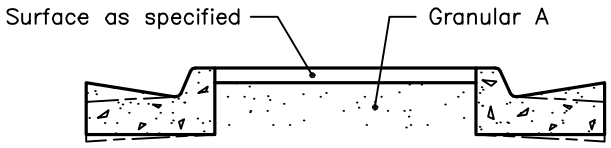



**WITHOUT CATCH BASIN**




**WITH CATCH BASIN**

**SECTION X–X**




**SECTION Y–Y**

NOTES:

1 In transition from curb with gutter to offset curb, this portion shall be horizontal.

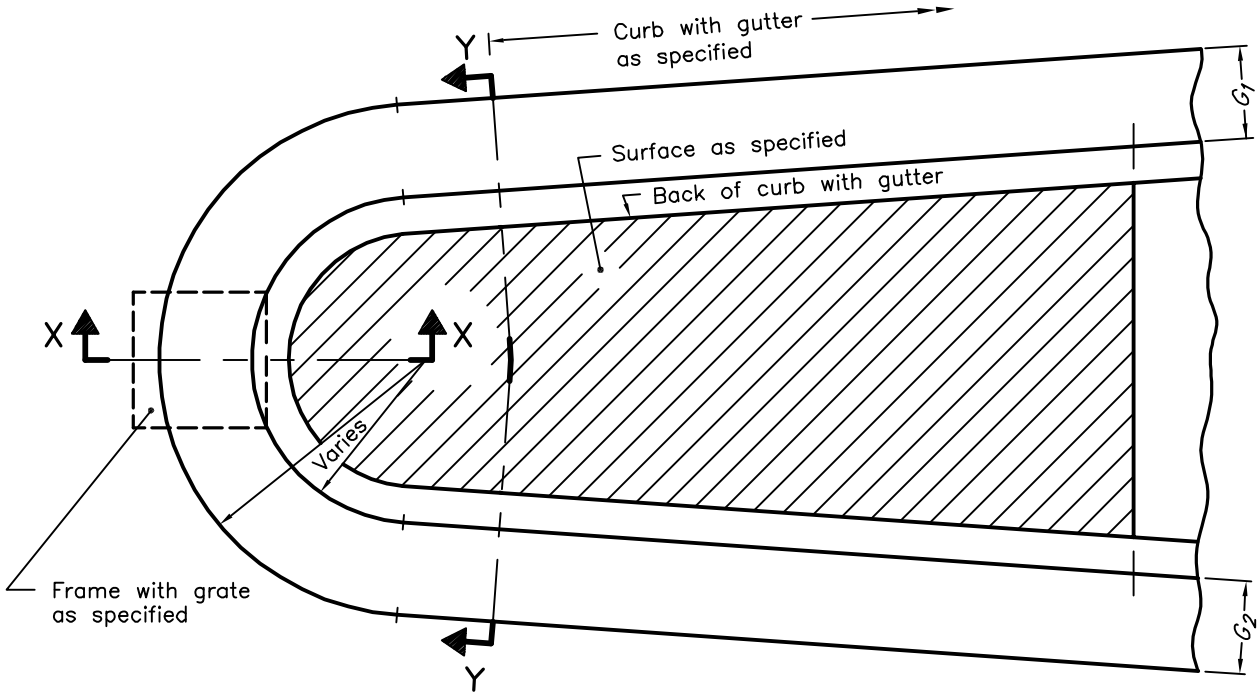
A All dimensions are in millimetres unless otherwise specified.

LEGEND:

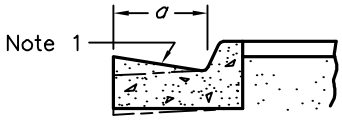
$G$ – Gutter width or offset distance.

$$a = \frac{G_1 + G_2}{2}$$

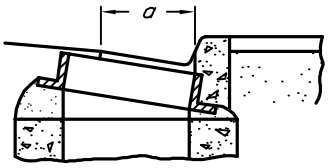
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **OVER 600mm RADIUS MOUNTABLE BULLNOSE** | | | |
| | **OPSD 607.010** | | |




PLAN

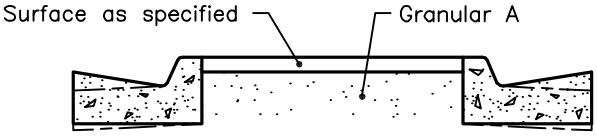



WITHOUT CATCH BASIN




WITH CATCH BASIN

SECTION X–X




SECTION Y–Y

NOTES:

1 In transition from curb with gutter to offset curb, this portion shall be horizontal.

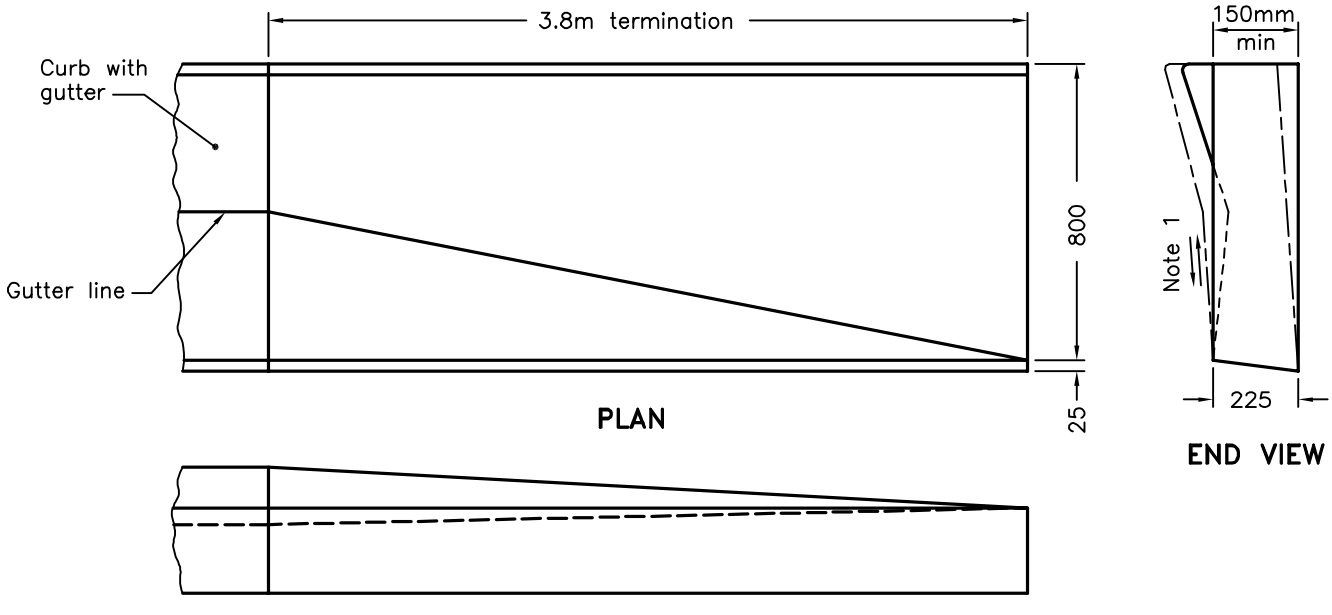
A All dimensions are in millimetres unless otherwise specified.

LEGEND:

$G$ – Gutter width or offset distance

$$a = \frac{G_1 + G_2}{2}$$

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| OVER 600mm RADIUS BARRIER BULLNOSE | | | |
| | OPSD 607.020 | | |

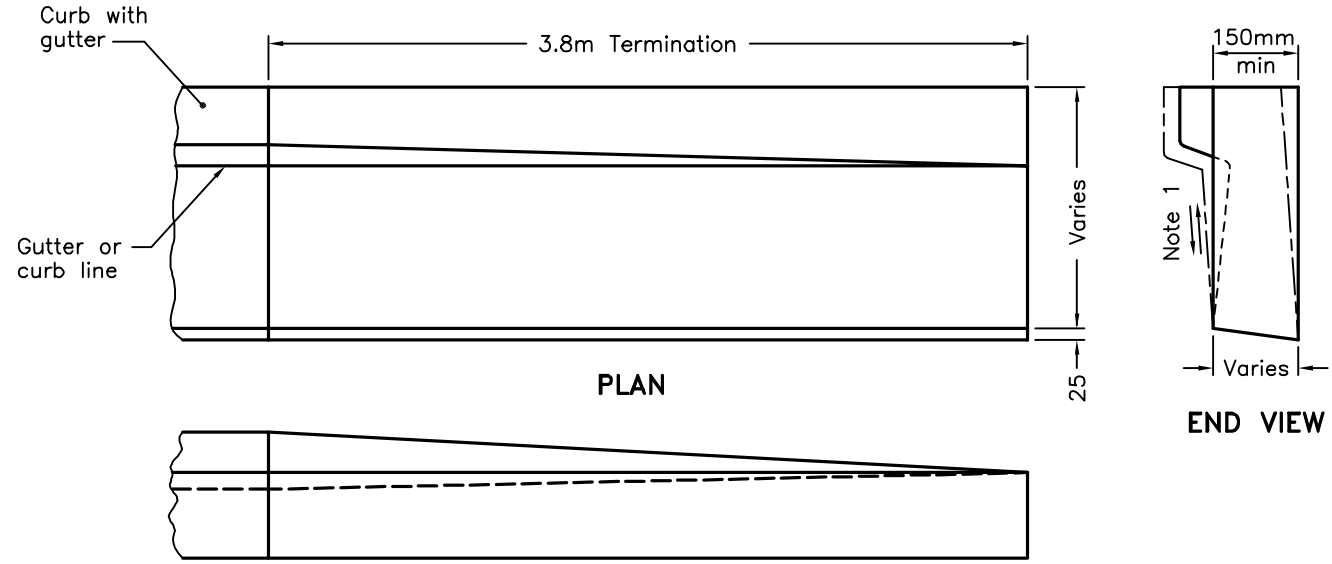



PLAN

END VIEW

ELEVATION

## MOUNTABLE CURB WITH GUTTER




PLAN

END VIEW

ELEVATION

## BARRIER AND SEMI-MOUNTABLE CURB WITH GUTTER

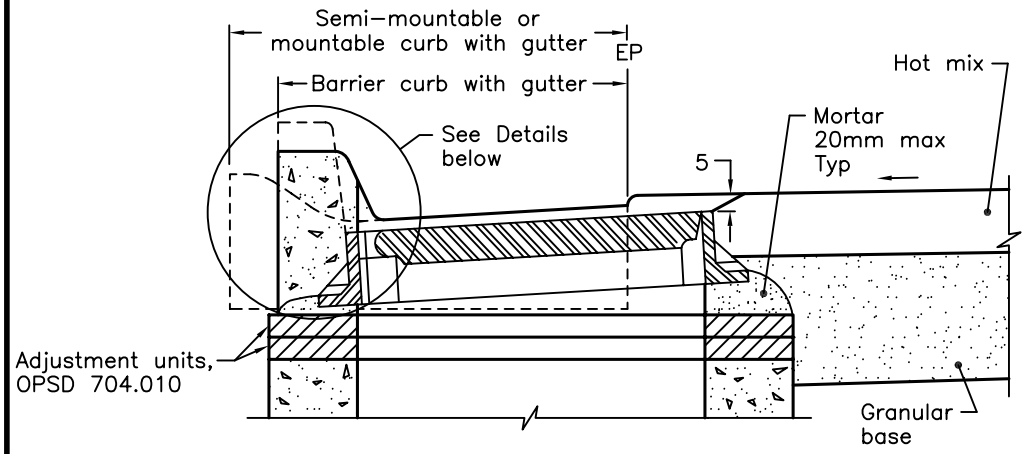
NOTES:

1 Slope shall match existing shoulder.

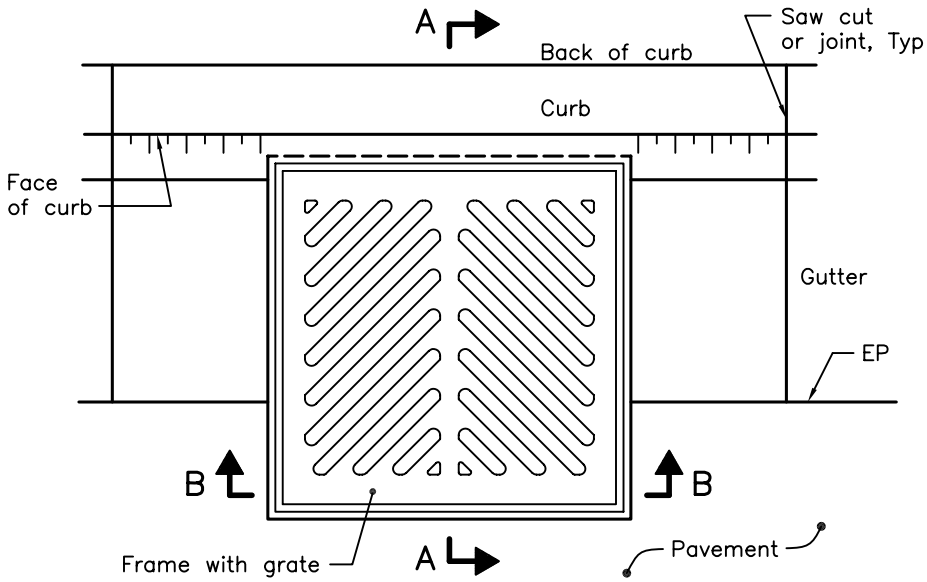
A This drawing shall be read in conjunction with OPSD 600 series curb with gutter drawings.

B All dimensions are in millimetres unless otherwise shown.

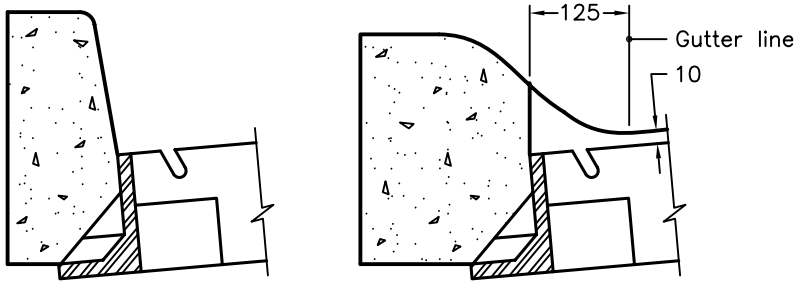
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **METHOD OF TERMINATION** FOR CONCRETE CURB WITH GUTTER | | | |
| | **OPSD 608.010** | | |




SECTION A–A



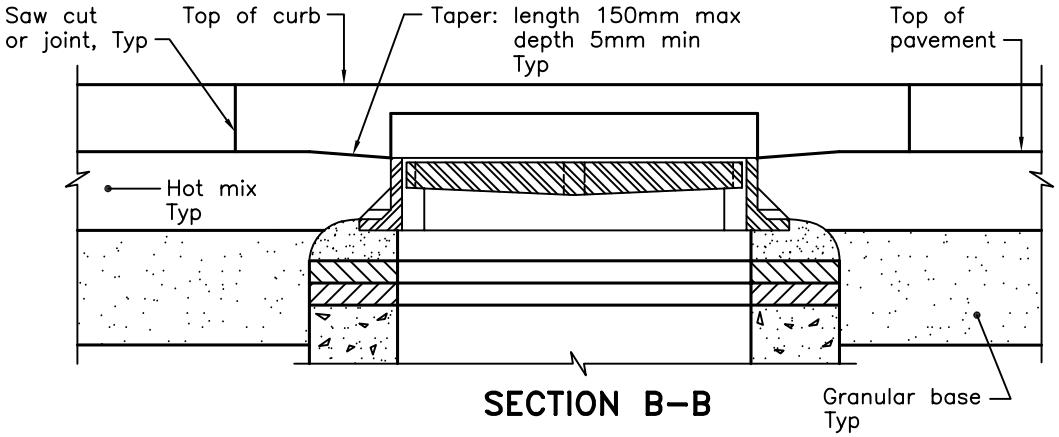

PLAN



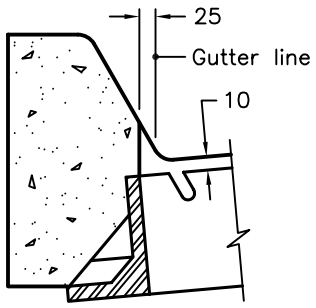

BARRIER CURB

SEMI–MOUNTABLE or MOUNTABLE
CURB WITH GUTTER

DETAILS




SECTION B–B

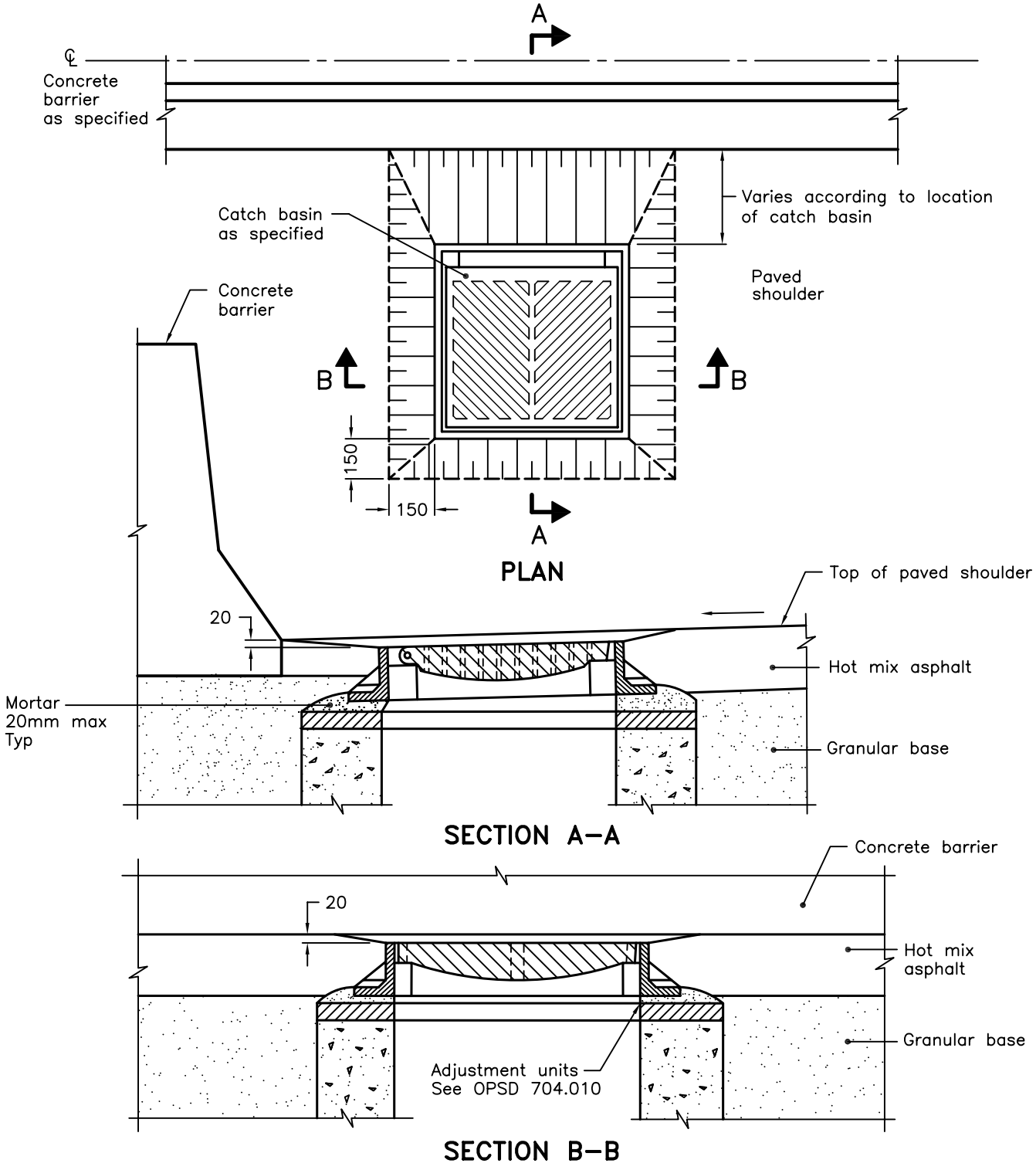



BARRIER
CURB WITH GUTTER

NOTE:

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| CATCH BASIN FRAME WITH GRATE INSTALLATION AT CURB WITH GUTTER | | | |
| | OPSD 610.010 | | |

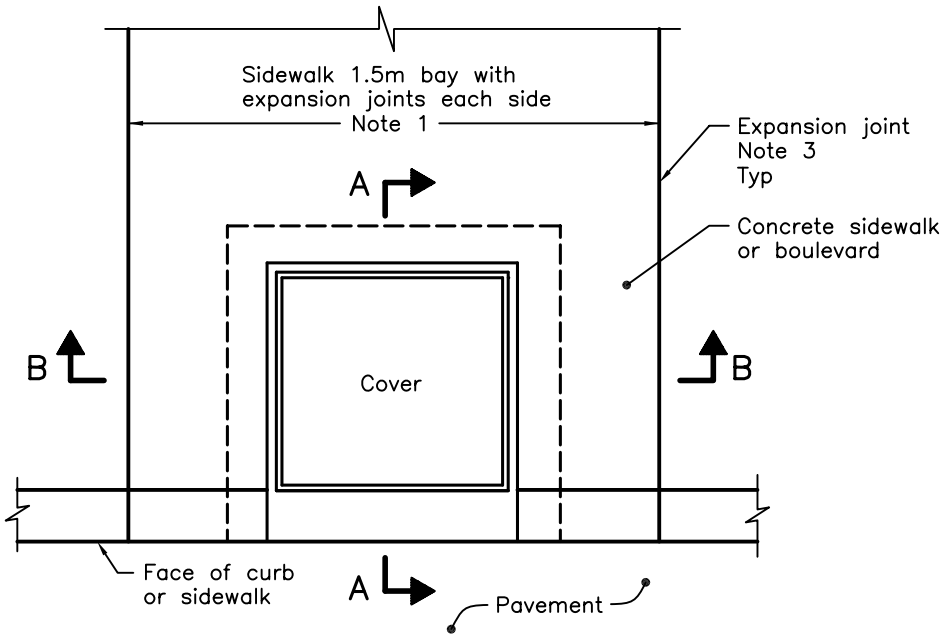



NOTES:

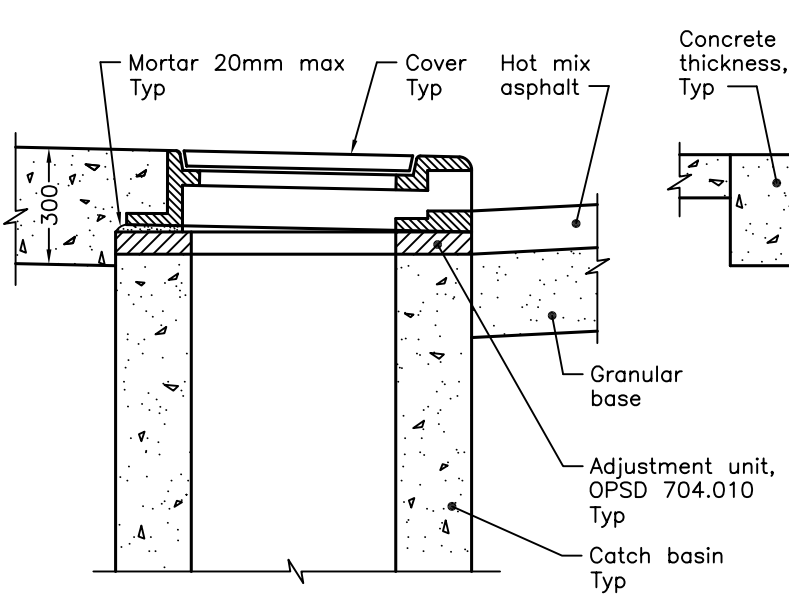
A When catch basins are placed back to back on both sides of the concrete barrier, backfill shall be unshrinkable backfill to the limits of the excavation and within 150mm of top of concrete catch basin structure. Where catch basins are not placed back to back they shall be staggered with a minimum spacing of 10m.

B All dimensions are in millimetres unless otherwise shown.

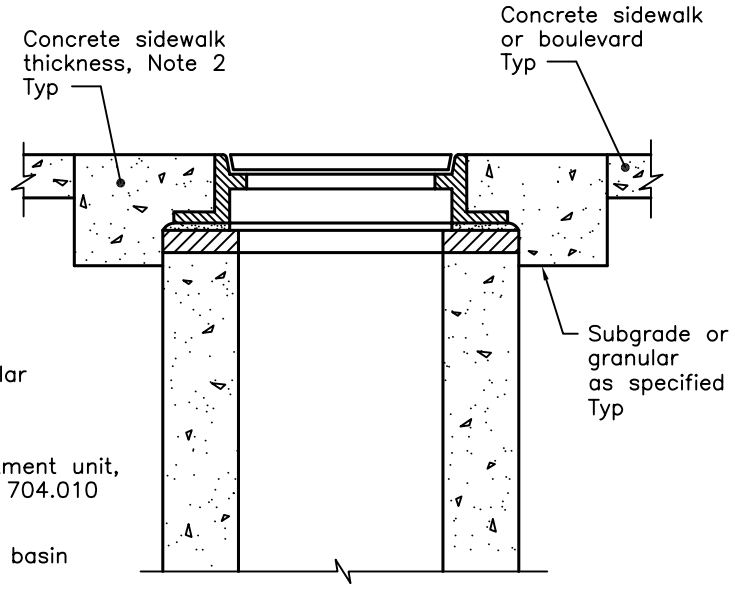
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2006 | Rev | 2 |
|---|---|---|---|
| CATCH BASIN FRAME WITH GRATE SHOULDER INSTALLATION AT CONCRETE BARRIER | | | |
| | OPSD 610.020 | | |




PLAN




SECTION A–A



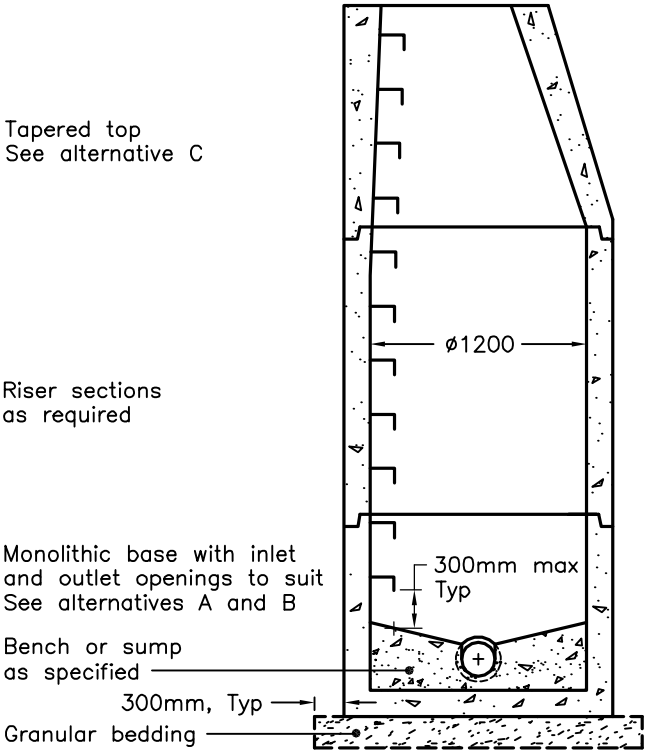

SECTION B–B

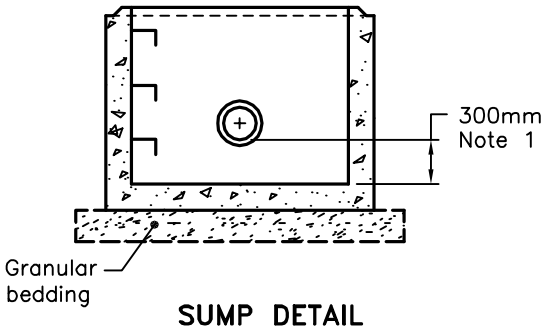
NOTES:

1 Catch basin to be centred within the sidewalk bay.
2 Concrete sidewalk thickness shall be 300mm for sidewalk bay with catch basin.
3 For expansion joint detail see OPSD 310.010.

A In grassed boulevard areas, install 300mm wide concrete support collar.
B All dimensions are in millimetres unless otherwise shown.

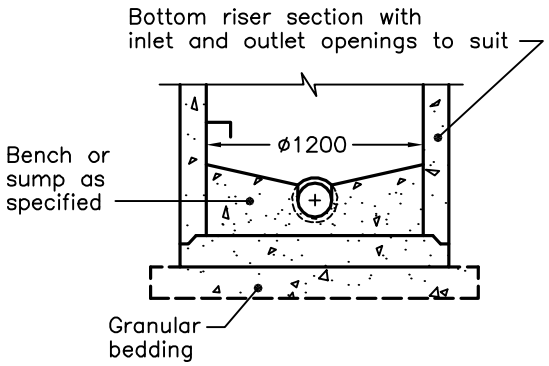
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| FRAME WITH COVER INSTALLATION FOR INLET TYPE CATCH BASINS | | | |
| | OPSD 610.030 | | |



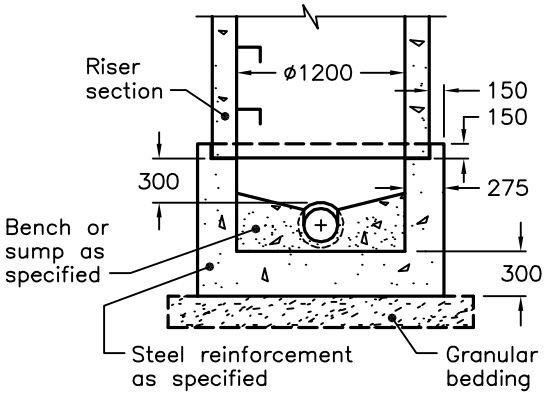




**SUMP DETAIL**

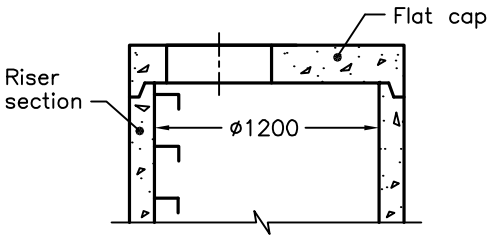
## ALTERNATIVES




**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.

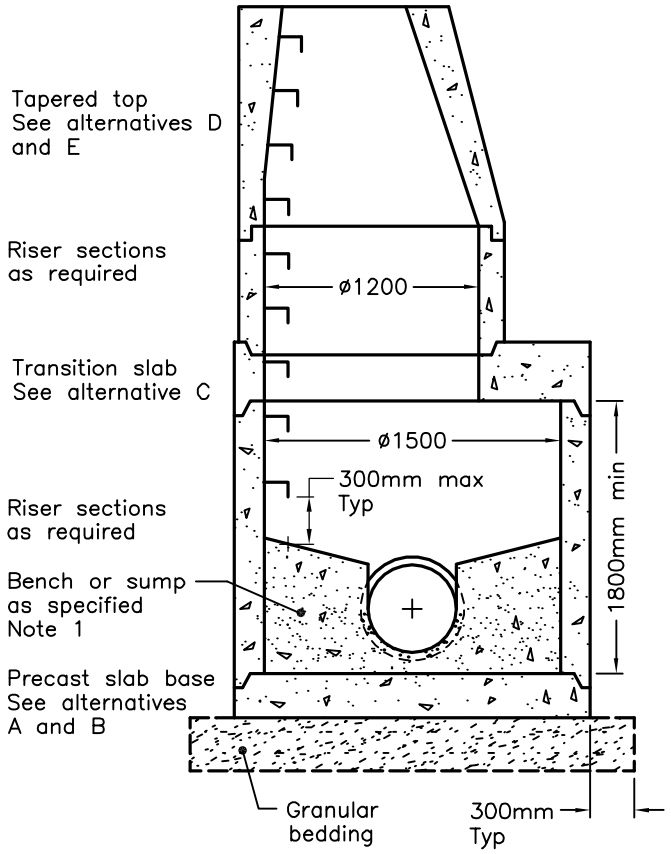
E For benching and pipe opening details, see OPSD 701.021.

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 | Nov 2014 | Rev | 5 |
|---|---|---|---|
| **PRECAST CONCRETE MAINTENANCE HOLE** 1200mm DIAMETER | | | |
| | | | **OPSD 701.010** |




## 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.

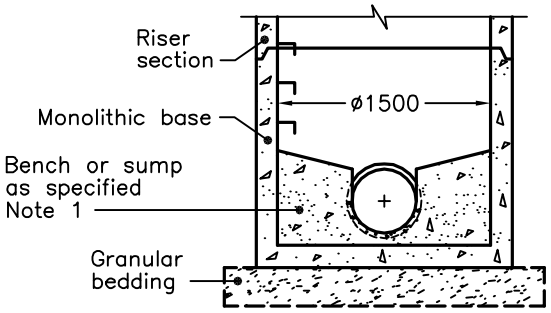
E For benching and pipe opening details, see OPSD 701.021.

F For adjustment unit and frame installation, see OPSD 704.010.

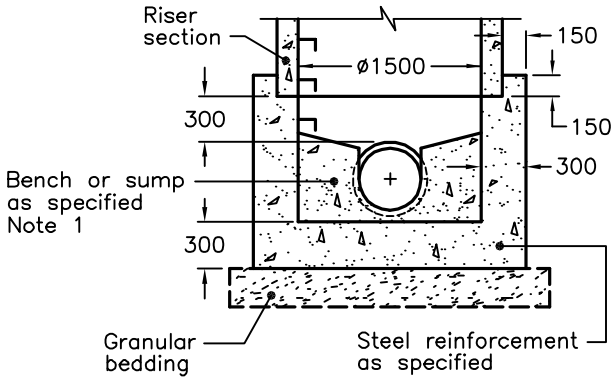
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

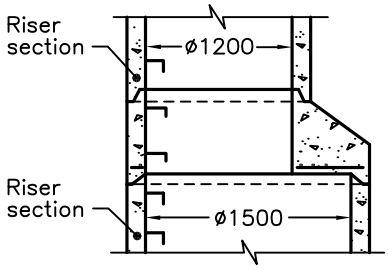
## ALTERNATIVES



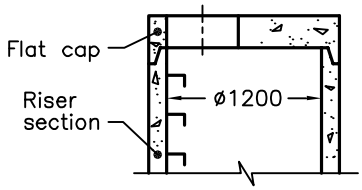

A PRECAST MONOLITHIC BASE



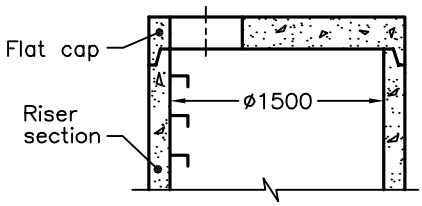

B CAST–IN–PLACE BASE




C TAPERED TRANSITION SLAB




D 1200mm PRECAST FLAT CAP




E 1500mm PRECAST FLAT CAP

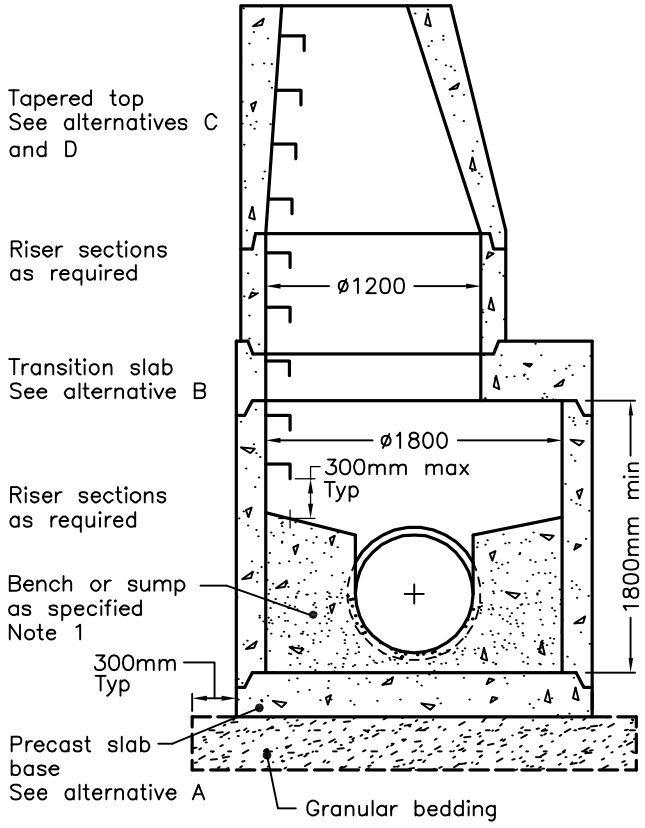
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 5

# PRECAST CONCRETE MAINTENANCE HOLE

1500mm DIAMETER

ONTARIO STANDARDS · OPS · MUNICIPAL – PROVINCIAL

OPSD 701.011




## 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.

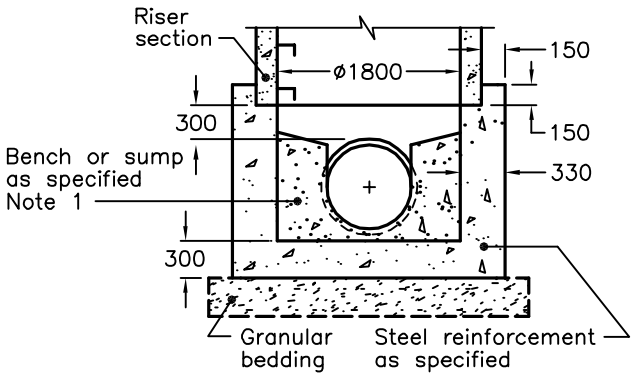
E For benching and pipe opening details, see OPSD 701.021.

F For adjustment unit and frame installation, see OPSD 704.010.

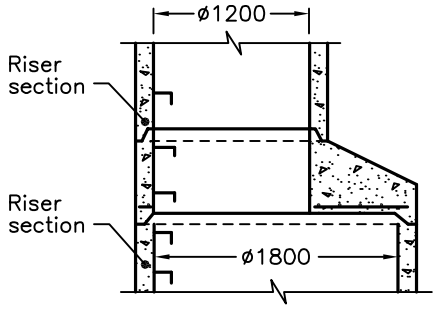
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

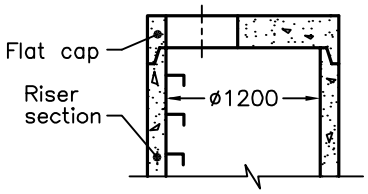
## ALTERNATIVES



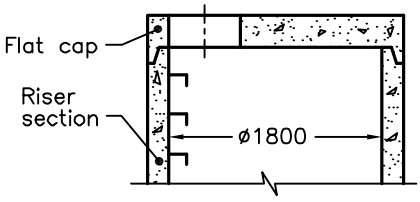

**A CAST-IN-PLACE BASE**




**B TAPERED TRANSITION SLAB**

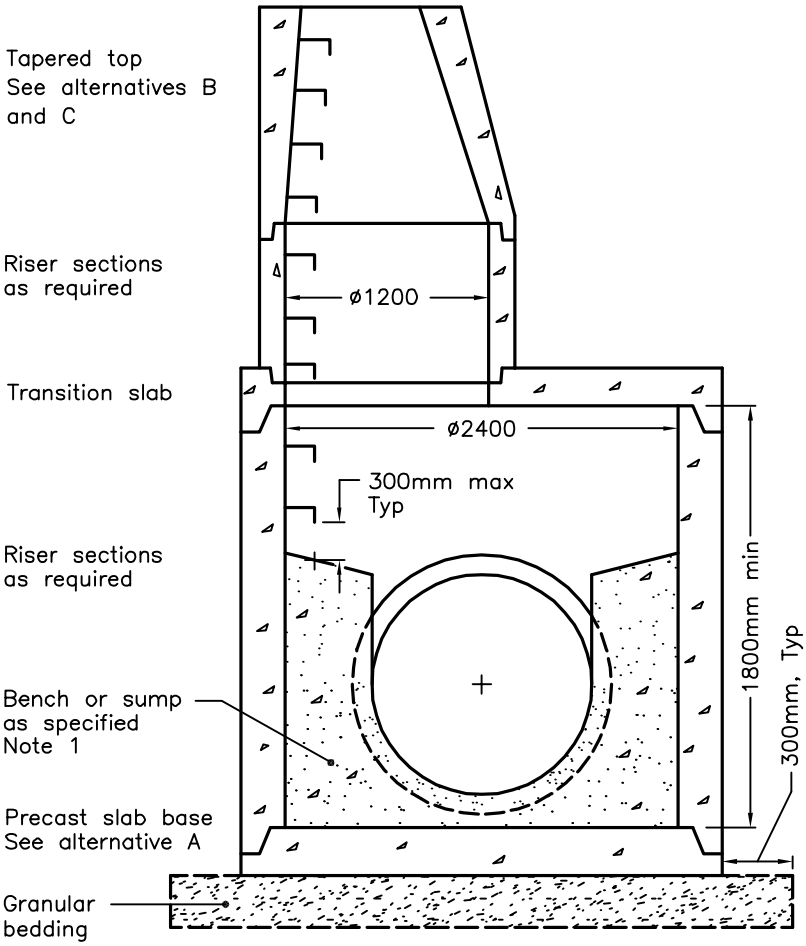



**C 1200mm PRECAST FLAT CAP**

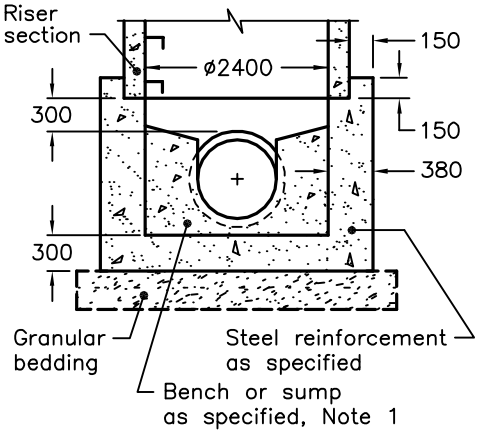



**D 1800mm PRECAST FLAT CAP**

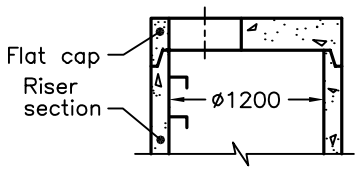
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 5 |
|---|---|---|---|
| **PRECAST CONCRETE MAINTENANCE HOLE** 1800mm DIAMETER | | | |
| | | | **OPSD 701.012** |



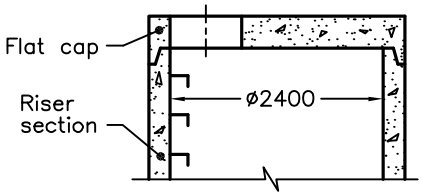

## ALTERNATIVES




**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.

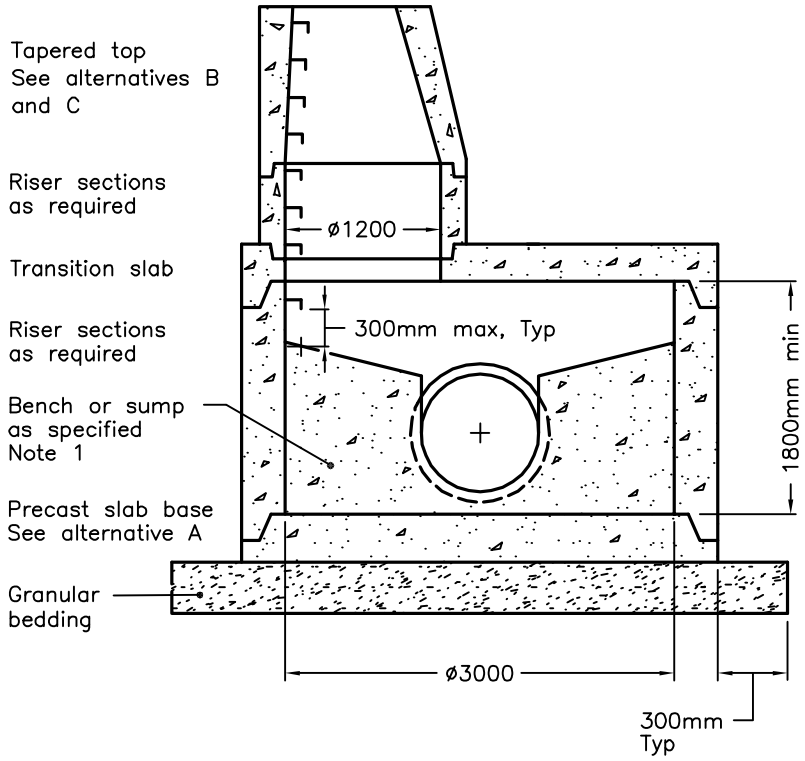
E For benching and pipe opening details, see OPSD 701.021.

F For adjustment unit and frame installation, see OPSD 704.010.

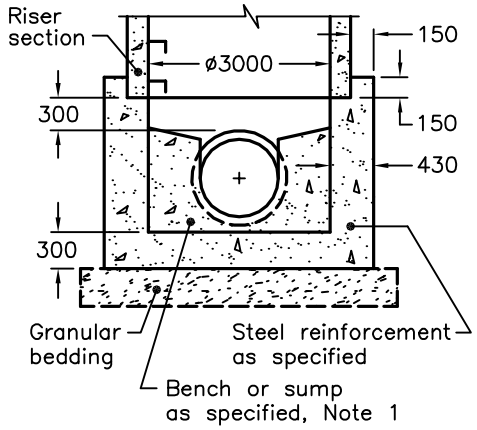
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

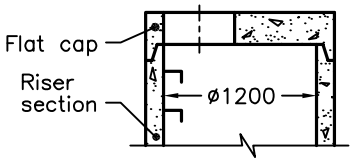
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 5 |
|---|---|---|---|
| **PRECAST CONCRETE MAINTENANCE HOLE**<br>2400mm DIAMETER | | | |
| | **OPSD 701.013** | | |



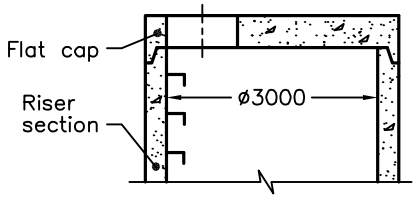

## ALTERNATIVES




**A CAST–IN–PLACE BASE**




**B 1200mm PRECAST FLAT CAP**




**C 3000mm 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, 701.070, 701.071, 703.014, 703.024, 706.040 and 706.041.

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.

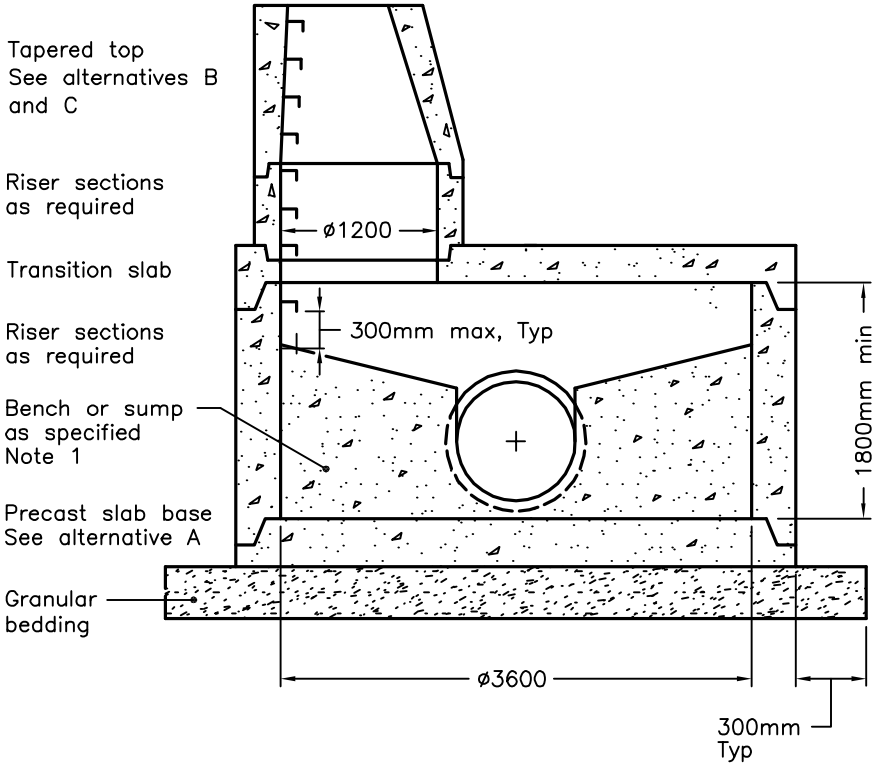
E For benching and pipe opening details, see OPSD 701.021.

F For adjustment unit and frame installation, see OPSD 704.010.

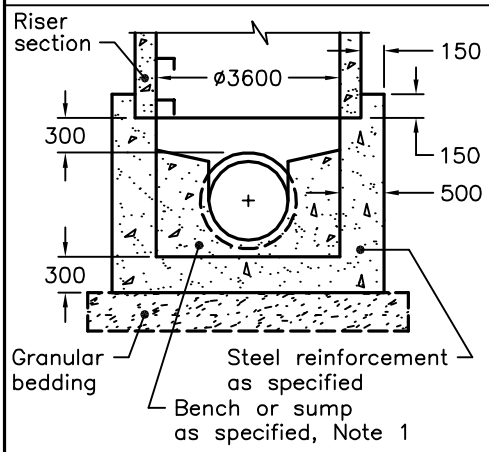
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

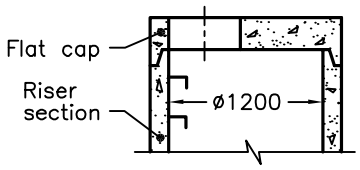
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 4 |
|---|---|---|
| **PRECAST CONCRETE MAINTENANCE HOLE** 3000mm DIAMETER | | |
| | | **OPSD 701.014** |



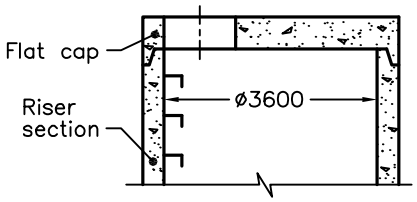

## ALTERNATIVES




A CAST–IN–PLACE BASE




B 1200mm PRECAST FLAT CAP




C 3600mm 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, 701.080, 701.081, and 703.015.

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.

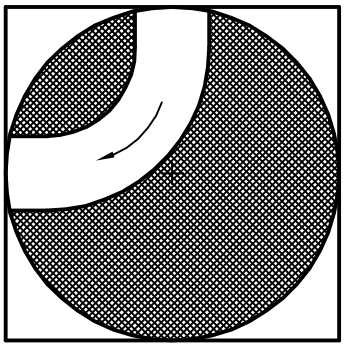
E For benching and pipe opening details, see OPSD 701.021.

F For adjustment unit and frame installation, see OPSD 704.010.

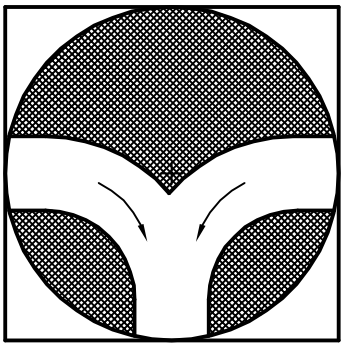
G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

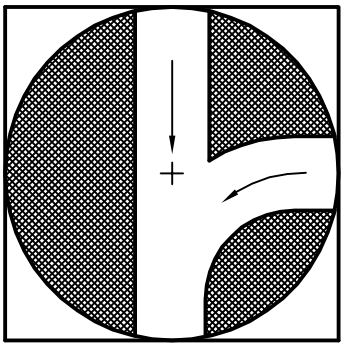
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 4 |
|---|---|---|---|
| **PRECAST CONCRETE MAINTENANCE HOLE** 3600mm DIAMETER | | | |
| | | | **OPSD 701.015** |



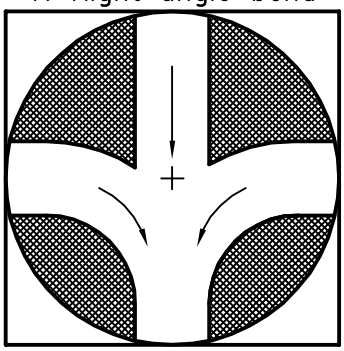
1. Right angle bend



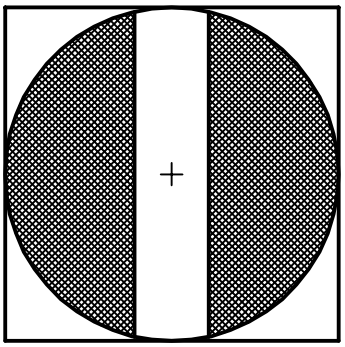
2. Tee connection



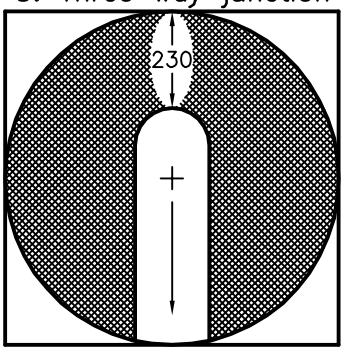
3. Three way junction



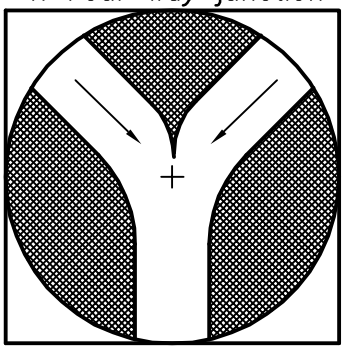
4. Four way junction



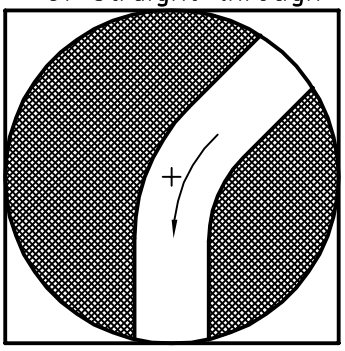
5. Straight through



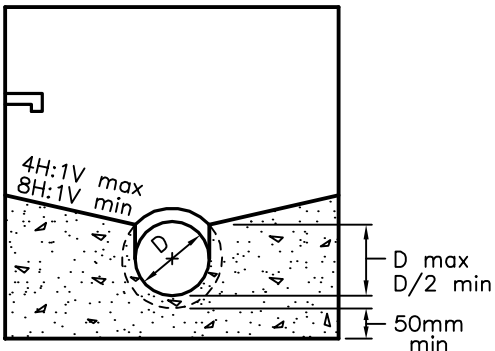

6. Dead end



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–finshed, it shall be given wood float finish, channel shall be given steel trowel finish.

C Benching 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.

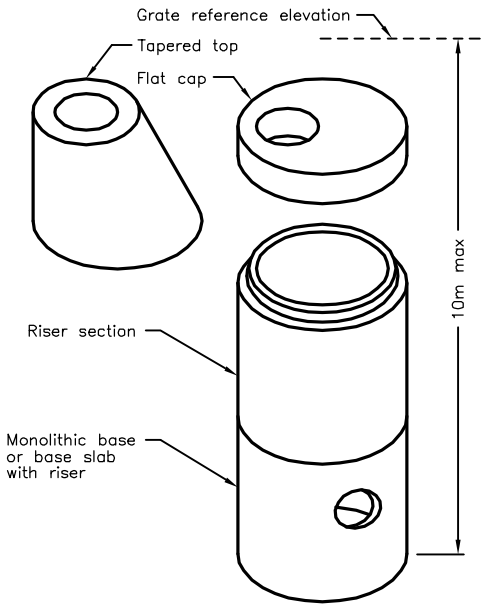
E All dimensions are nominal.

F All dimensions are in millimetres unless otherwise shown.

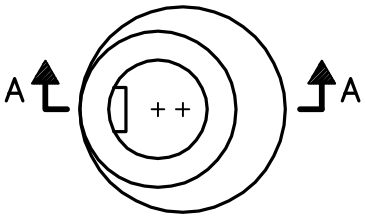
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 4

# MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES

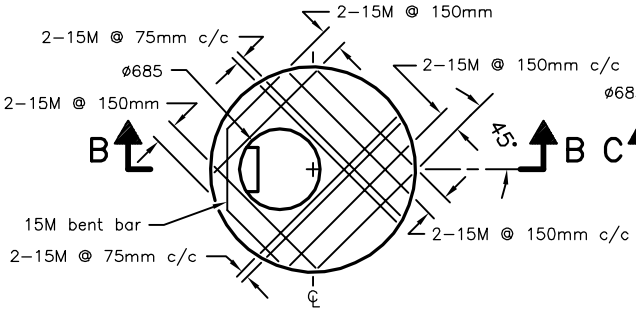
OPSD 701.021



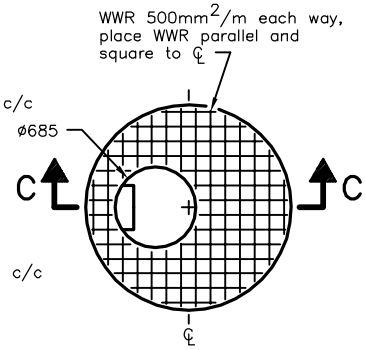

**1200mm DIAMETER MAINTENANCE HOLE**



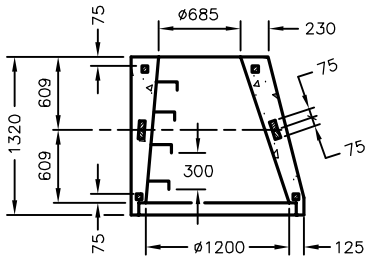

**PLAN OF TAPERED TOP**



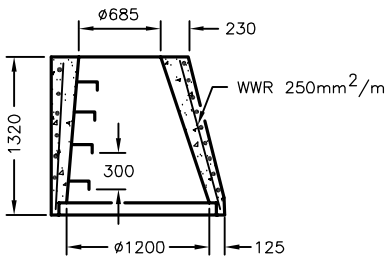

**PLAN OF FLAT CAP WITH REINFORCING STEEL BARS**



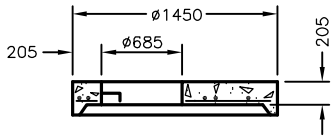

**PLAN OF FLAT CAP WITH WWR**



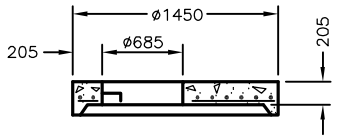

**SECTION A–A TAPERED TOP WITH HOOP STEEL**




**SECTION A–A TAPERED TOP WITH WWR**




**SECTION B–B**

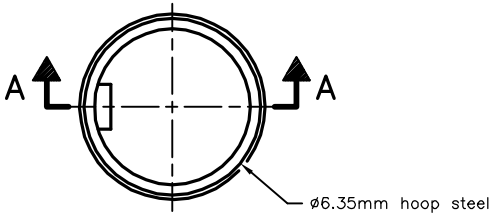



**SECTION C–C**

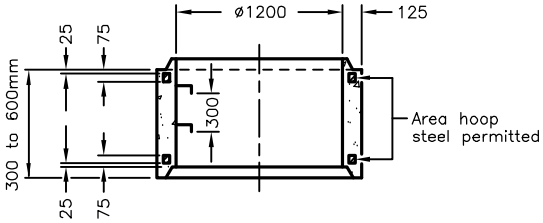
## NOTES:

A This drawing shall be read in conjunction with OPSD 701.031 and 701.032.
B Centre reinforcing steel in riser ±20mm. All other reinforcing steel shall have 25mm minimum cover.
C Steps shall be according to OPSD 405.010 or 405.020.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

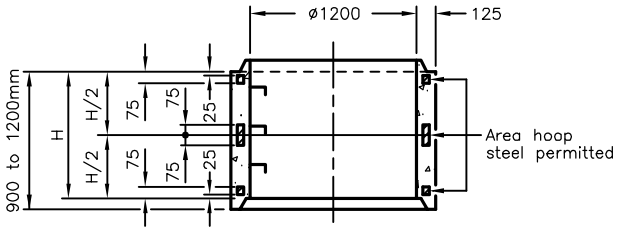
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 4 |
|---|---|---|---|
| **PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS**<br>1200mm DIAMETER<br>TAPERED TOP AND FLAT CAP | | | |
| | | | **OPSD 701.030** |



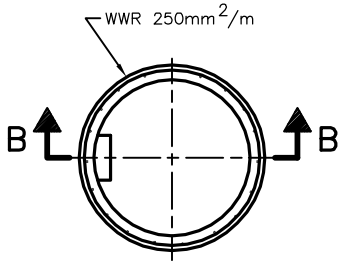

PLAN OF RISER
WITH HOOP STEEL



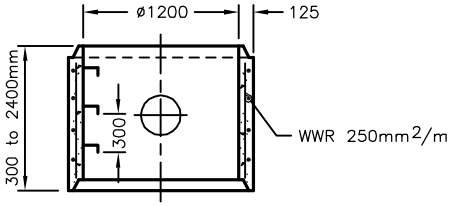

SECTION A–A
RISERS < 900mm HIGH



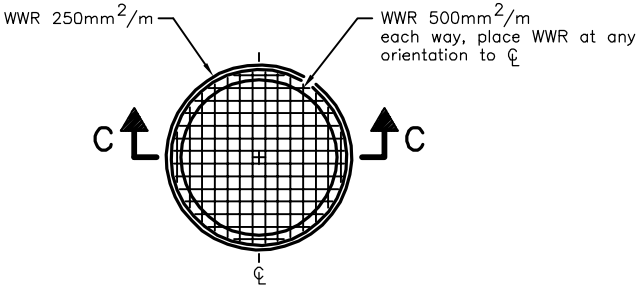

SECTION A–A
RISERS ≥ 900mm



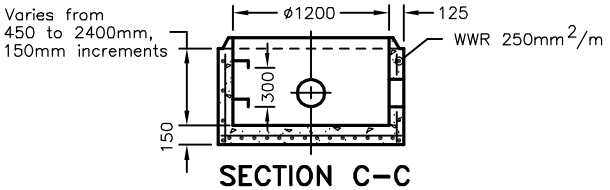

PLAN OF RISER
WITH WWR



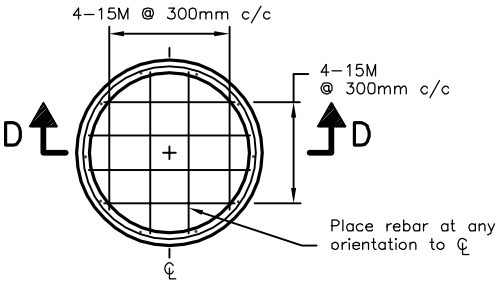

SECTION B–B



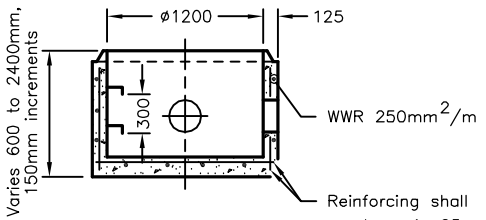

PLAN OF MONOLITHIC BASE WITH WWR




SECTION C–C




PLAN OF MONOLITHIC BASE
WITH REINFORCING STEEL BARS
AND WWR




SECTION D–D

## NOTES:

A This drawing shall be read in conjunction with OPSD 701.030 and 701.032.
B Centre reinforcing steel in riser ±20mm. All other reinforcing steel shall have 25mm minimum cover.
C Steps shall be according to OPSD 405.010 or 405.020.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

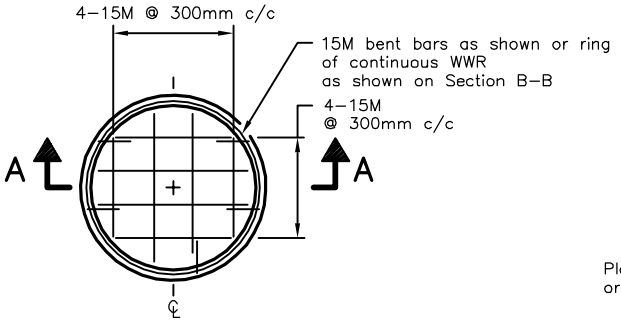
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 1200mm DIAMETER RISER AND MONOLITHIC BASE

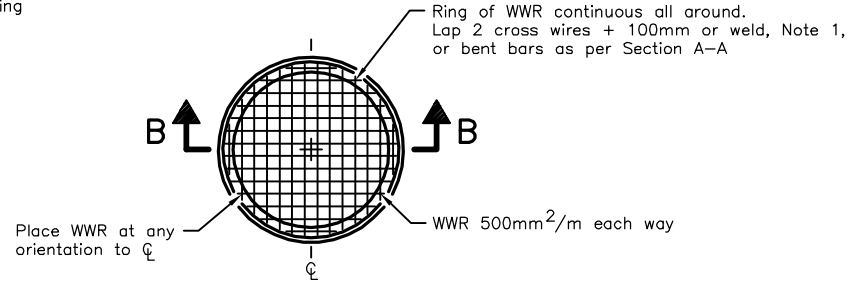
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

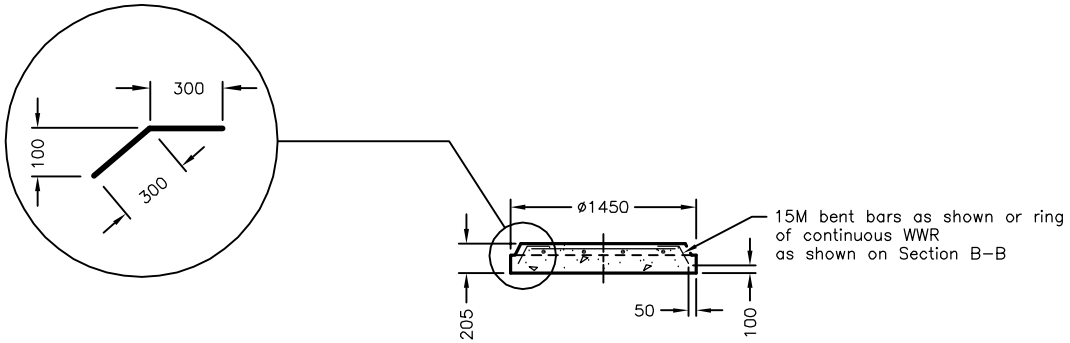
OPSD 701.031



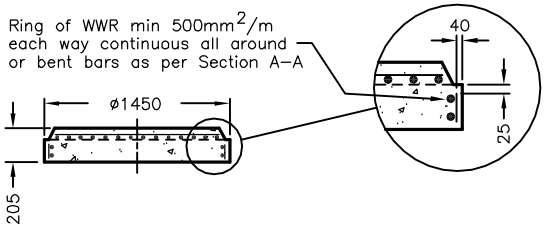

PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS




PLAN OF BASE SLAB
WITH WWF




SECTION A–A




SECTION B–B

## NOTES:

1 Welded splice shall develop minimum 50% yield strength of bar or wire, as applicable.

A This drawing shall be read in conjunction with OPSD 701.030 and 701.031.
B Centre reinforcing steel in riser ±20mm. All other reinforcing steel shall have 25mm minimum cover.
C All dimensions are nominal.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

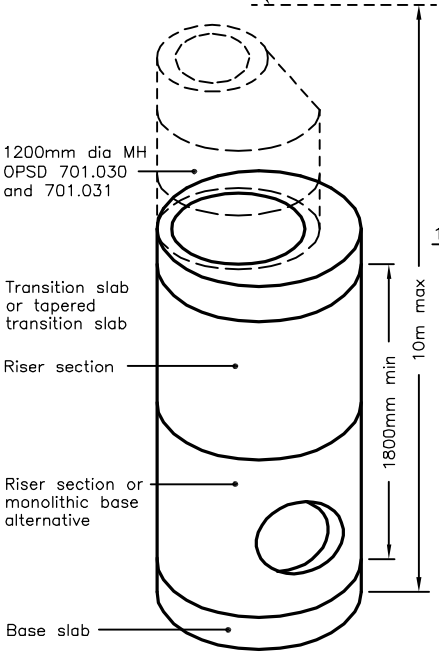
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

1200mm DIAMETER

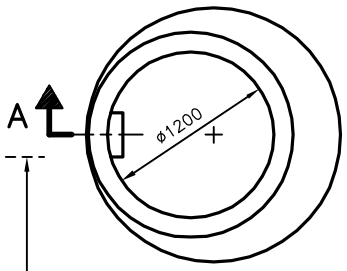
BASE SLAB

Nov 2014 | Rev 2

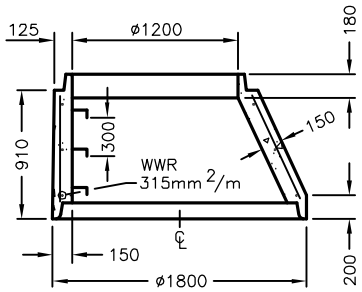
OPSD 701.032



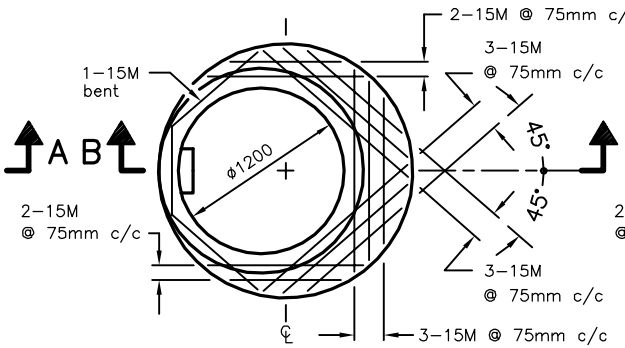

**1500 to 1200mm DIAMETER MAINTENANCE HOLE**



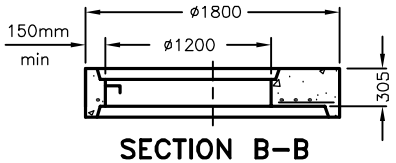

**PLAN OF TRANSITION CONE**



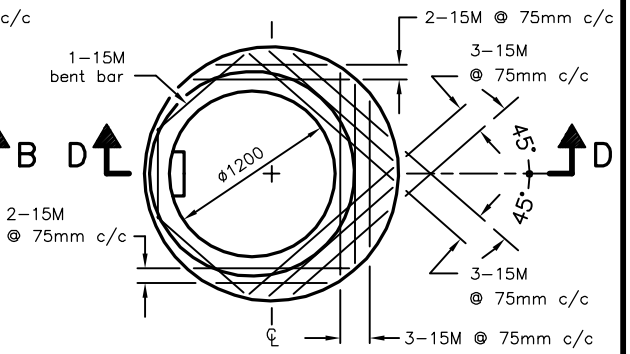

**SECTION A–A**



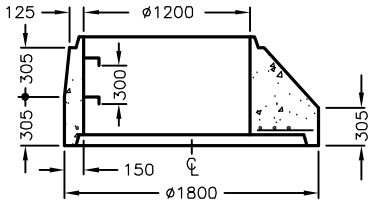

**PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS**



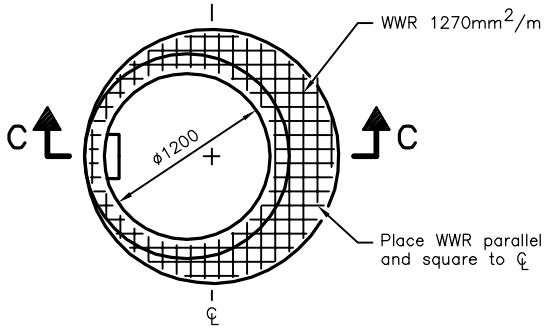

**SECTION B–B**



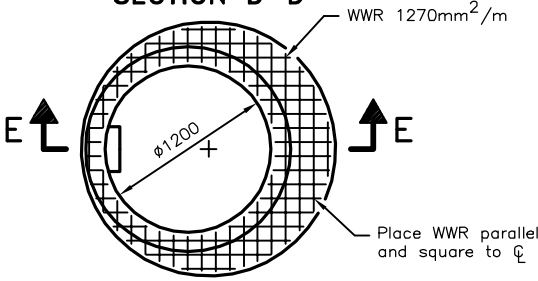

**PLAN OF TAPERED TRANSITION SLAB WITH REINFORCING STEEL BARS**



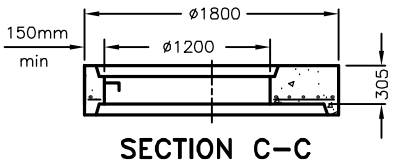

**SECTION D–D**



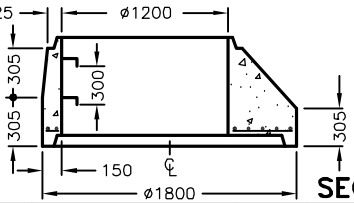

**PLAN OF TRANSITION SLAB WITH WWR**




**PLAN OF TAPERED TRANSITION SLAB WITH WWR**




**SECTION C–C**




**SECTION E–E**

## NOTES:

A This OPSD shall be read in conjunction with OPSD 701.041.

B Centre reinforcing in transition cone ±25mm. All other reinforcing steel shall have 25mm minimum cover.

C Steps shall be according to OPSD 405.010 or 405.020.

D All dimensions are nominal.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

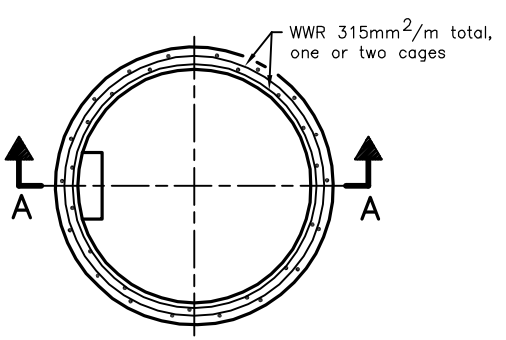
Nov 2014 | Rev 4

# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

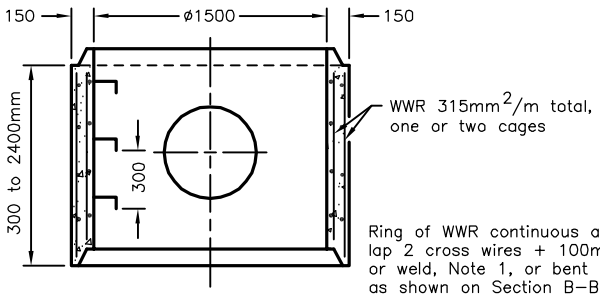
## 1500mm DIAMETER TRANSITION CONE AND SLABS

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

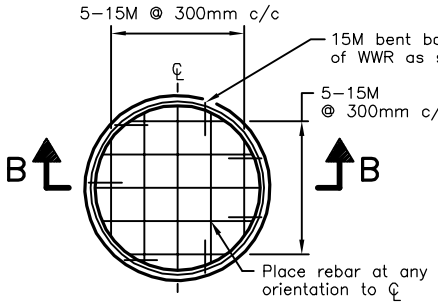
**OPSD 701.040**



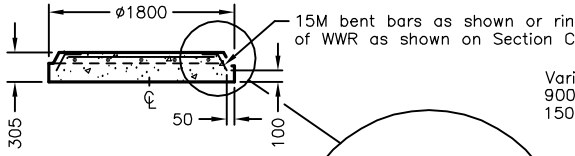

PLAN OF RISER WITH WWR



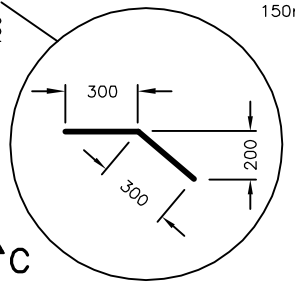

SECTION A–A

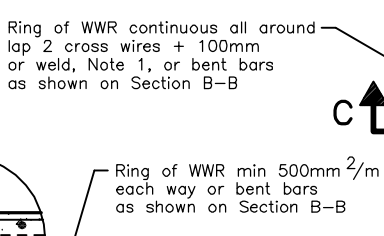



PLAN OF BASE SLAB WITH REINFORCING STEEL BARS

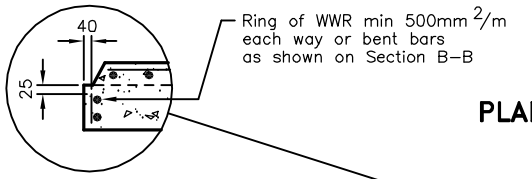


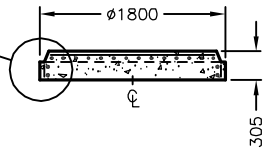

SECTION B–B



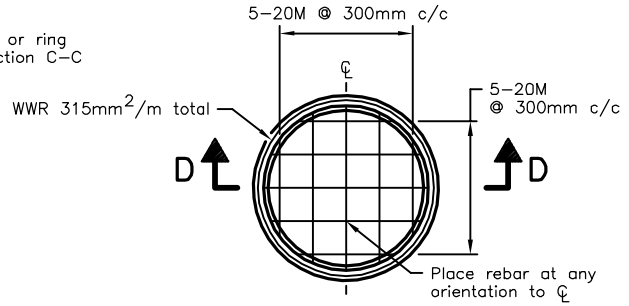




PLAN OF BASE SLAB WITH WWR

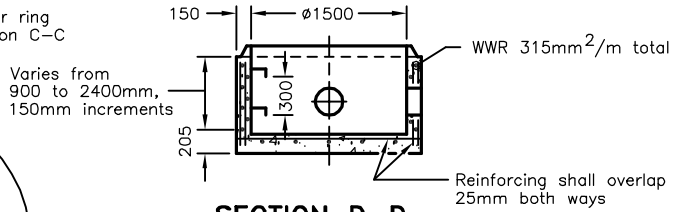


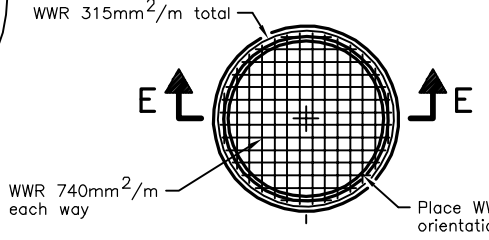

SECTION C–C



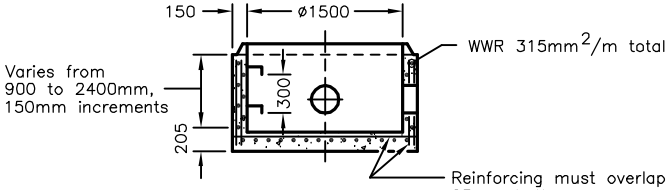

PLAN OF MONOLITHIC BASE WITH REINFORCING STEEL BARS




SECTION D–D




PLAN OF MONOLITHIC BASE WITH WWR




SECTION E–E

## NOTES:

1 Welded splice shall develop minimum 50% yield strength of bar or wire, as applicable.

A This OPSD shall be read in conjunction with OPSD 701.040.

B If single cage of reinforcing in riser, centre reinforcing in wall ±25mm. All other reinforcing steel shall have 25mm minimum cover.

C Steps shall be according to OPSD 405.010 or 405.020.

D All dimensions are nominal.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

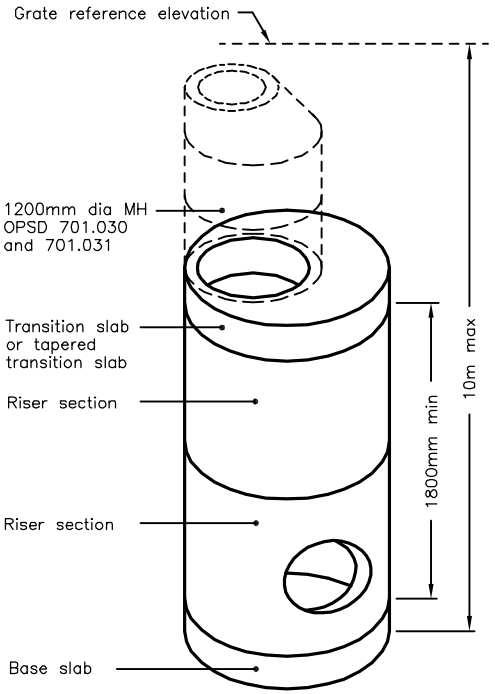
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 1500mm DIAMETER RISER AND BASES

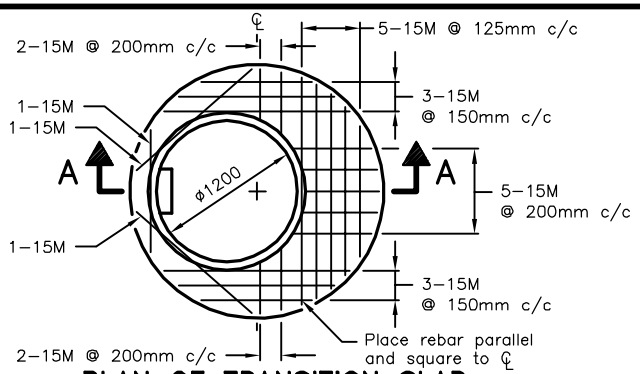
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

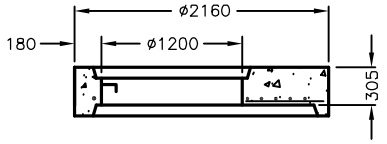
OPSD 701.041



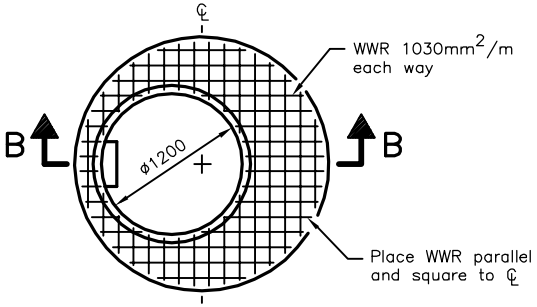

**1800 to 1200mm DIAMETER MAINTENANCE HOLE**



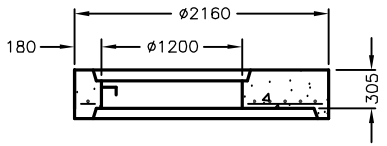

**PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS**



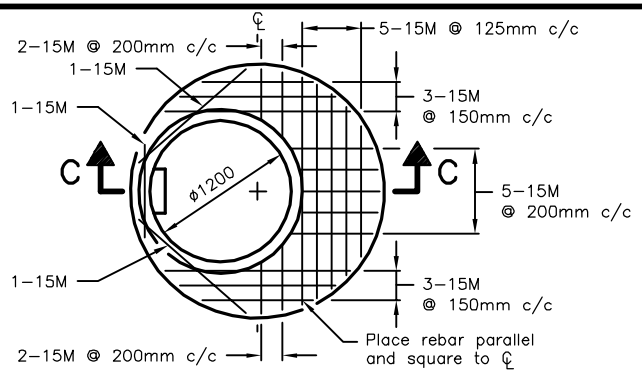

**SECTION A–A**



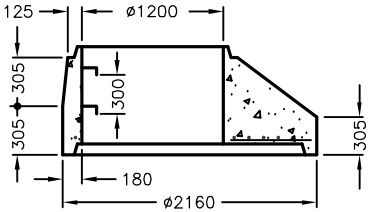

**PLAN OF TRANSITION SLAB WITH WWR**



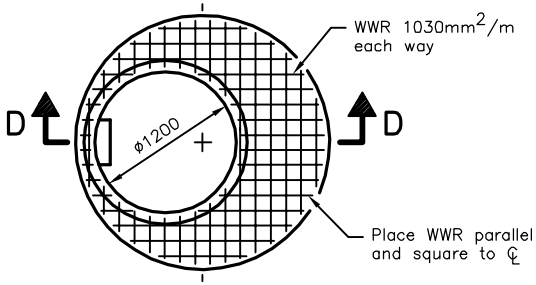

**SECTION B–B**



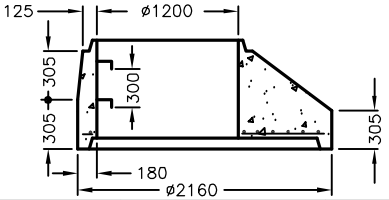

**PLAN OF TAPERED TRANSITION SLAB WITH REINFORCING STEEL BARS**




**SECTION C–C**




**PLAN OF TAPERED TRANSITION SLAB WITH WWR**




**SECTION D–D**

## NOTES:

A This OPSD shall be read in conjunction with OPSD 701.051.

B All reinforcing steel shall have 25mm minimum cover.

C Steps shall be according to OPSD 405.010 or 405.020.

D All dimensions are nominal.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

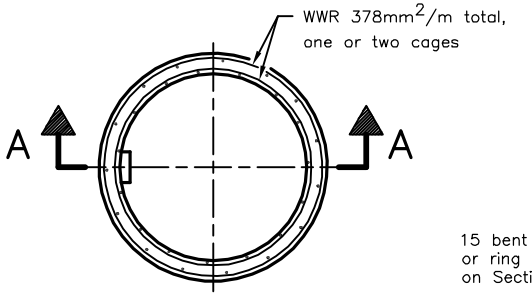
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 1800mm DIAMETER TRANSITION SLABS

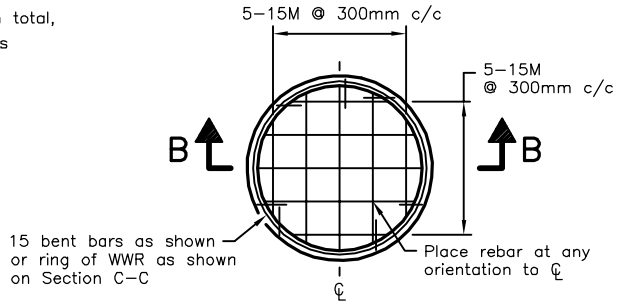
Nov 2014 | Rev 4

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

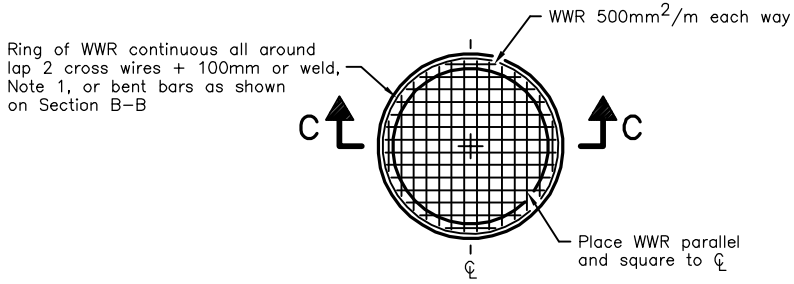
**OPSD 701.050**



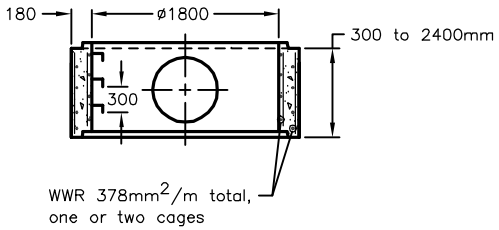

PLAN OF RISER
WITH WWR



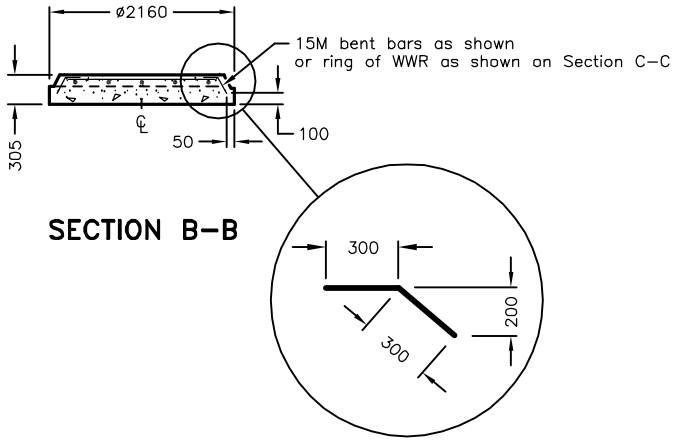

PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



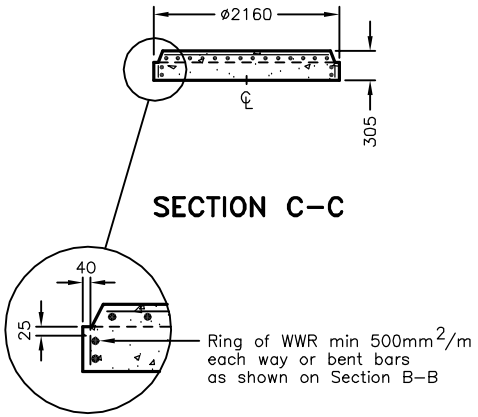

PLAN OF BASE SLAB
WITH WWR




SECTION A–A




SECTION B–B




SECTION C–C

## NOTES:

1 Welded splice shall develop 50% of yield strength of wires.

A This OPSD shall be read in conjunction with OPSD 701.050.

B If single cage of reinforcement in riser, centre reinforcement in wall ±25mm. All other reinforcing steel shall have 25mm minimum cover.

C Steps shall be according to OPSD 405.010 or 405.020.

D All dimensions are nominal.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

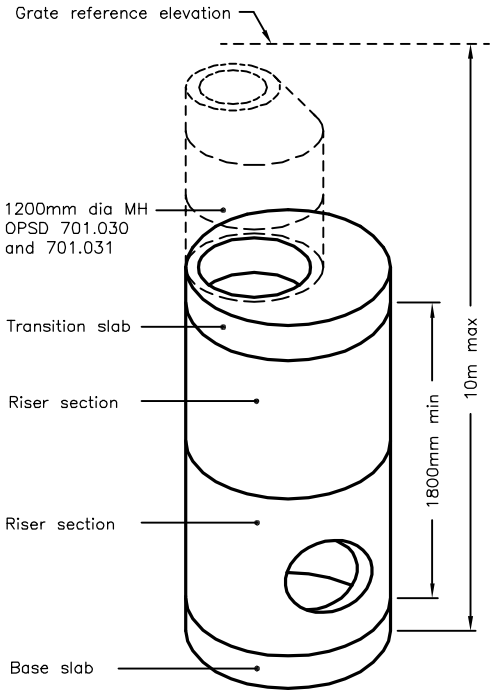
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 1800mm DIAMETER RISER AND BASE SLAB

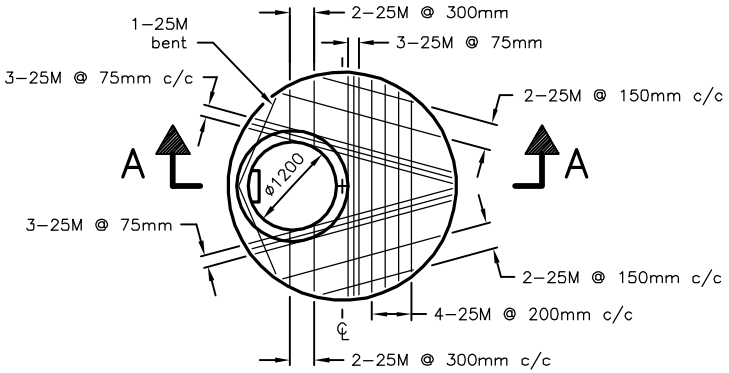
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

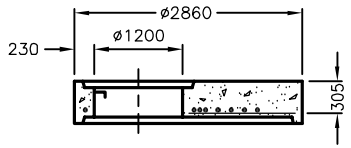
OPSD 701.051



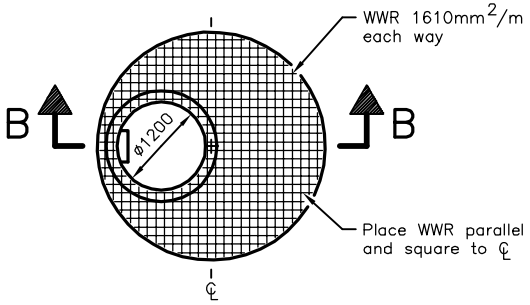

**2400 to 1200mm DIAMETER MAINTENANCE HOLE**



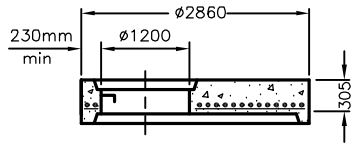

**PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS**




**SECTION A–A**




**PLAN OF TRANSITION SLAB WITH WWR**




**SECTION B–B**

## NOTES:

A This OPSD shall be read in conjunction with OPSD 701.061.
B All reinforcing steel shall have 25mm minimum cover.
C Steps shall be according to OPSD 405.010 or 405.020.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

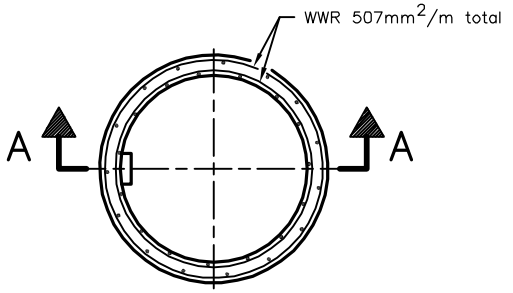
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 2400mm DIAMETER TRANSITION SLAB

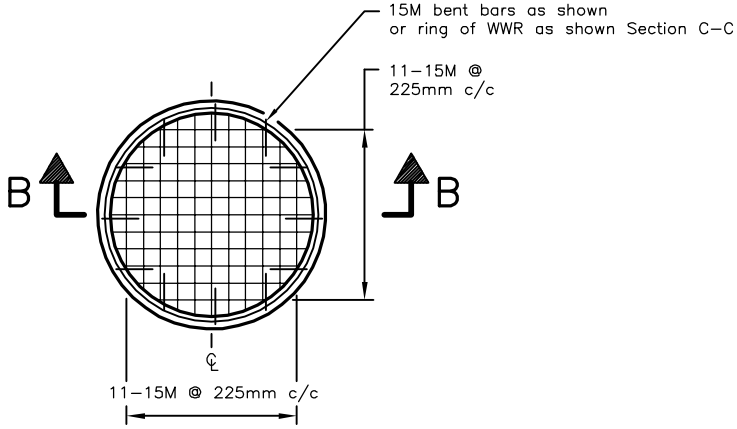
Nov 2014 | Rev 4

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

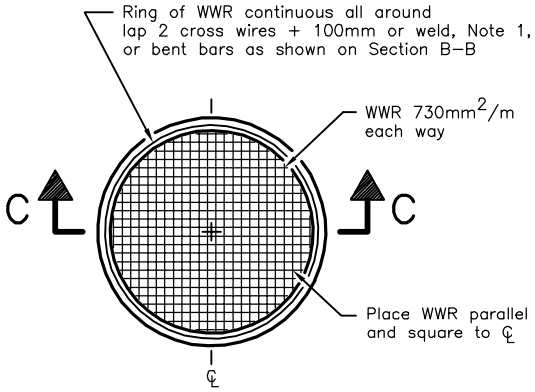
**OPSD 701.060**



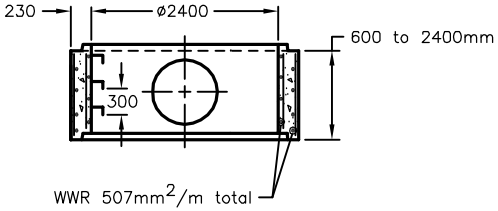

PLAN OF RISER



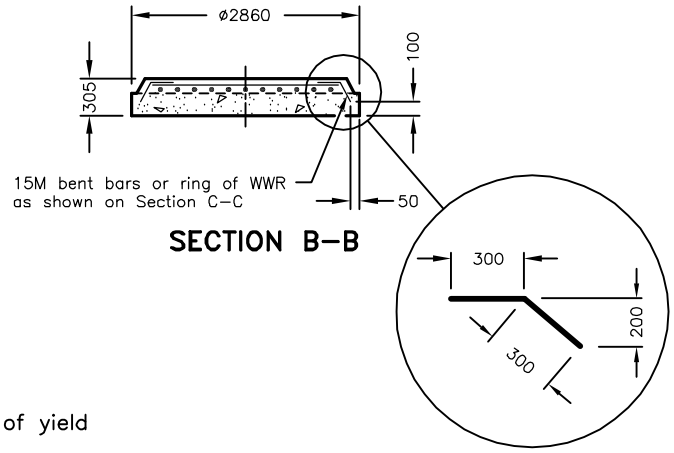

PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



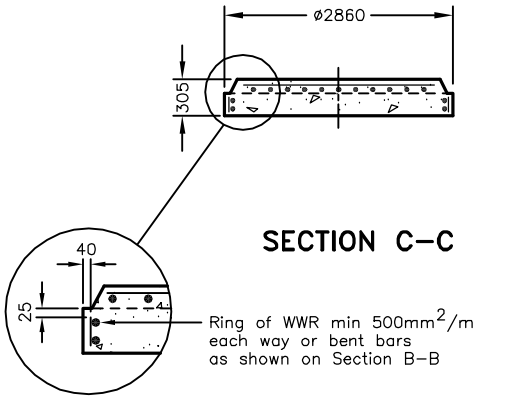

PLAN OF BASE SLAB
WITH WWR




SECTION A–A




SECTION B–B




SECTION C–C

## NOTES:

1 Welded splice shall develop minimum 50% of yield strength of wires.

A This OPSD shall be read in conjunction with OPSD 701.060.

B All reinforcing steel shall have 25mm minimum cover.

C Steps shall be according to OPSD 405.010 or 405.020.

D All dimensions are nominal.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

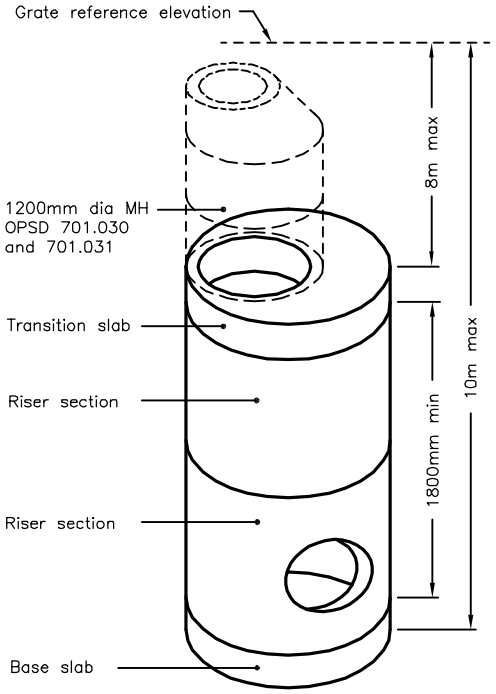
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 2400mm DIAMETER RISER AND BASE SLAB

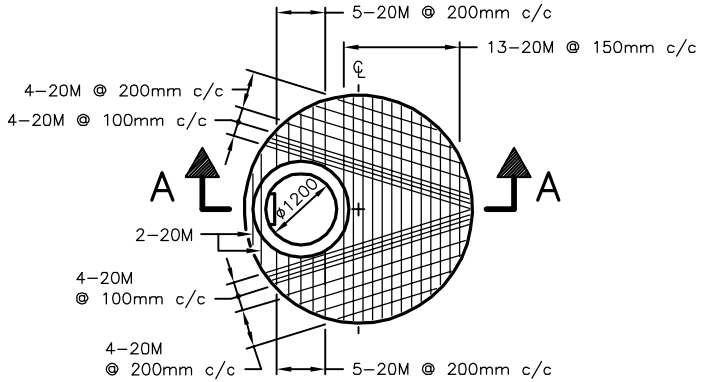
Nov 2014 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

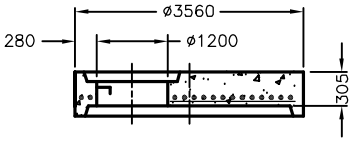
# OPSD 701.061



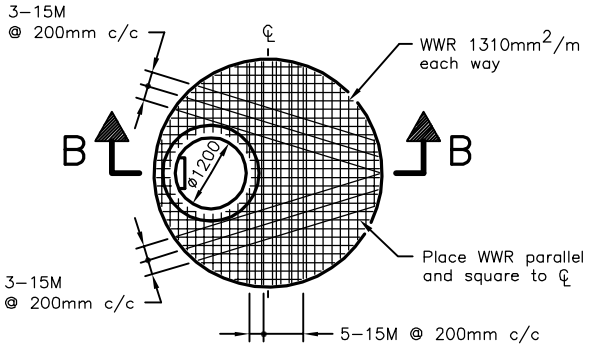

**3000 to 1200mm DIAMETER MAINTENANCE HOLE**



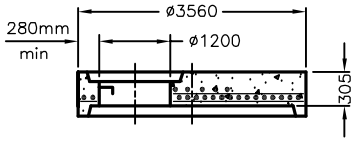

**PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS**




**SECTION A–A**




**PLAN OF TRANSITION SLAB WITH WWR AND REINFORCING STEEL BARS**




**SECTION B–B**

## NOTES:

A This OPSD shall be read in conjunction with OPSD 701.071.
B All reinforcing steel shall have 25mm minimum cover.
C Steps shall be according to OPSD 405.010 or 405.020.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

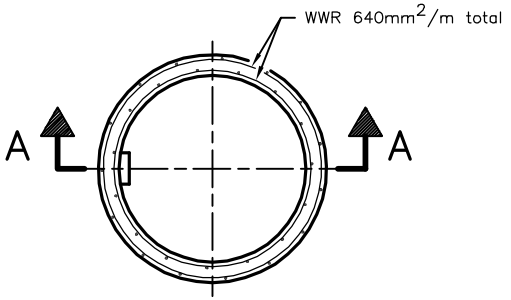
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 3000mm DIAMETER TRANSITION SLAB

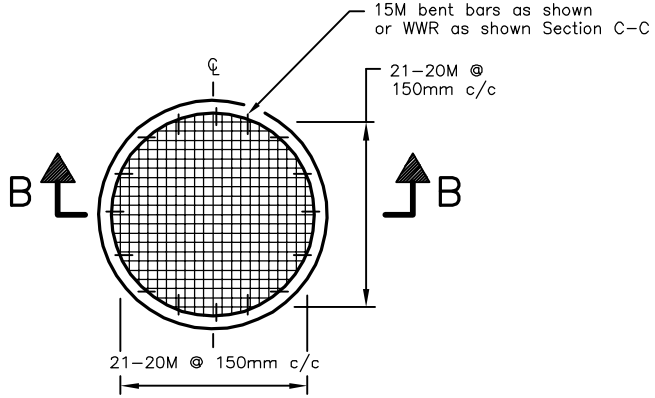
Nov 2014 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

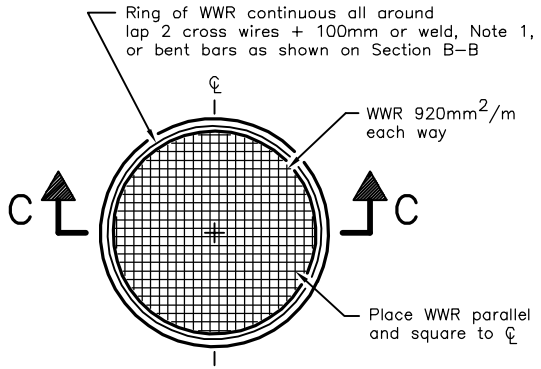
**OPSD 701.070**



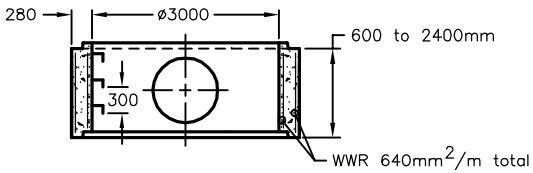

PLAN OF RISER



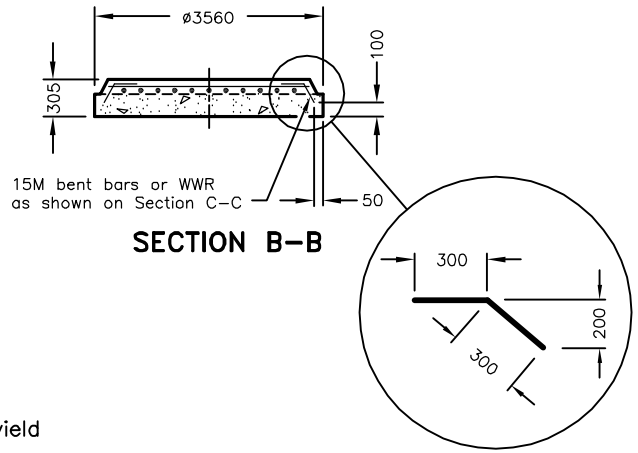

PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



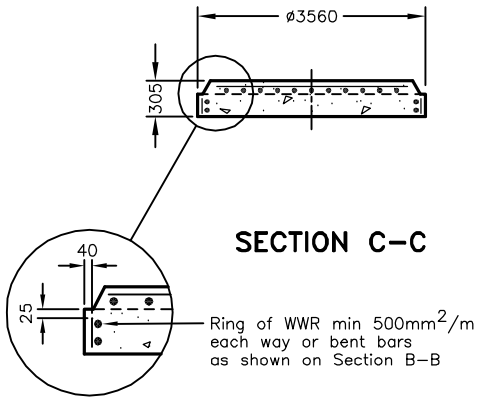

PLAN OF BASE SLAB
WITH WWR




SECTION A–A




SECTION B–B




SECTION C–C

## NOTES:

1 Welded splice shall develop minimum 50% of yield strength of reinforcing steel bars or wire, as applicable.

A This OPSD shall be read in conjunction with OPSD 701.070.
B All reinforcing steel shall have 25mm minimum cover.
C Steps shall be according to OPSD 405.010 or 405.020.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

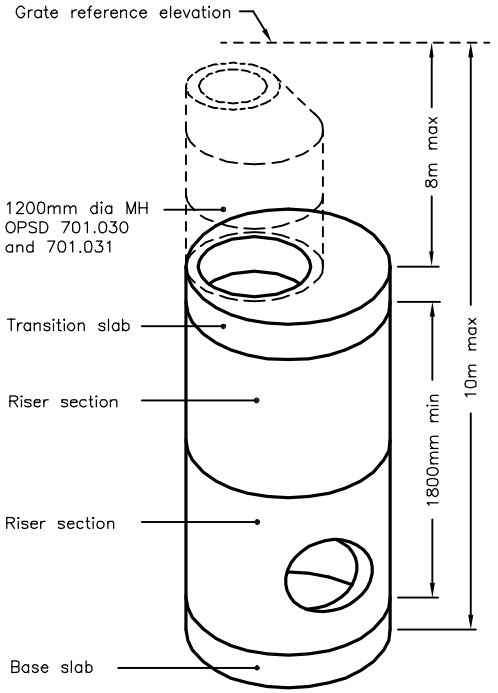
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

## 3000mm DIAMETER RISER AND BASE SLAB

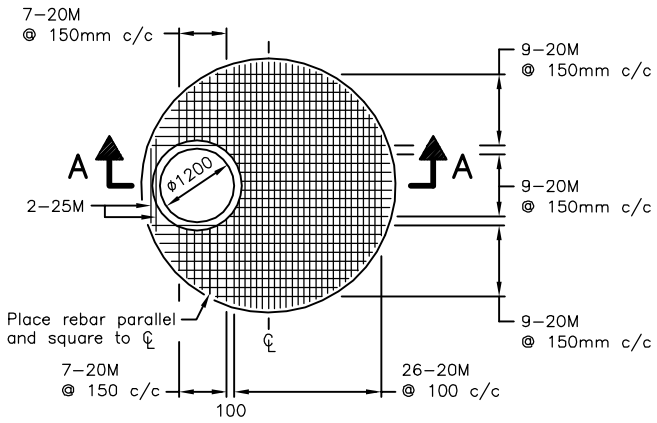
Nov 2014 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

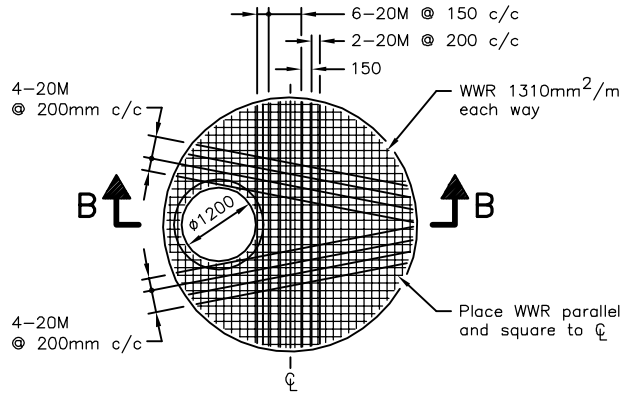
OPSD 701.071



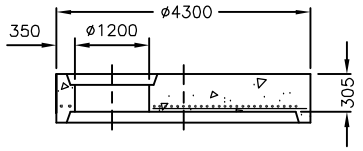

**3600 to 1200mm DIAMETER MAINTENANCE HOLE**



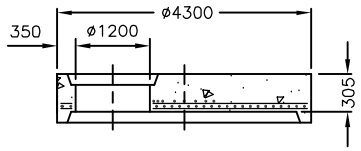

**PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS**




**PLAN OF TRANSITION SLAB WITH REINFORCING STEEL BARS AND WWR**




**SECTION A–A**

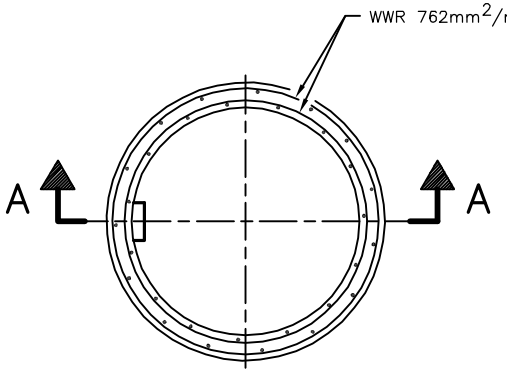



**SECTION B–B**

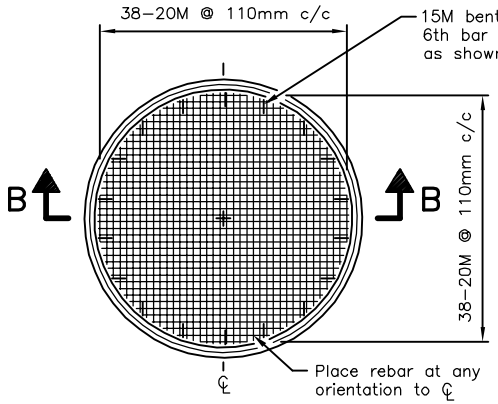
## NOTES:

A This OPSD shall be read in conjunction with OPSD 701.081.
B All reinforcing steel shall have 25mm minimum cover.
C Steps shall be according to OPSD 405.010 or 405.020.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

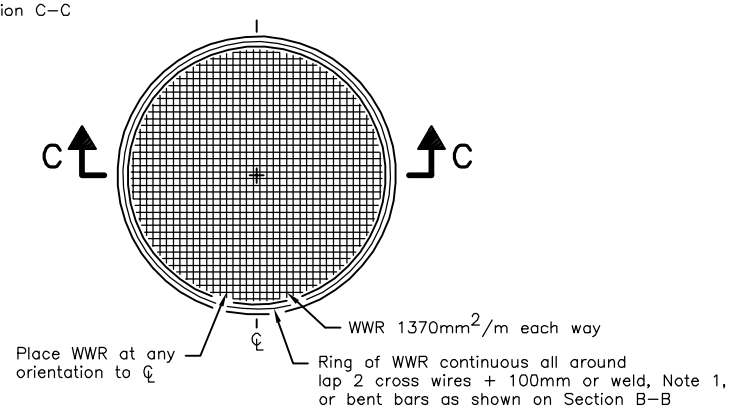
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 3 |
|---|---|---|---|
| **PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS**<br>3600mm DIAMETER<br>TRANSITION SLAB | | | |
| | | | **OPSD 701.080** |



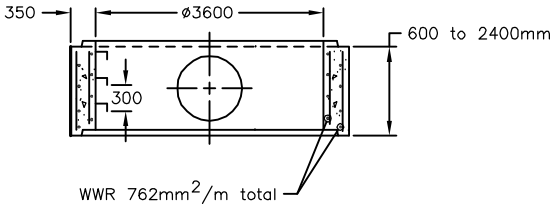

PLAN OF RISER



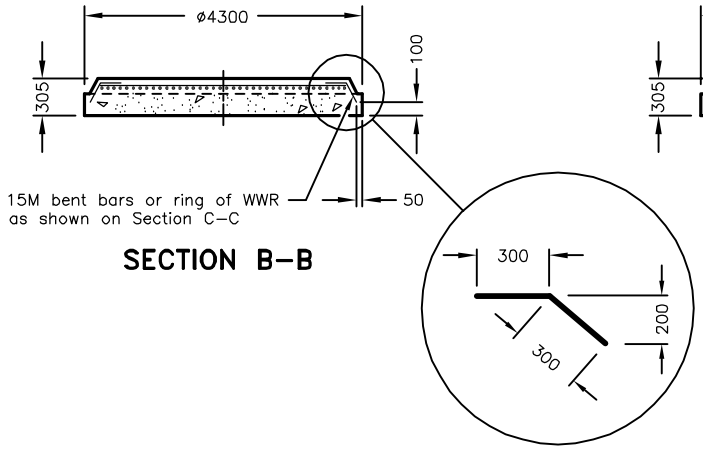

PLAN OF BASE SLAB
WITH REINFORCING STEEL BARS



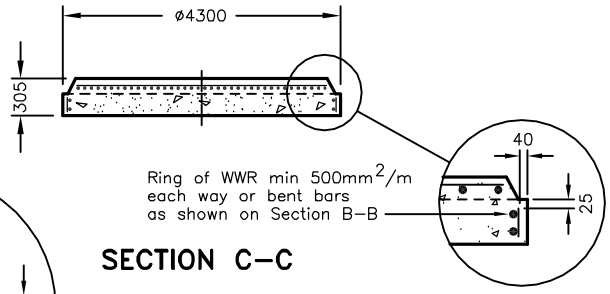

PLAN OF BASE SLAB
WITH WWR




SECTION A–A




SECTION B–B




SECTION C–C

## NOTES:

1 Welded splice shall develop minimum 50% of yield strength of reinforcing steel bars or wires, as applicable.

A This OPSD shall be read in conjunction with OPSD 701.080.

B All reinforcing steel shall have 25mm minimum cover.

C Steps shall be according to OPSD 405.010 or 405.020.

D All dimensions are nominal.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

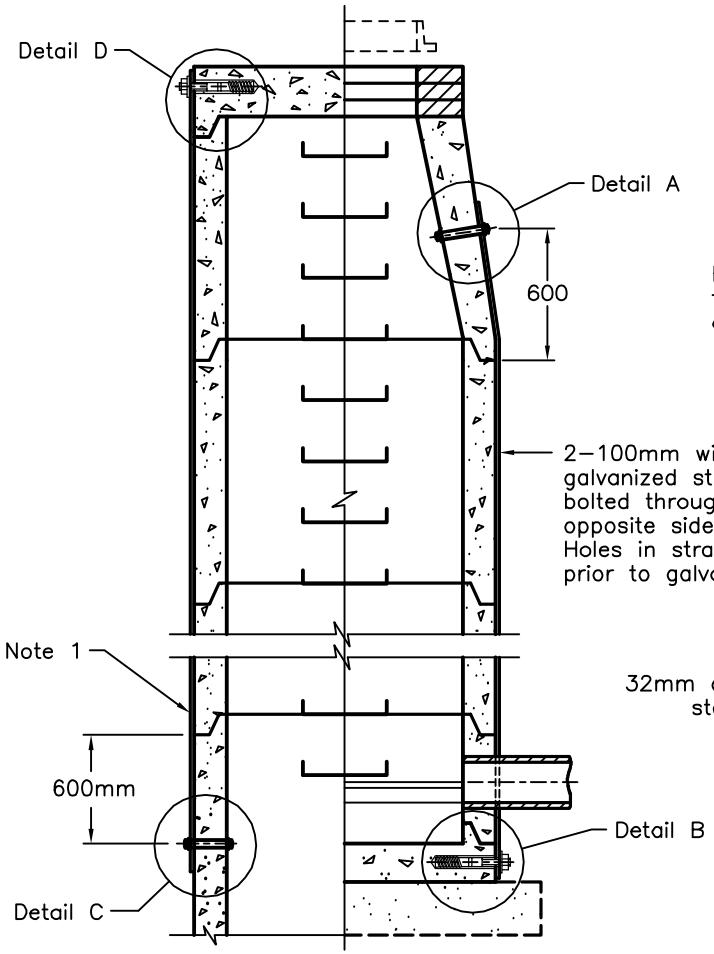
# PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS

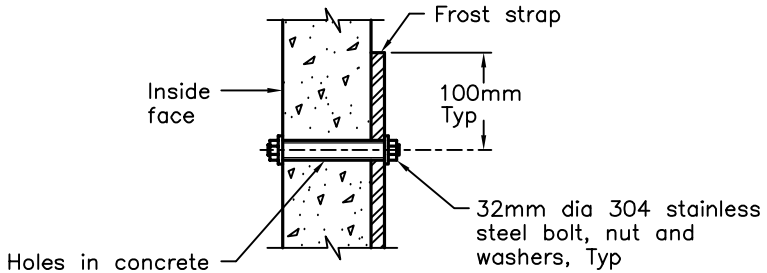
## 3600mm DIAMETER RISER AND BASE SLAB

Nov 2014 | Rev 2

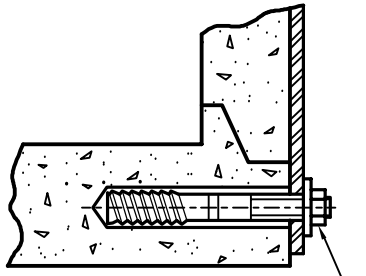
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

# OPSD 701.081

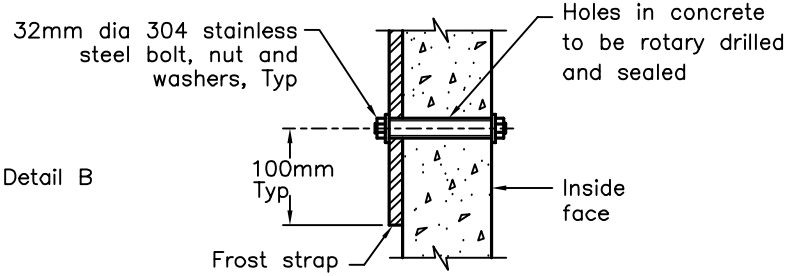


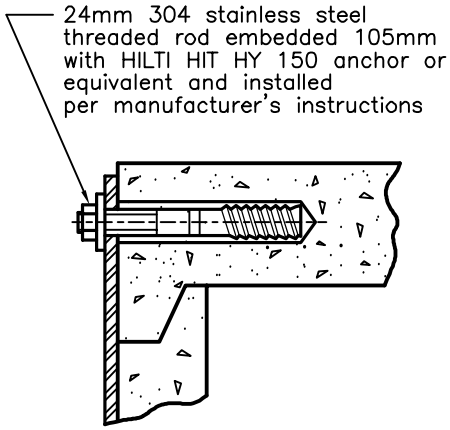

**DETAIL A**




**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.

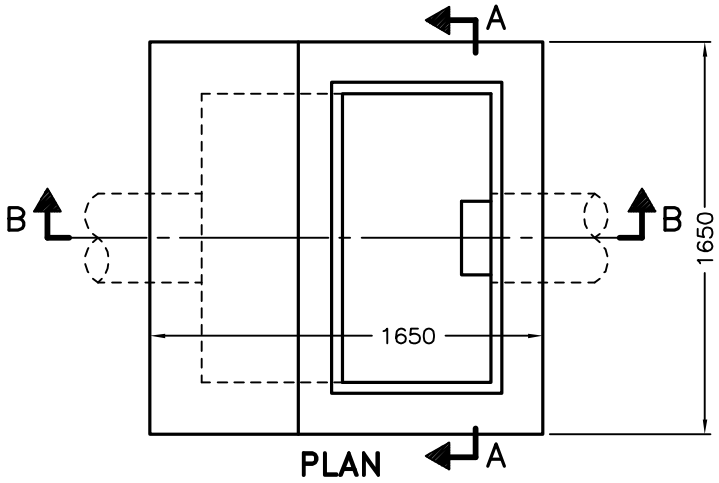
ONTARIO PROVINCIAL STANDARD DRAWING

# FROST STRAP INSTALLATION

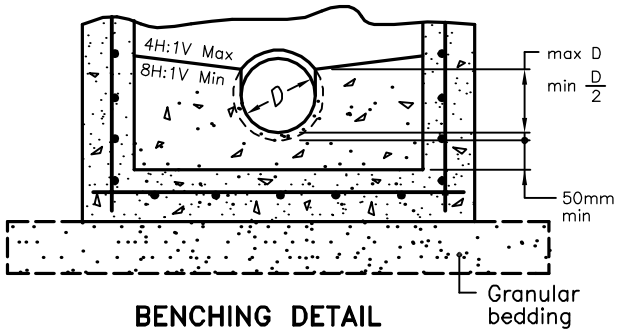
Nov 2010 | Rev 2

ONTARIO STANDARDS – MUNICIPAL – PROVINCIAL

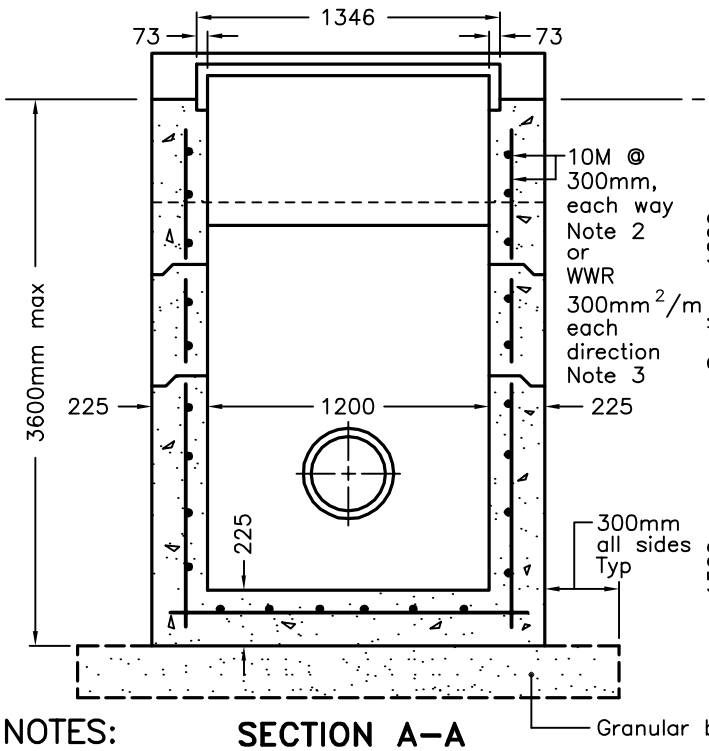
OPSD 701.100



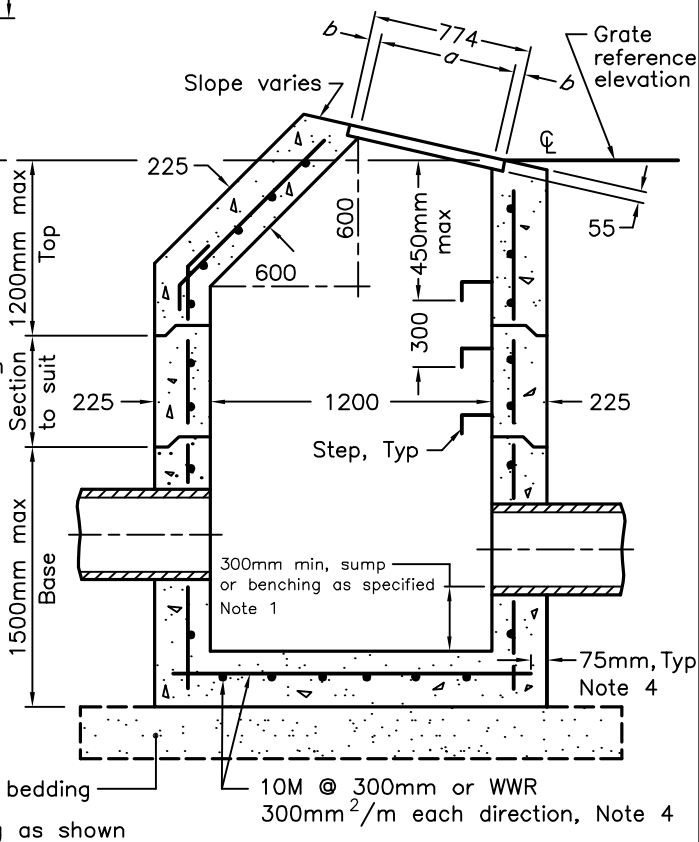

PLAN




BENCHING DETAIL




SECTION A–A




SECTION B–B

NOTES:

1 The sump is measured from the lowest invert. Benching as shown in Benching Detail.
2 Lap horizontal 10M rebar 300mm. Laps shall be placed at corners.
3 Lap horizontal wires 300mm or weld. Welds to develop 75% of yield strength of wire. Laps or welds shall be placed at corners.
4 End rebar or WWR in base 75mm from outside face of wall.

A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B Granular backfill shall be placed a minimum thickness of 300mm all around the ditch inlet maintenance hole.
C Concrete for benching shall be 30MPa.
D Benching slope and height shall be as specified.
E Grating shall be according to OPSD 403.010.
F Steps shall be according to OPSD 405.010 or 405.020.
G Maximum pipe size: straight through–1200mm dia; right angle pipes–700mm diameter.
H Pipe support shall be according to OPSD 708.020.
I Centre reinforcing in walls ±35mm. All other reinforcing shall have a minimum cover of 25mm.
J All dimensions are nominal.
K All dimensions are in millimetres unless otherwise shown.

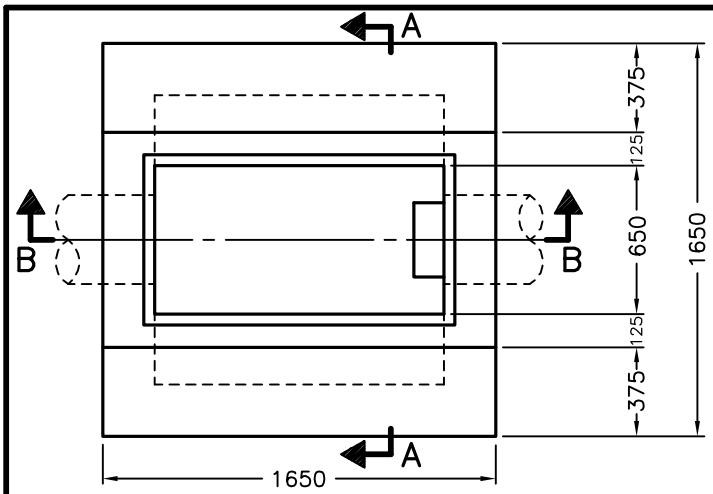
| Opening Dimensions | | | |
|---|---|---|---|
| Grate | | a | b |
| Type | Slope | | |
| B | 2H:1V | 670 | 52 |
| | 3H:1V | 632 | 71 |
| | 4H:1V | 618 | 78 |
| | 6H:1V | 608 | 83 |
| | HOR | 600 | 87 |

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 3

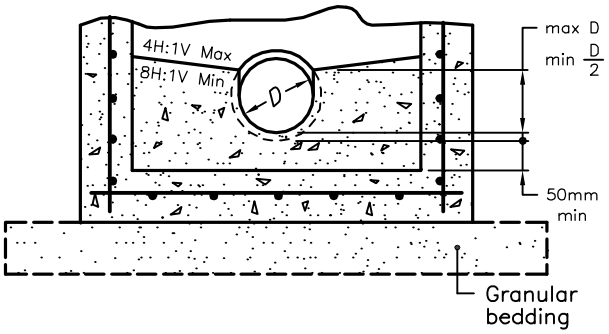
# PRECAST CONCRETE DITCH INLET MAINTENANCE HOLE – TYPE A

1200 x 1200mm

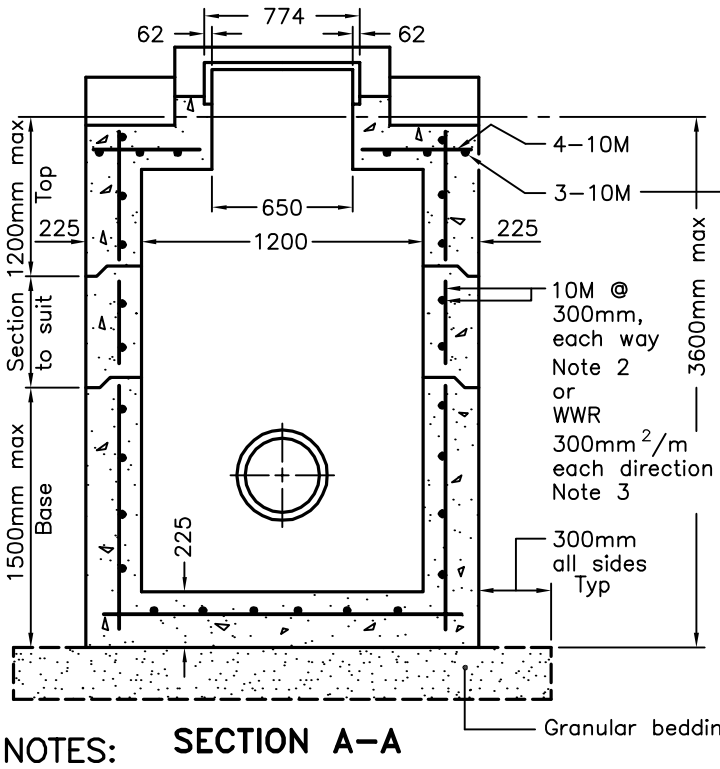
OPSD 702.040



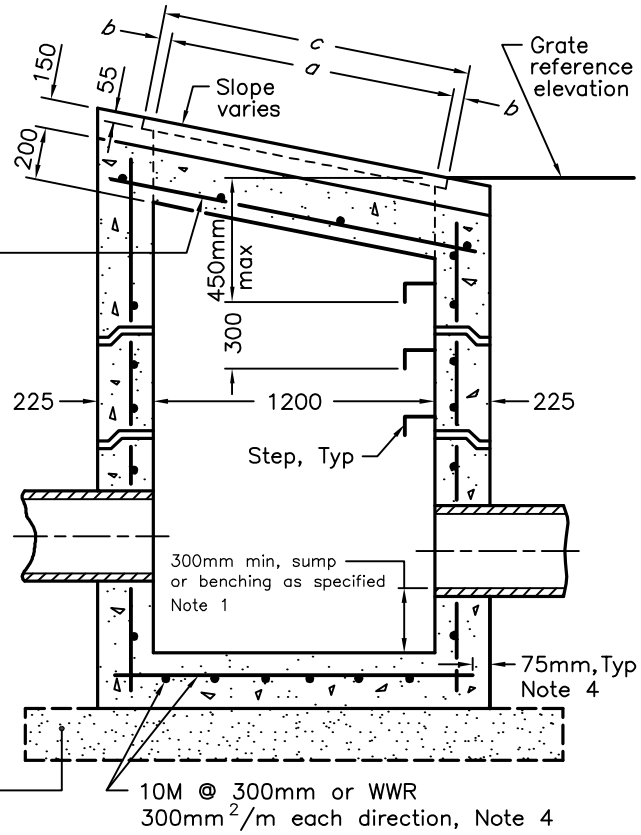

PLAN




BENCHING DETAIL




SECTION A–A




SECTION B–B

NOTES:

1 The sump is measured from the lowest invert. Benching as shown in Benching Detail.
2 Lap horizontal 10M rebar 300mm. Laps shall be placed at corners.
3 Lap horizontal wires 300mm or weld. Welds to develop 75% of yield strength of wire. Laps or welds shall be placed at corners.
4 End rebar or WWR in base 75mm from outside face of wall.
A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B Granular backfill shall be placed a minimum thickness of 300mm all around the ditch inlet maintenance hole.
C Concrete for benching shall be 30MPa.
D Benching slope and height shall be as specified.
E Grating shall be according to OPSD 403.010.
F Steps shall be according to OPSD 405.010 or 405.020.
G Maximum pipe size: straight through–1200mm dia; right angle pipes – – 700mm diameter.
H Pipe support shall be according to OPSD 708.020.
I Centre reinforcing in walls ±35mm. All other reinforcing shall have a minimum cover of 25mm.
J All dimensions are nominal.
K All dimensions are in millimetres unless otherwise shown.

| Opening Dimensions | | | | |
|---|---|---|---|---|
| Grate | | a | b | c |
| Type | Slope | | | |
| C | 2H:1V | 1341 | 66 | 1473 |
| | 3H:1V | 1265 | 104 | 1473 |
| | 4H:1V | 1237 | 118 | 1473 |
| B | 6H:1V | 1216 | 65 | 1346 |
| | 8H:1V | 1210 | 68 | 1346 |
| | 10H:1V | 1206 | 70 | 1346 |
| | HOR | 1200 | 73 | 1346 |

ONTARIO PROVINCIAL STANDARD DRAWING

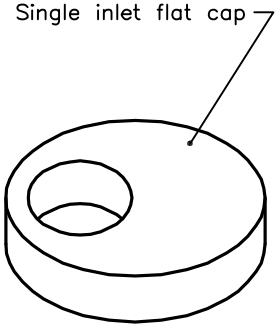
Nov 2014 | Rev 3

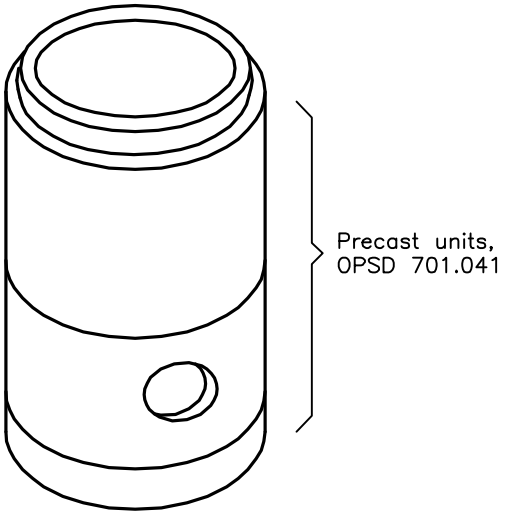
# PRECAST CONCRETE DITCH INLET MAINTENANCE HOLE – TYPE B

1200 x 1200mm

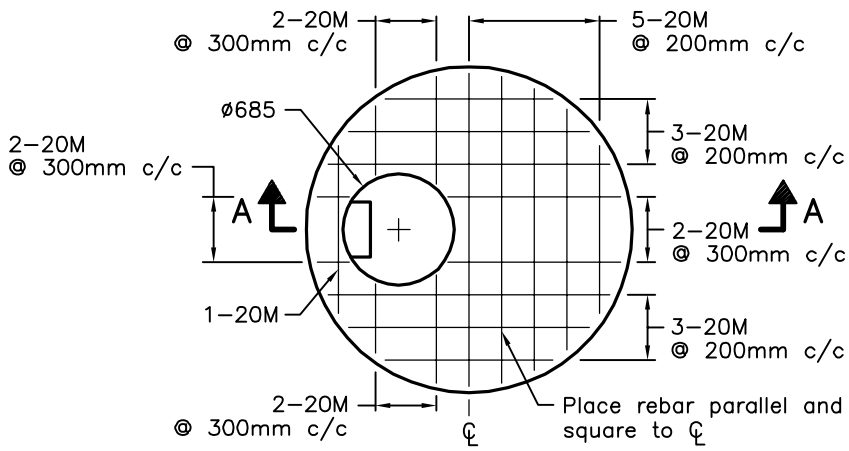
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 702.050

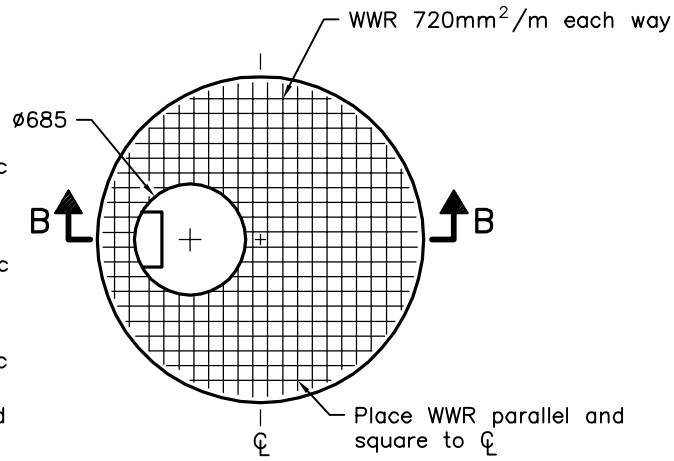


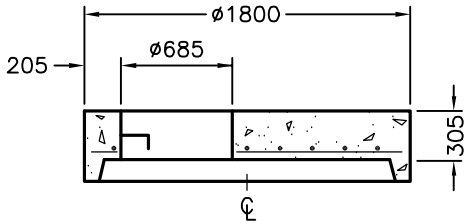

**1500mm DIAMETER MAINTENANCE HOLE**



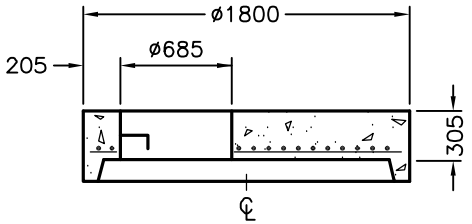

**PLAN OF FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF FLAT CAP WITH WWR**




**SECTION A–A**




**SECTION B–B**

NOTES:

A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

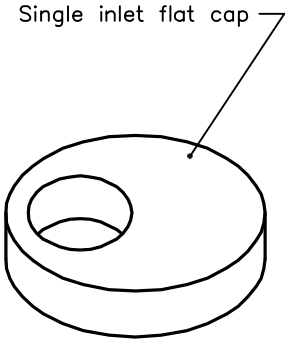
ONTARIO PROVINCIAL STANDARD DRAWING

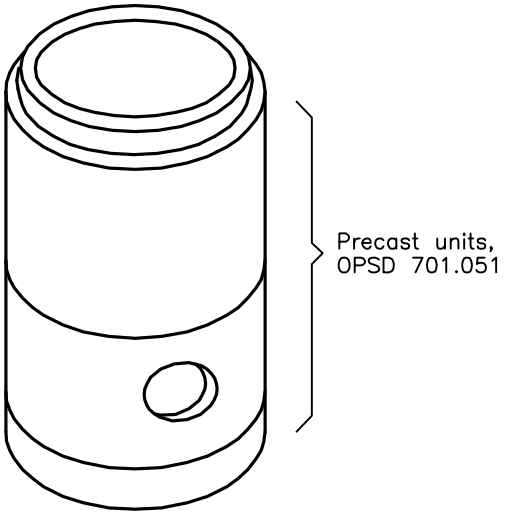
# PRECAST CONCRETE SINGLE INLET FLAT CAP

1500mm DIAMETER

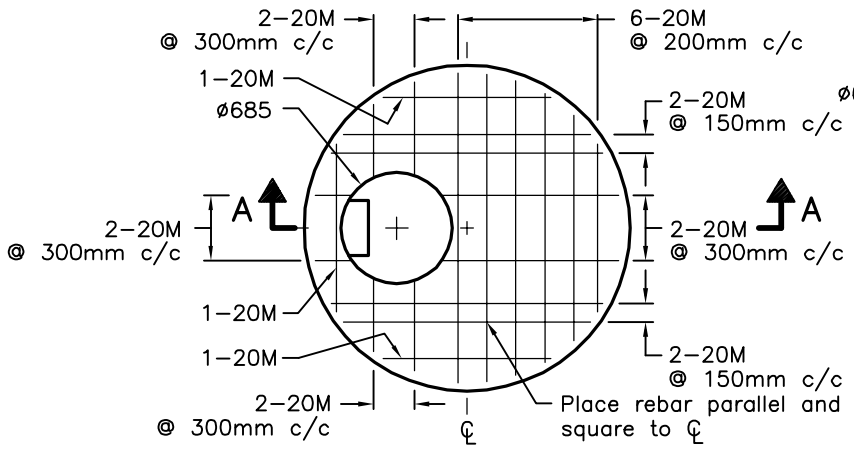
| Nov 2014 | Rev | 2 |
|---|---|---|

OPSD 703.011

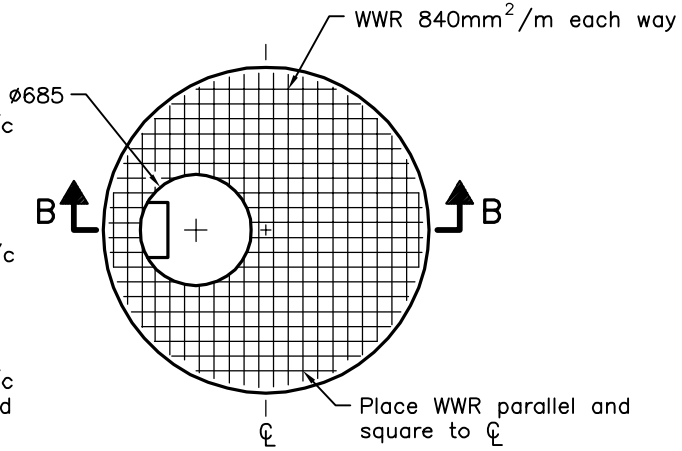


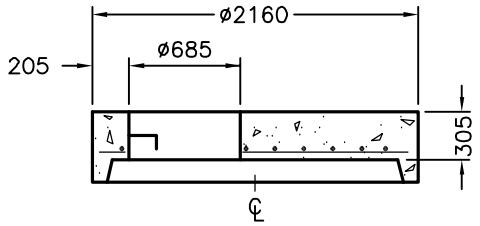

**1800mm DIAMETER MAINTENANCE HOLE**



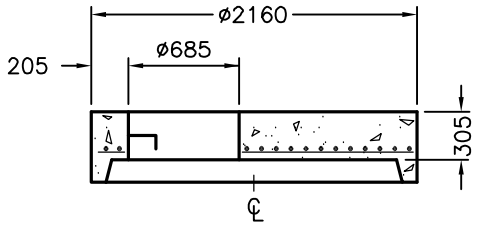

**PLAN OF FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF FLAT CAP WITH WWR**




**SECTION A–A**




**SECTION B–B**

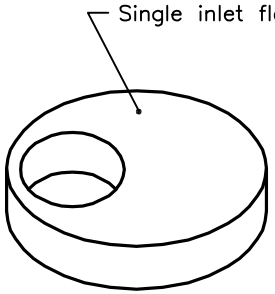
NOTES:

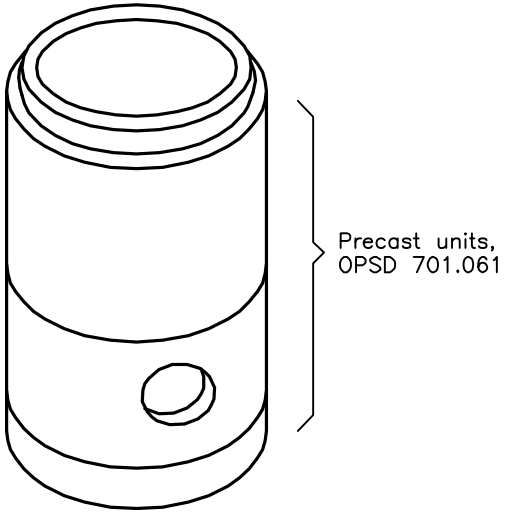
A All reinforcing steel shall have 25mm minimum cover.

B All dimensions are nominal.

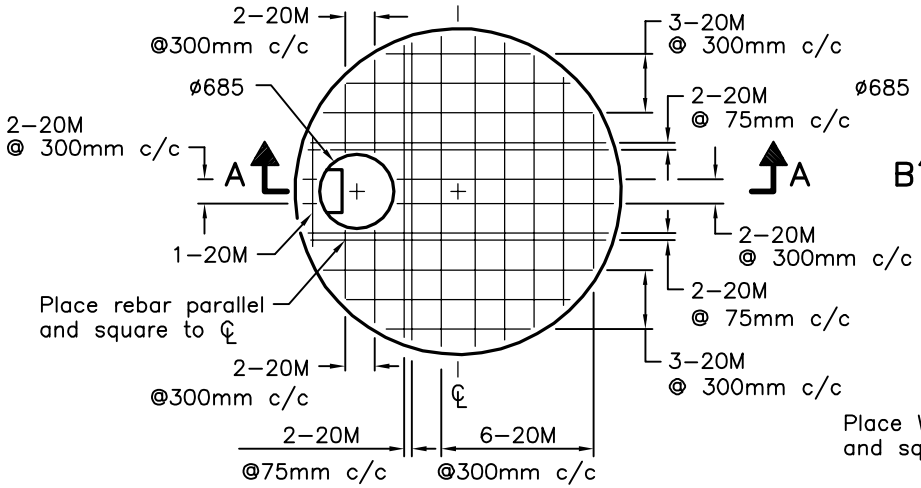
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| **PRECAST CONCRETE SINGLE INLET FLAT CAP** 1800mm DIAMETER | | | |
| | **OPSD 703.012** | | |

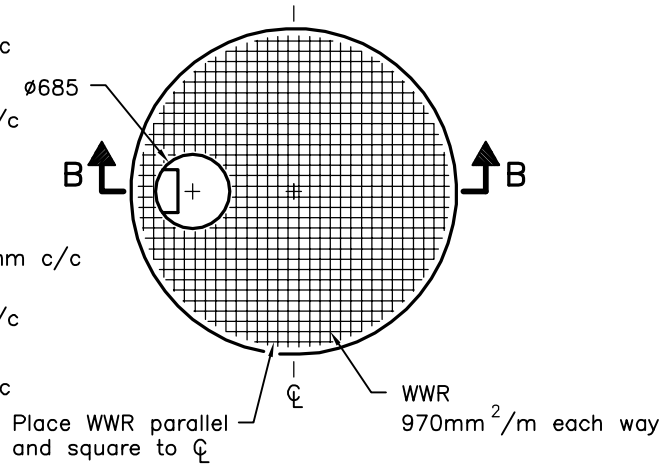


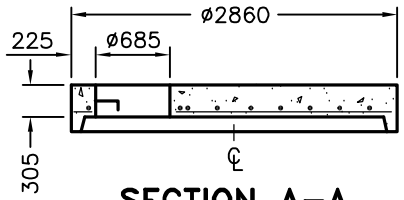

**2400mm DIAMETER MAINTENANCE HOLE**



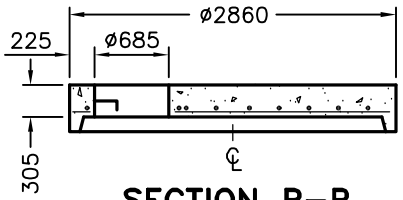

**PLAN OF FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF FLAT CAP WITH WWR**




**SECTION A–A**

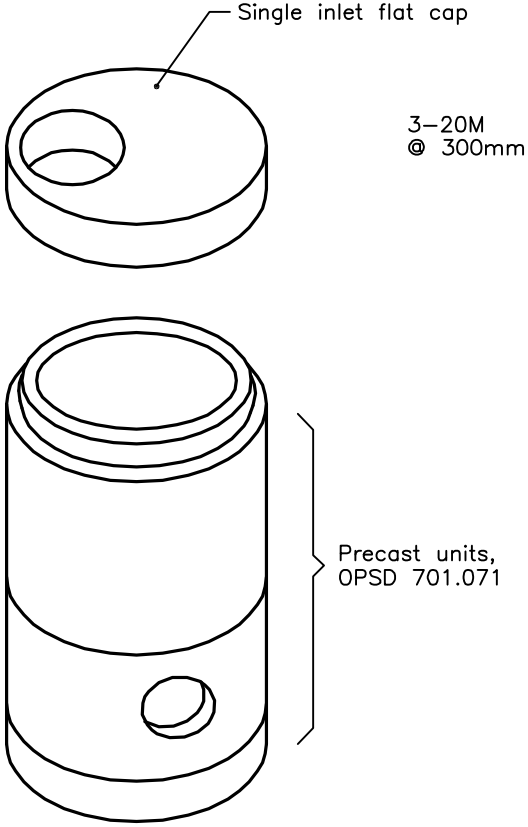



**SECTION B–B**

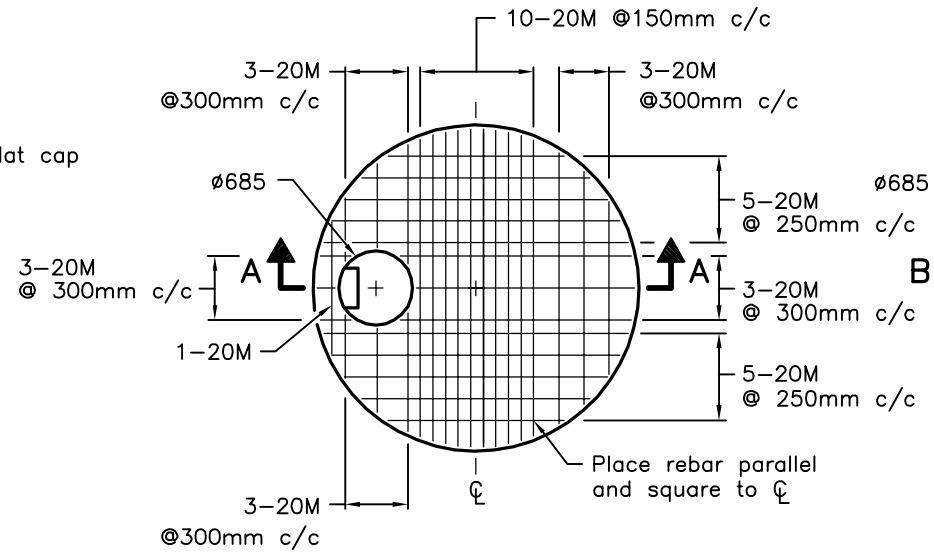
NOTES:

A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

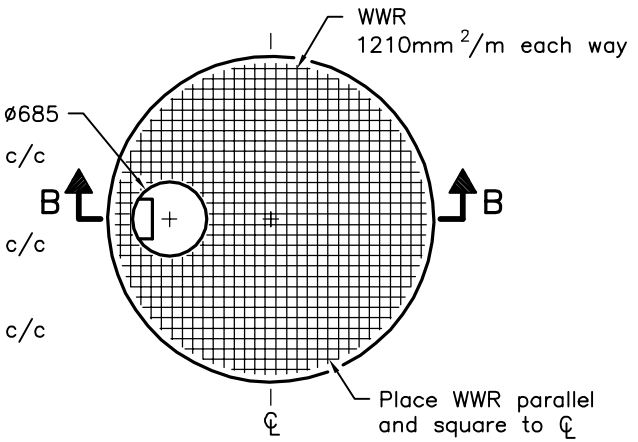
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| PRECAST CONCRETE<br>SINGLE INLET FLAT CAP<br>2400mm DIAMETER | | | |
| | OPSD 703.013 | | |



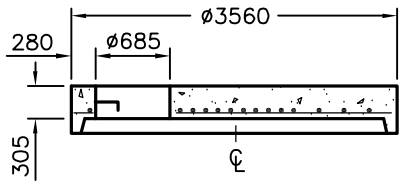

**3000mm DIAMETER MAINTENANCE HOLE**



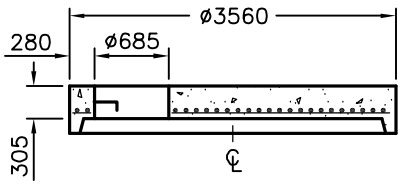

**PLAN OF FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF FLAT CAP WITH WWR**




**SECTION A–A**




**SECTION B–B**

NOTES:

A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

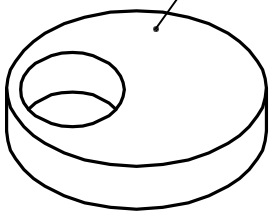
# PRECAST CONCRETE SINGLE INLET FLAT CAP

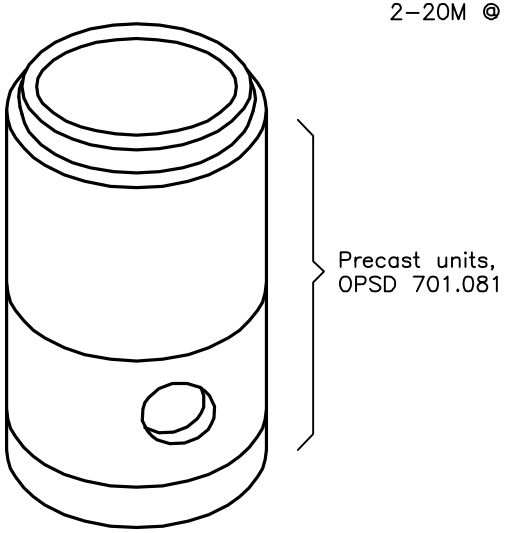
3000mm DIAMETER

| Nov 2014 | Rev | 2 |
|---|---|---|

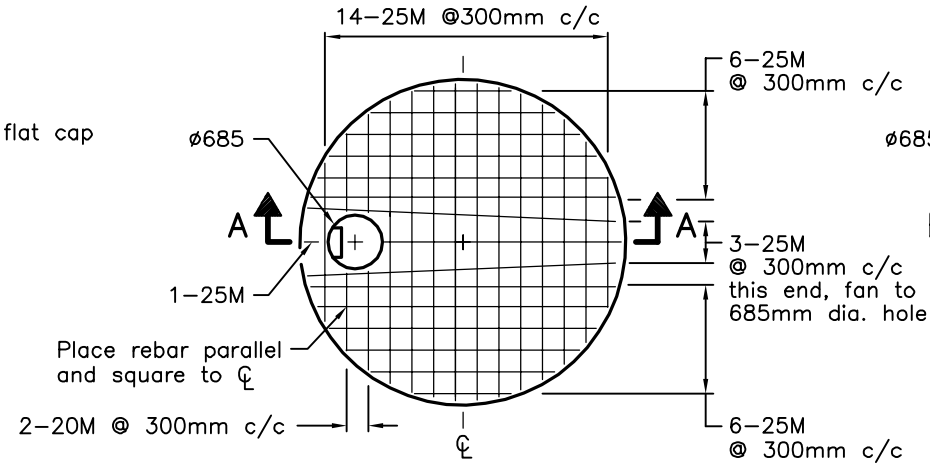
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

**OPSD 703.014**

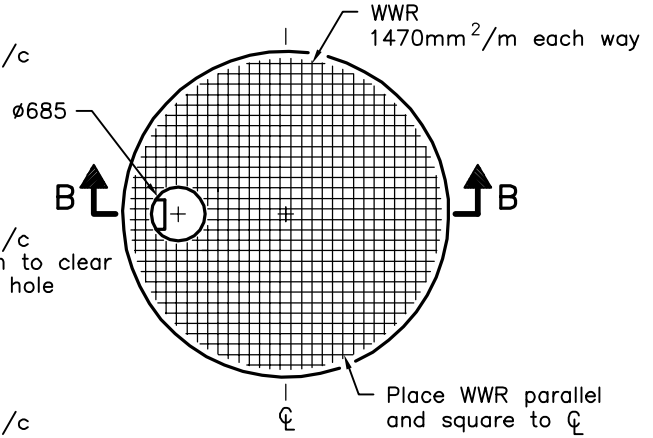


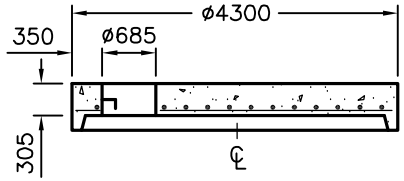

**3600mm DIAMETER MAINTENANCE HOLE**



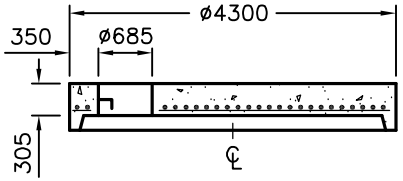

**PLAN OF FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF FLAT CAP WITH WWR**




**SECTION A–A**

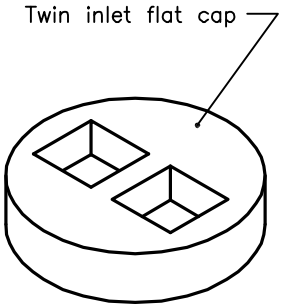


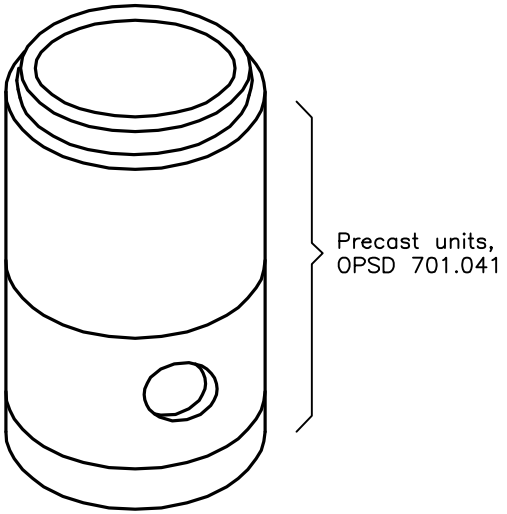

**SECTION B–B**

NOTES:

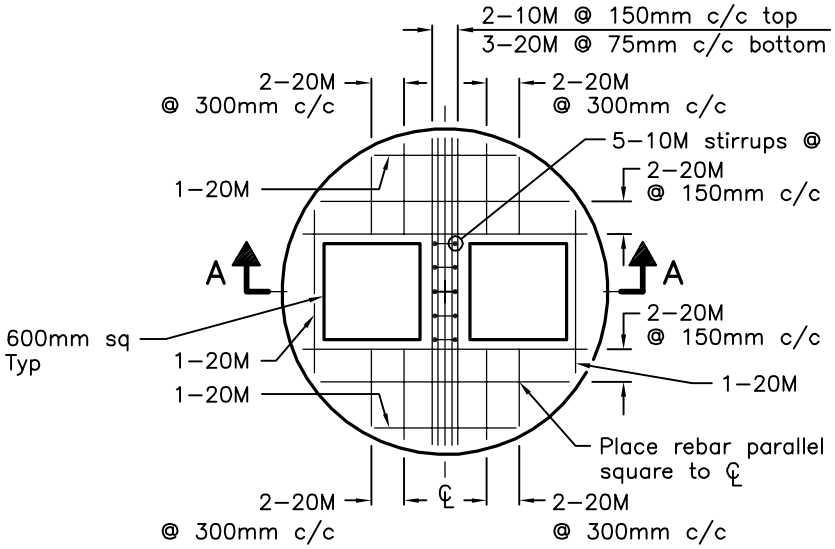
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| PRECAST CONCRETE<br>SINGLE INLET FLAT CAP<br>3600mm DIAMETER | | | |
| | OPSD 703.015 | | |

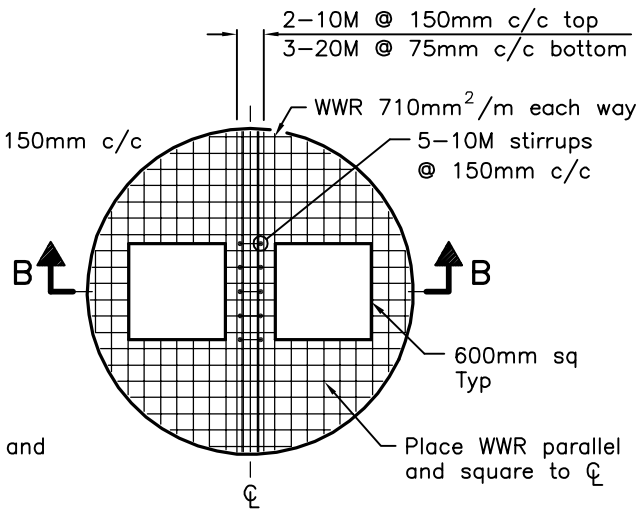


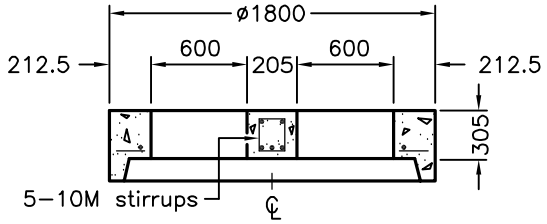

**1500mm DIAMETER MAINTENANCE HOLE**



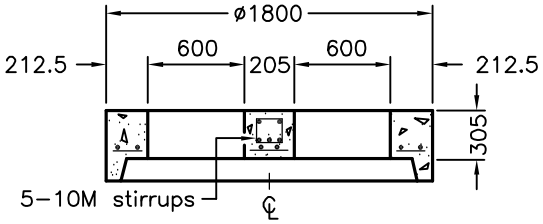

**PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF TWIN INLET FLAT CAP WITH WWR**




**SECTION A–A**

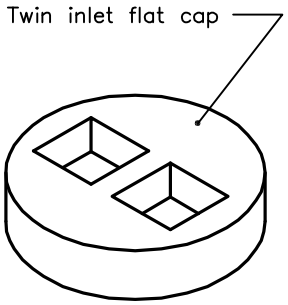


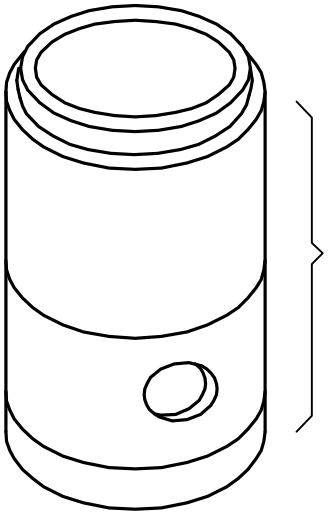

**SECTION B–B**

NOTES:

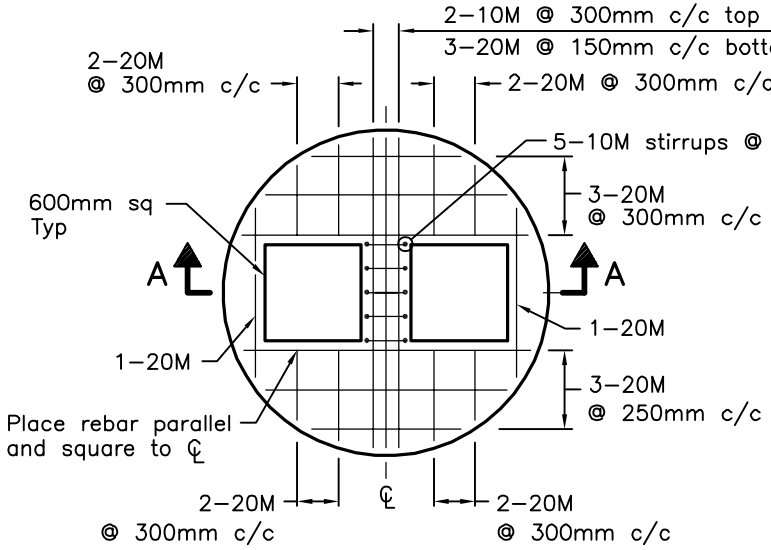
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| **PRECAST CONCRETE TWIN INLET FLAT CAP** 1500mm DIAMETER | | | |
| | | | **OPSD 703.021** |

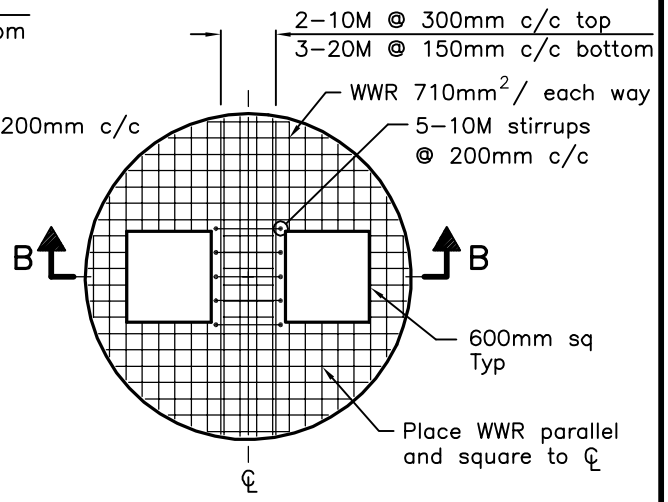


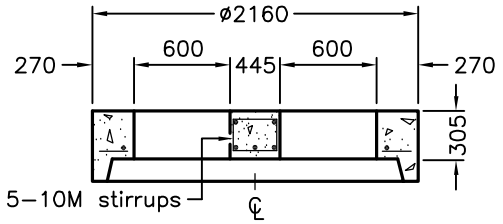

**1800mm DIAMETER MAINTENANCE HOLE**



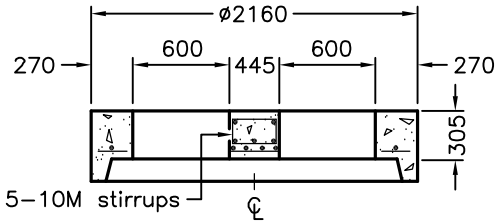

**PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF TWIN INLET FLAT CAP WITH WWR**




**SECTION A–A**

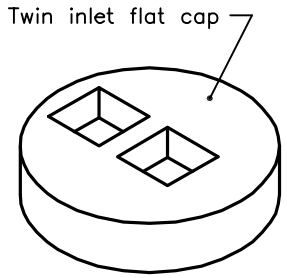


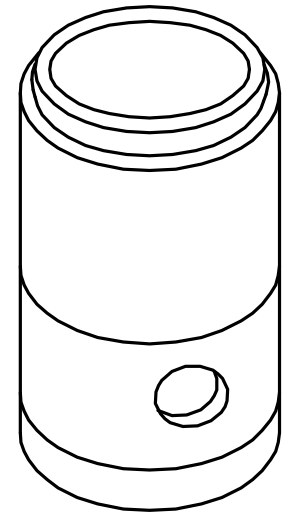

**SECTION B–B**

NOTES:

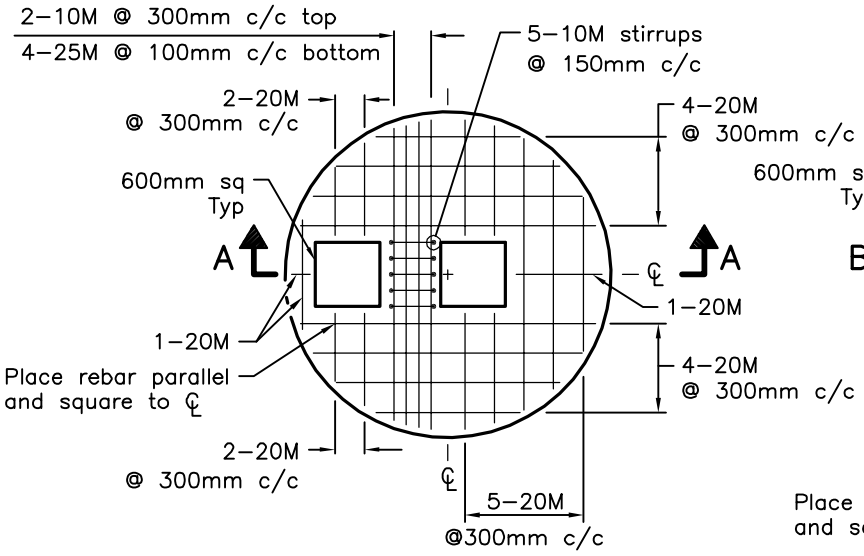
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| **PRECAST CONCRETE TWIN INLET FLAT CAP** 1800mm DIAMETER | | | |
| | **OPSD 703.022** | | |

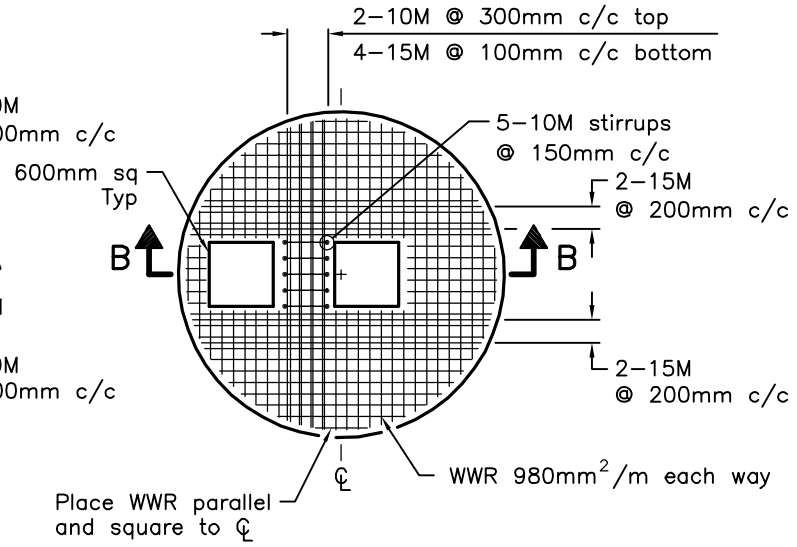


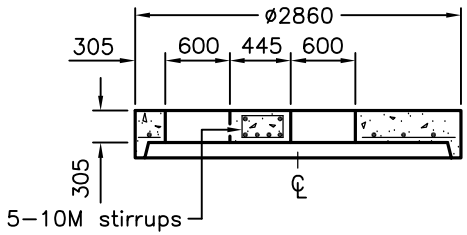

**2400mm DIAMETER MAINTENANCE HOLE**



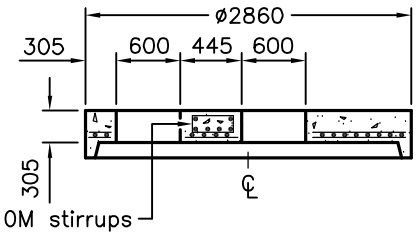

**PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF TWIN INLET FLAT CAP WITH WWR**




**SECTION A–A**

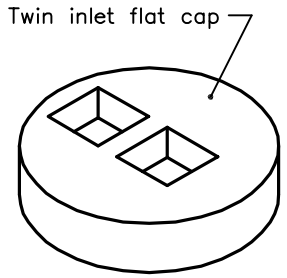


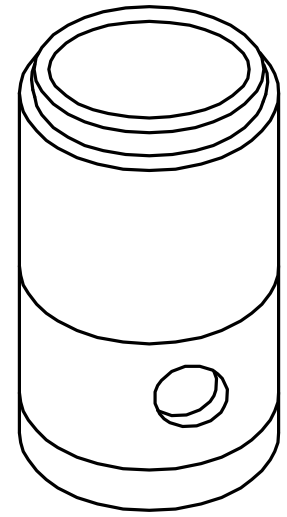

**SECTION B–B**

NOTES:

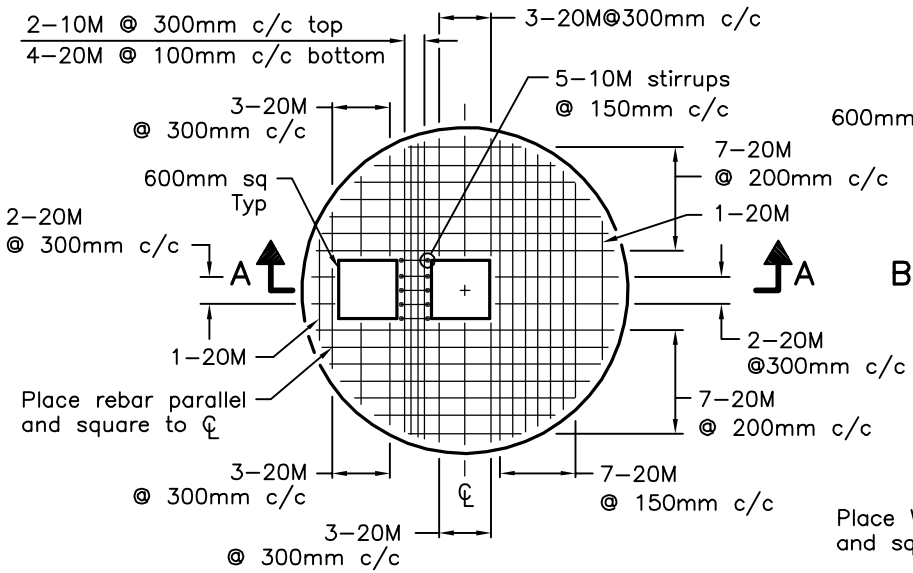
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| **PRECAST CONCRETE TWIN INLET FLAT CAP** 2400mm DIAMETER | | | |
| | | | **OPSD 703.023** |

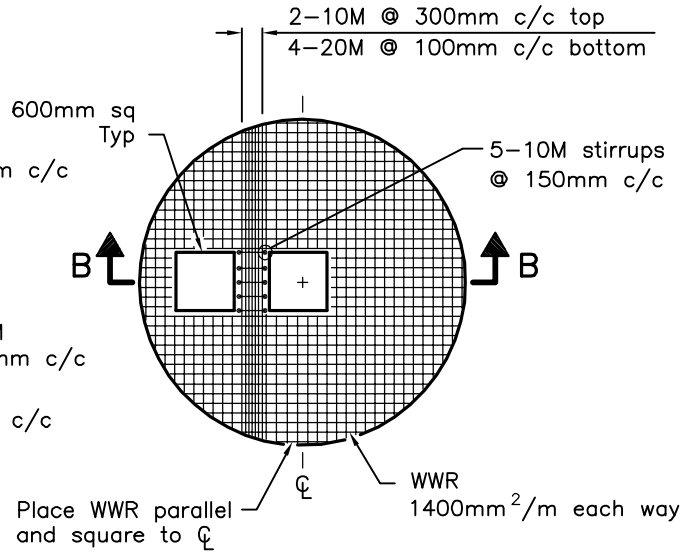


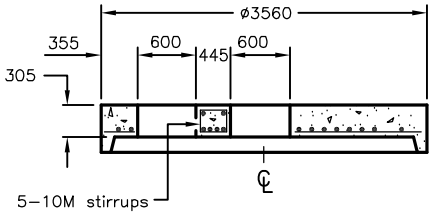

**3000mm DIAMETER MAINTENANCE HOLE**



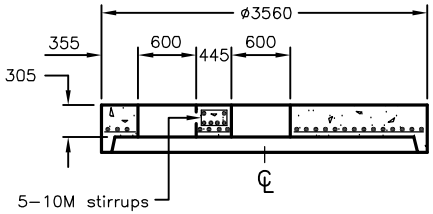

**PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS**




**PLAN OF TWIN INLET FLAT CAP WITH WWR AND REINFORCING STEELBARS**




**SECTION A–A**

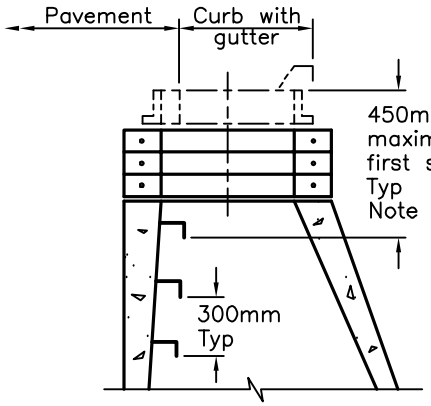



**SECTION B–B**

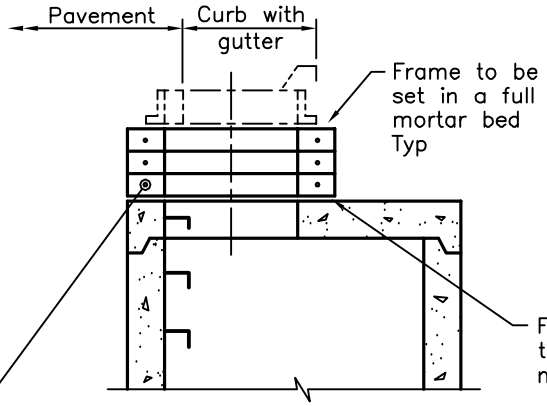
NOTES:

A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

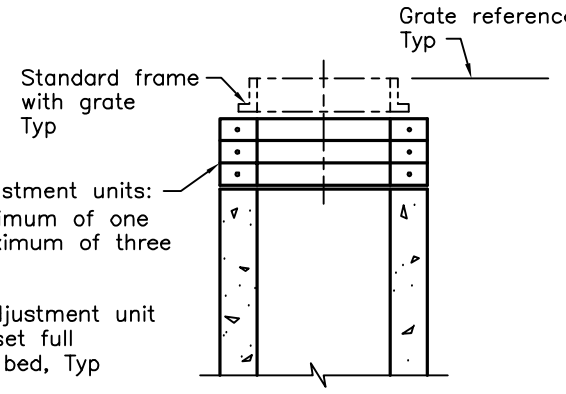
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| **PRECAST CONCRETE TWIN INLET FLAT CAP** 3000mm DIAMETER | | | |
| | | | **OPSD 703.024** |



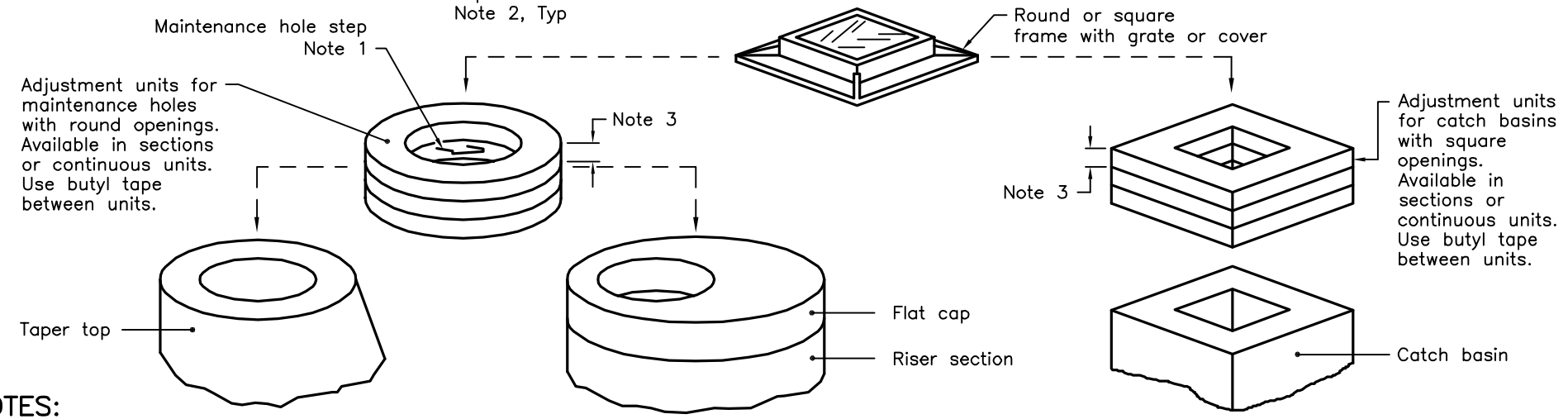

SECTION THROUGH TAPER TOP




SECTION THROUGH FLAT CAP




SECTION THROUGH CATCH BASIN




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 ±10mm.

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.

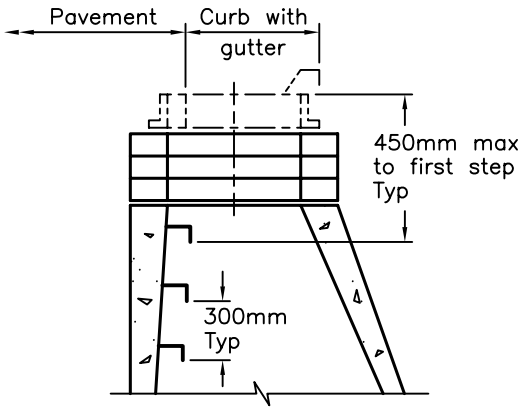
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

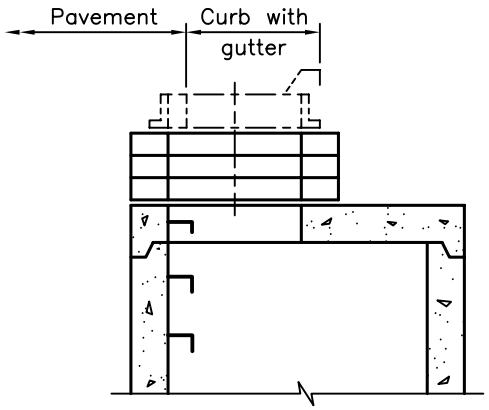
# PRECAST CONCRETE ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS

Nov 2014 | Rev 3

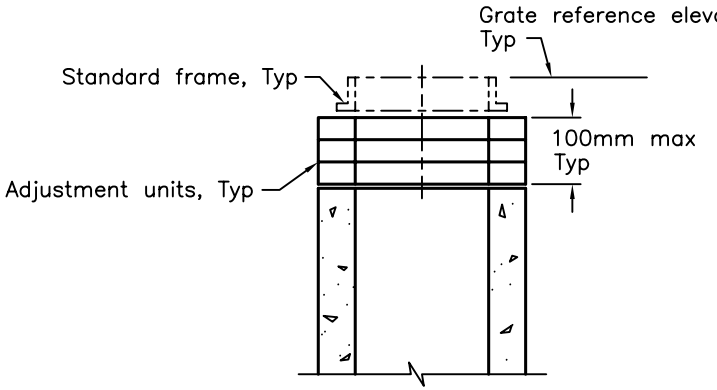
OPSD 704.010



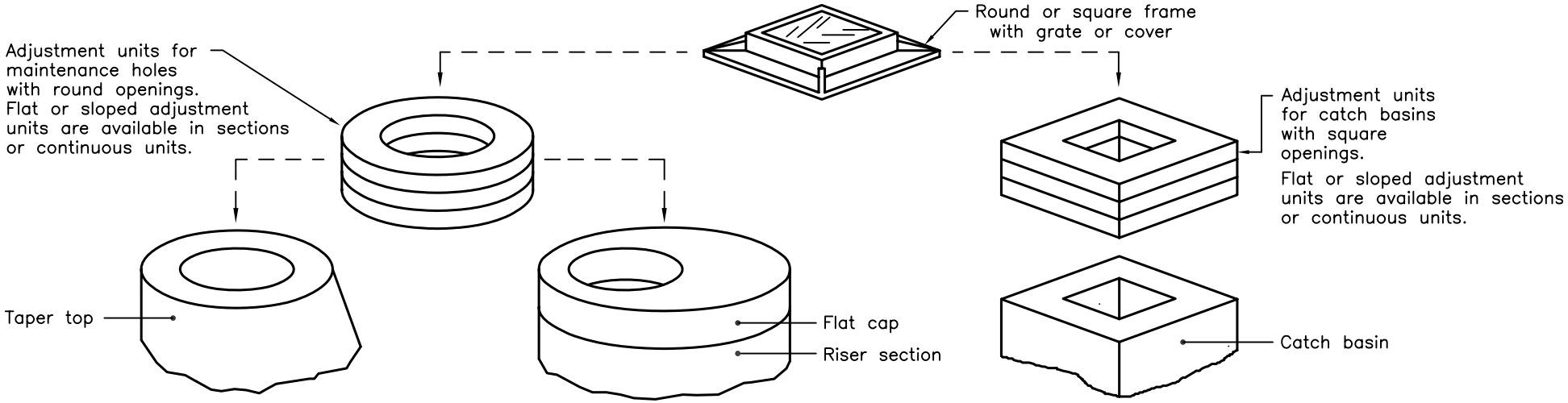

SECTION THROUGH TAPER TOP




SECTION THROUGH FLAT CAP




SECTION THROUGH CATCH BASIN




NOTES:

A Installation and sealing of adjustment units and frame shall be according to adjustment unit manufacturer's recommendations.

B Adjustment units shall not extend beyond the outside edge of the structure.

C All dimensions are in millimetres unless otherwise shown.

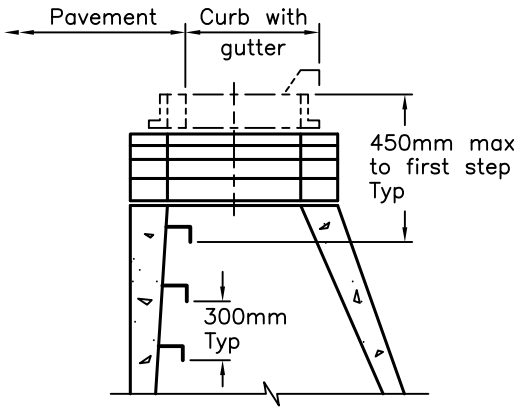
ONTARIO PROVINCIAL STANDARD DRAWING

# HIGH DENSITY POLYETHYLENE ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS

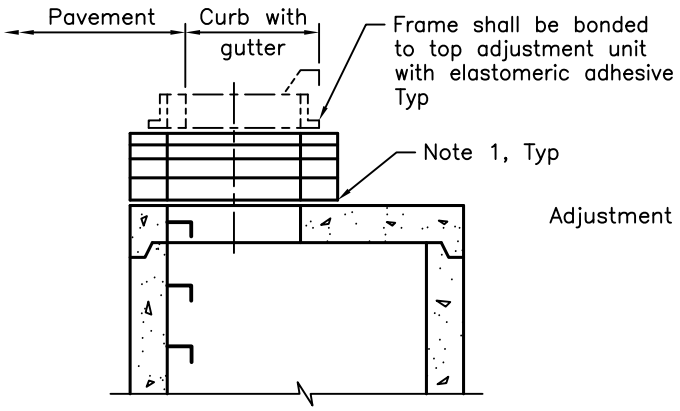
Nov 2008 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

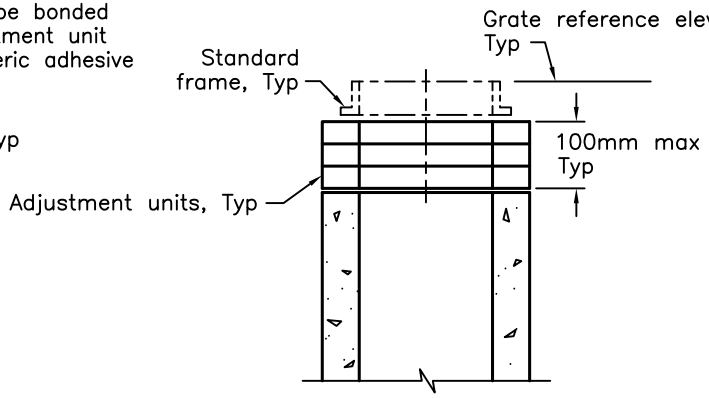
OPSD 704.011



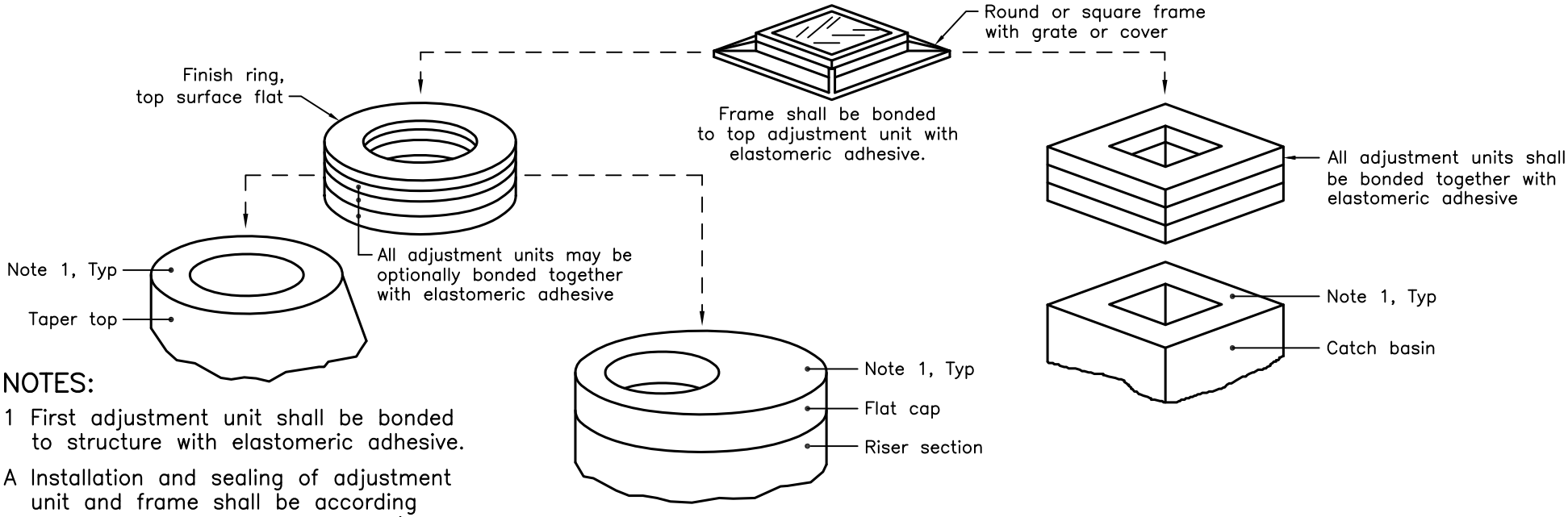

SECTION THROUGH TAPER TOP




SECTION THROUGH FLAT CAP




SECTION THROUGH CATCH BASIN




## NOTES:

1 First adjustment unit shall be bonded to structure with elastomeric adhesive.

A Installation and sealing of adjustment unit and frame shall be according to adjustment unit manufacturer's recommendations.

B Adjustment units shall not extend beyond the outside edge of the structure.

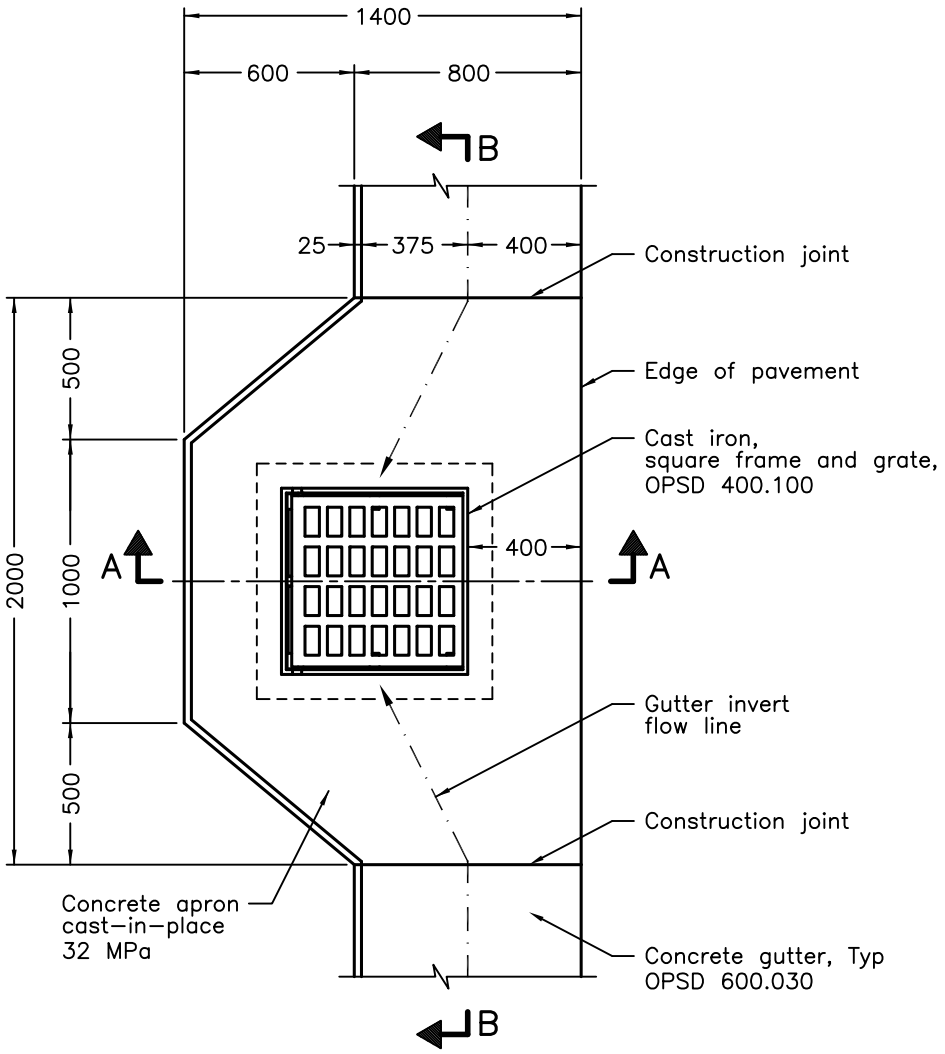
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

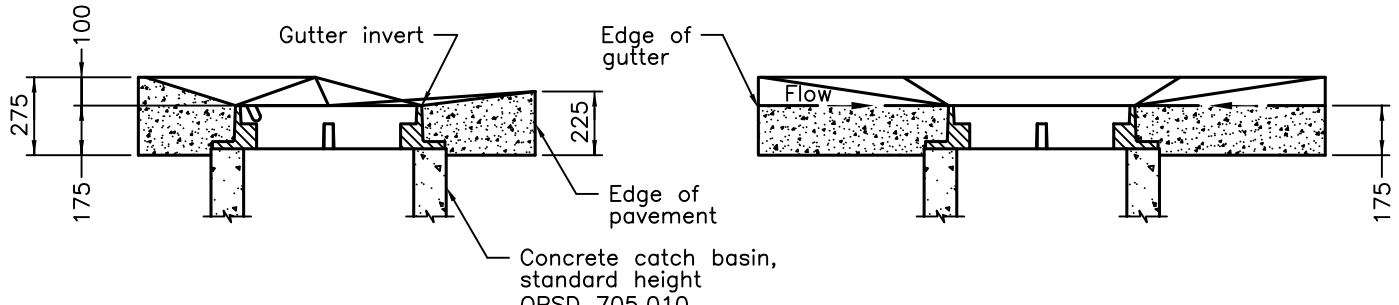
# EXPANDED POLYSTYRENE (EPS) ADJUSTMENT UNITS FOR MAINTENANCE HOLES, CATCH BASINS, AND VALVE CHAMBERS

April 2013 | Rev 0

OPSD 704.012




**PLAN**




**SECTION A–A**

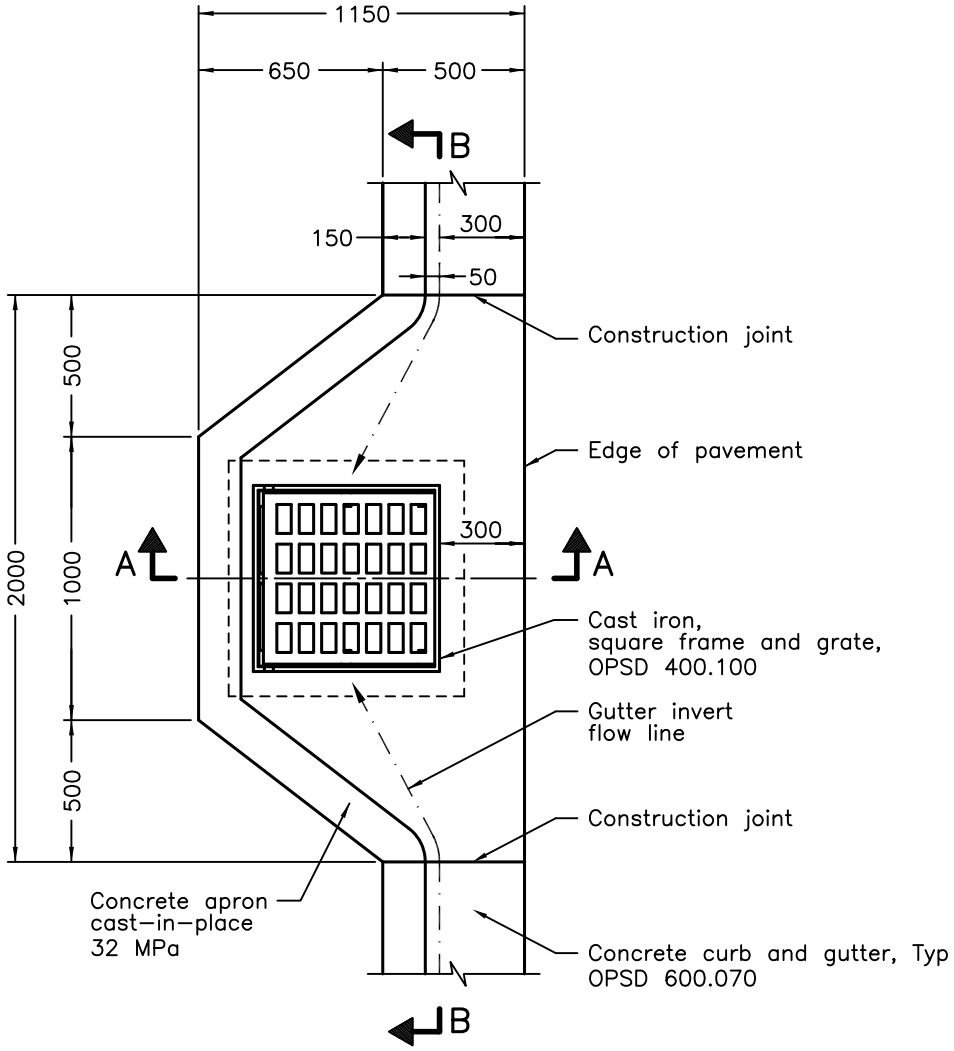
**SECTION B–B**

NOTES:

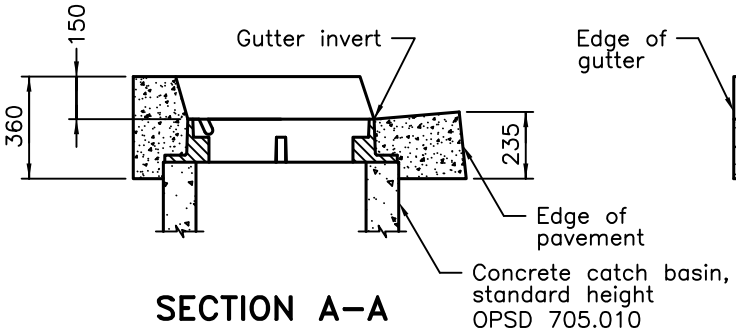
1 All construction joints shall be filled with fibre board or hot–poured rubberized asphalt joint sealing compound and joint filler.

A All dimensions are in millimetres unless otherwise shown.

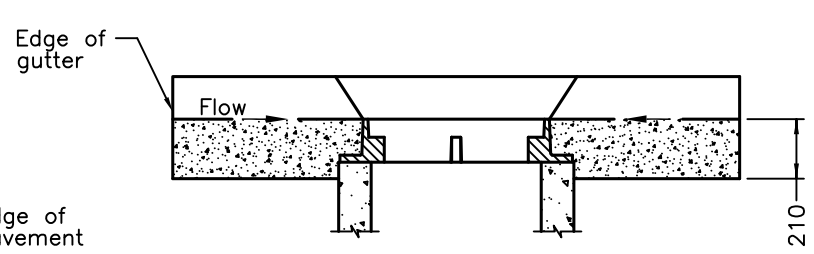
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| CONCRETE CATCH BASIN APRON<br>MOUNTABLE CURB<br>WITH WIDE GUTTER | | | |
| | OPSD 705.001 | | |




**PLAN**




**SECTION A–A**




**SECTION B–B**

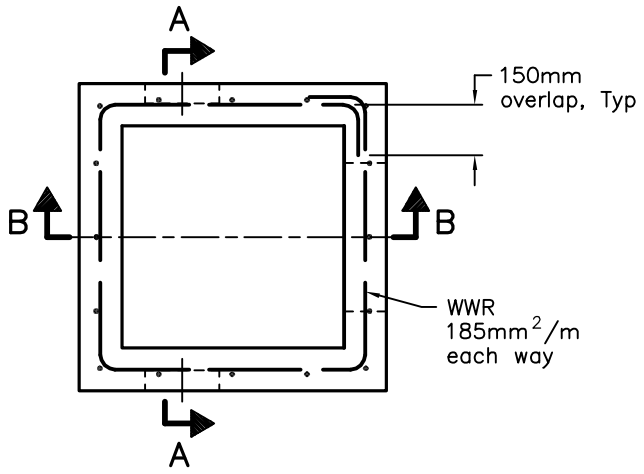
NOTES:

1 All construction joints shall be filled with fibre board or hot–poured rubberized asphalt joint sealing compound and joint filler.

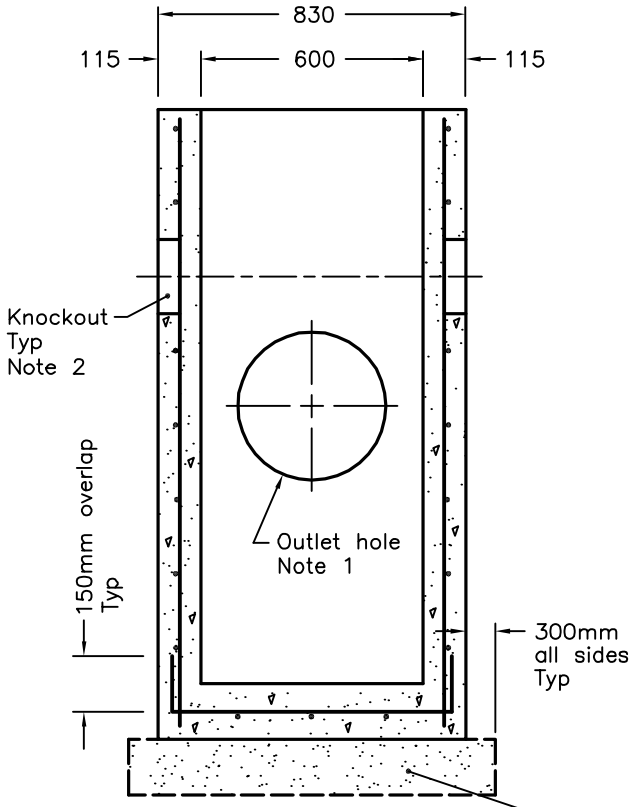
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| CONCRETE CATCH BASIN APRON<br>BARRIER CURB<br>WITH STANDARD GUTTER | | | |
| | OPSD 705.002 | | |

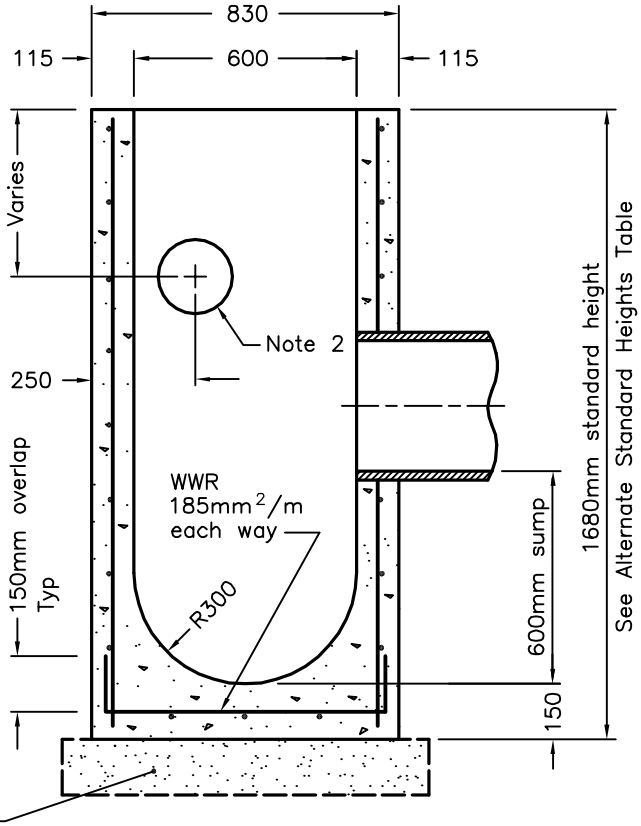
| ALTERNATE STANDARD HEIGHTS | |
|---|---|
| ALTERNATIVE | DIMENSION |
| A | 1980 |
| B | 1830 |
| C | 1520 |
| D | 1380 |




PLAN




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 ±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.

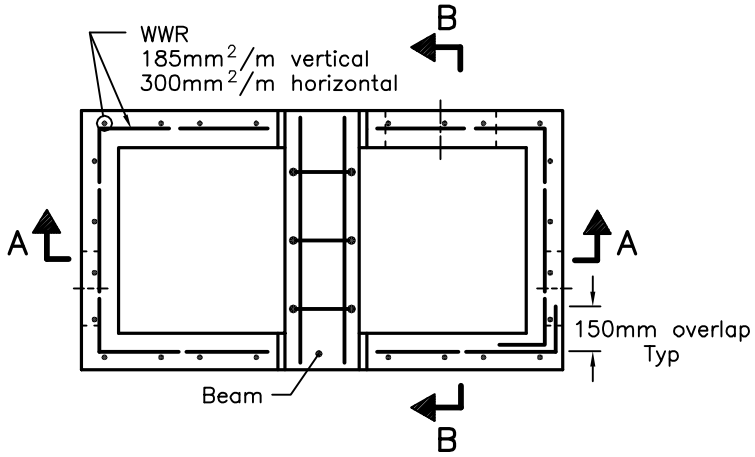
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 3

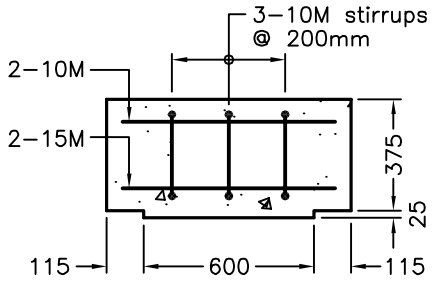
# PRECAST CONCRETE CATCH BASIN

600x600mm

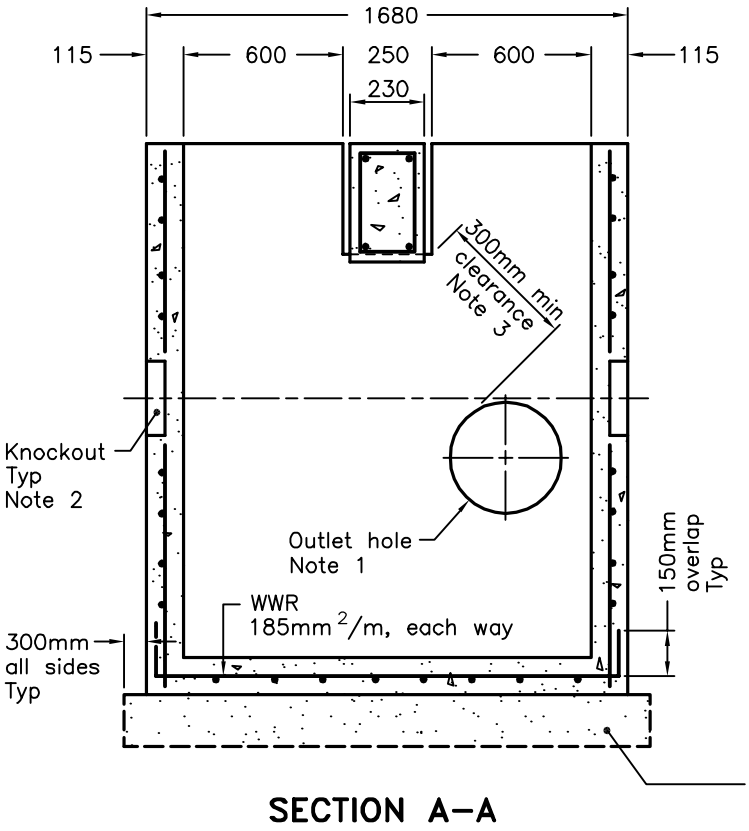
OPSD 705.010



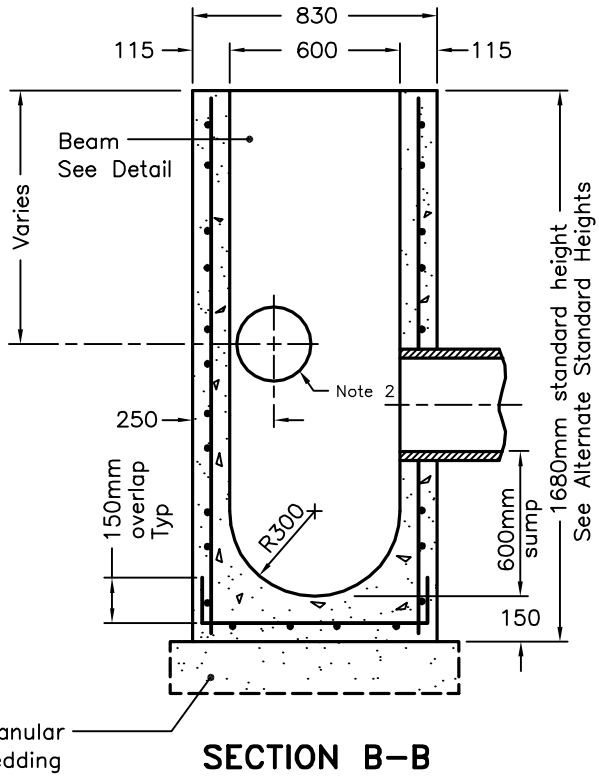

PLAN




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 |

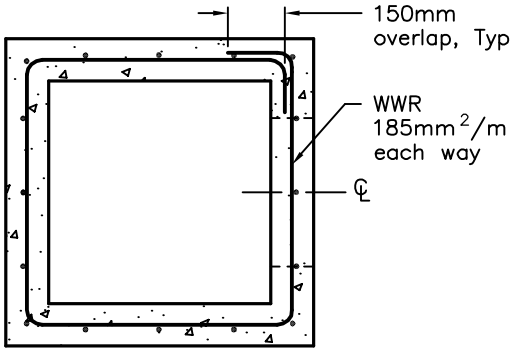
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev 3

# PRECAST CONCRETE
# TWIN INLET CATCH BASIN
## 600 x 1450mm

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

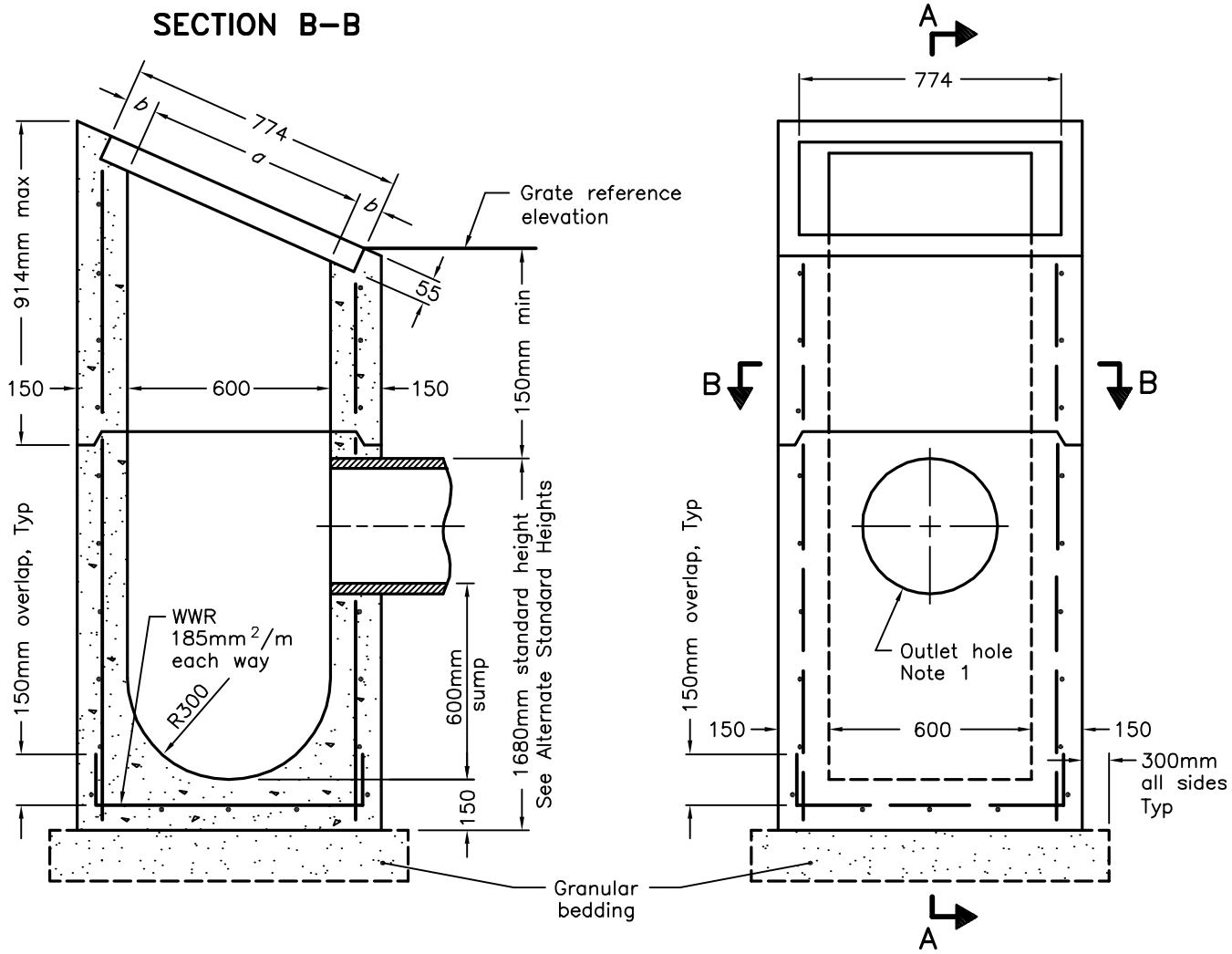
OPSD 705.020




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 ±25mm.

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.

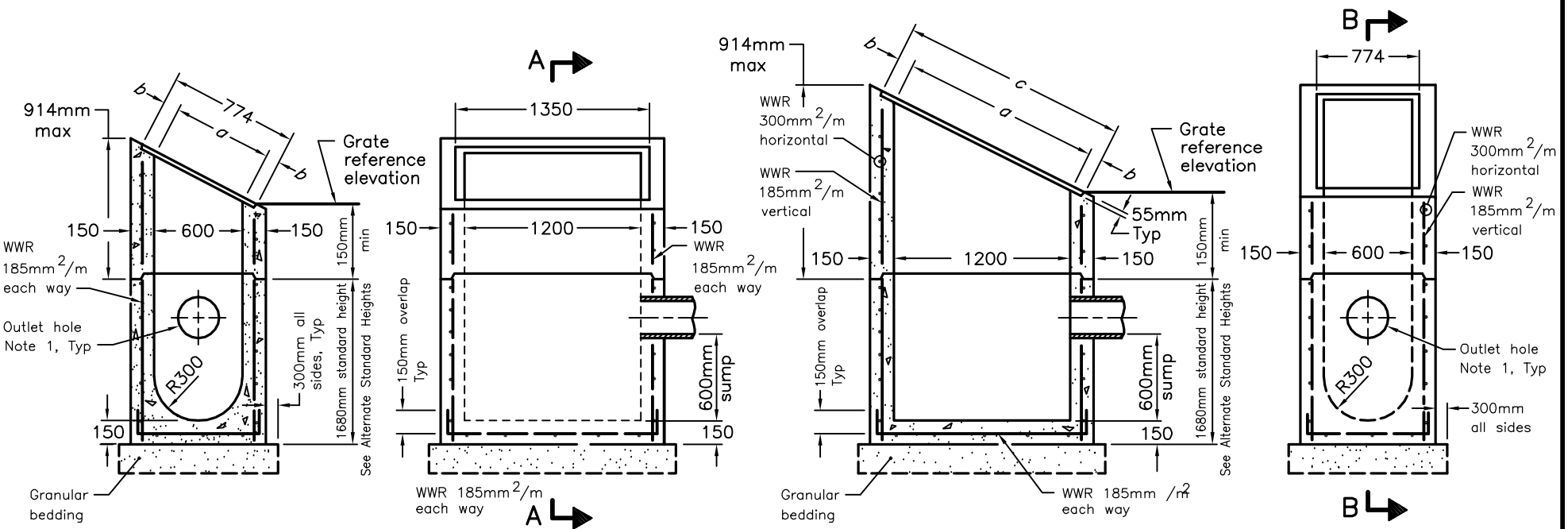
G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 3

# PRECAST CONCRETE DITCH INLET

600 x 600mm

OPSD 705.030




## TYPE A

| Opening Dimensions | | | |
|---|---|---|---|
| Grate | | *a* | *b* |
| Type | Slope | | |
| B | 2H:1V | 670 | 52 |
| | 3H:1V | 632 | 71 |
| | 4H:1V | 618 | 78 |
| | HOR | 600 | 87 |

| Alternate Standard Heights | |
|---|---|
| Alternate | Dimension |
| A | 1980 |
| B | 1520 |
| C | 1380 |

## TYPE B

| Opening Dimensions | | | | |
|---|---|---|---|---|
| Grate | | *a* | *b* | *c* |
| Type | Slope | | | |
| C | 2H:1V | 1341 | 66 | 1473 |
| | 3H:1V | 1265 | 104 | 1473 |
| | 4H:1V | 1237 | 118 | 1473 |
| B | 6H:1V | 1216 | 65 | 1346 |
| | HOR | 1200 | 73 | 1346 |

## NOTES:

1 Outlet hole size 525mm max diameter.

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 base slab ±25mm.

C Lap riser horizontal wires 300mm. Laps shall be placed at corners.

D Granular backfill shall be placed to a minimum thickness of 300mm all around the ditch inlet.

E Grating shall be according to OPSD 403.010.

F Pipe support shall be according to OPSD 708.020.

G All dimensions are nominal.

H All dimensions are in millimetres unless otherwise shown.

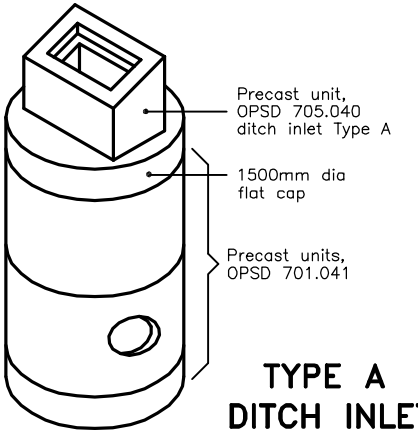
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE DITCH INLETS

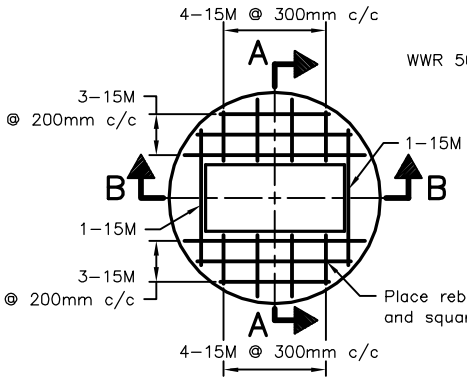
600 x 1200mm

Nov 2014 | Rev 3

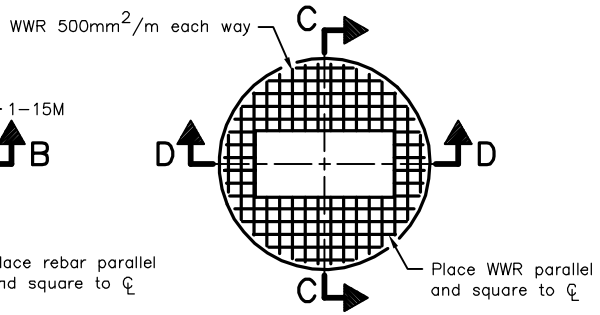
OPSD 705.040



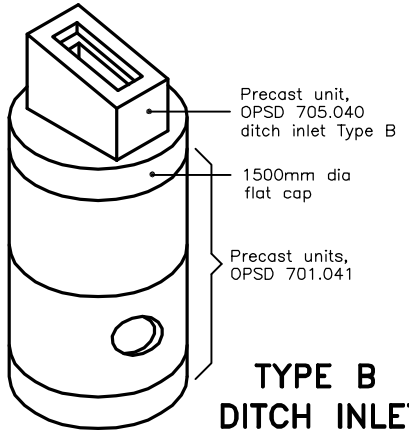

## TYPE A DITCH INLET



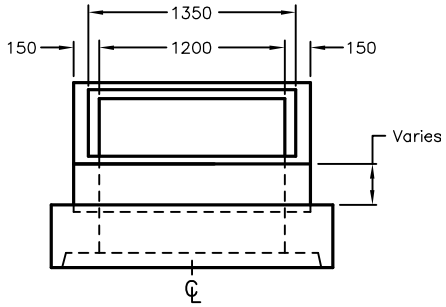

## PLAN OF FLAT CAP WITH REINFORCING STEEL BARS




## PLAN OF FLAT CAP WITH WWR



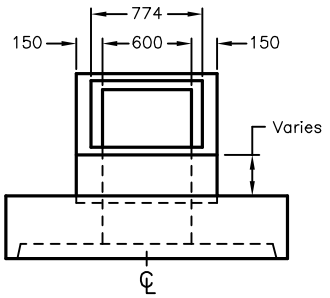

## TYPE B DITCH INLET



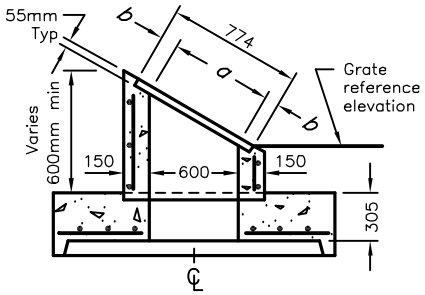

## FRONT VIEW

| Opening Dimensions | | | |
|---|---|---|---|
| Grate | | *a* | *b* |
| Type | Slope | | |
| B | 2H:1V | 670 | 52 |
| | 3H:1V | 632 | 71 |
| | 4H:1V | 618 | 78 |
| | Horizontal | 600 | 87 |

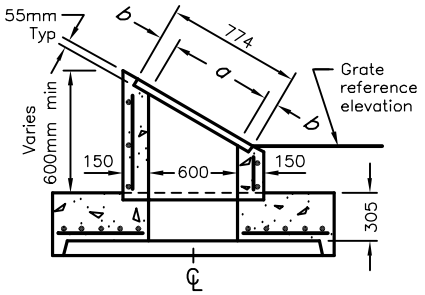
| Opening Dimensions | | | | |
|---|---|---|---|---|
| Grate | | *a* | *b* | *c* |
| Type | Slope | | | |
| C | 2H:1V | 1341 | 66 | 1473 |
| | 3H:1V | 1265 | 104 | 1473 |
| | 4H:1V | 1237 | 118 | 1473 |
| B | 6H:1V | 1216 | 65 | 1346 |
| | Horizontal | 1200 | 73 | 1346 |



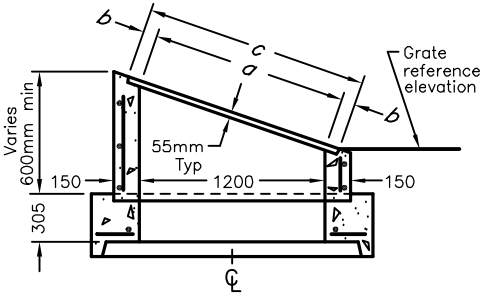

## FRONT VIEW



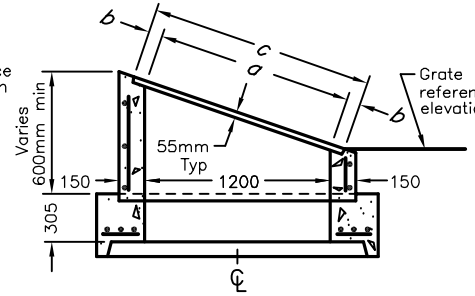

## SECTION A–A




## SECTION C–C




## SECTION B–B




## SECTION D–D

## NOTES:

A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

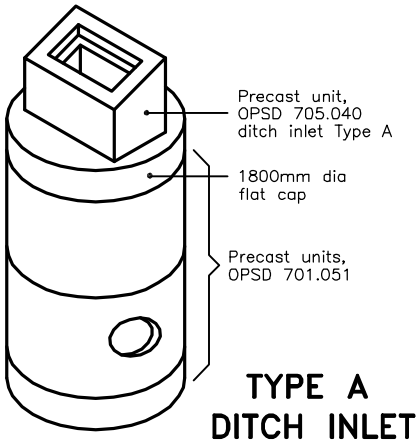
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE DITCH INLETS 600x1200mm WITH 1500mm DIAMETER FLAT CAP

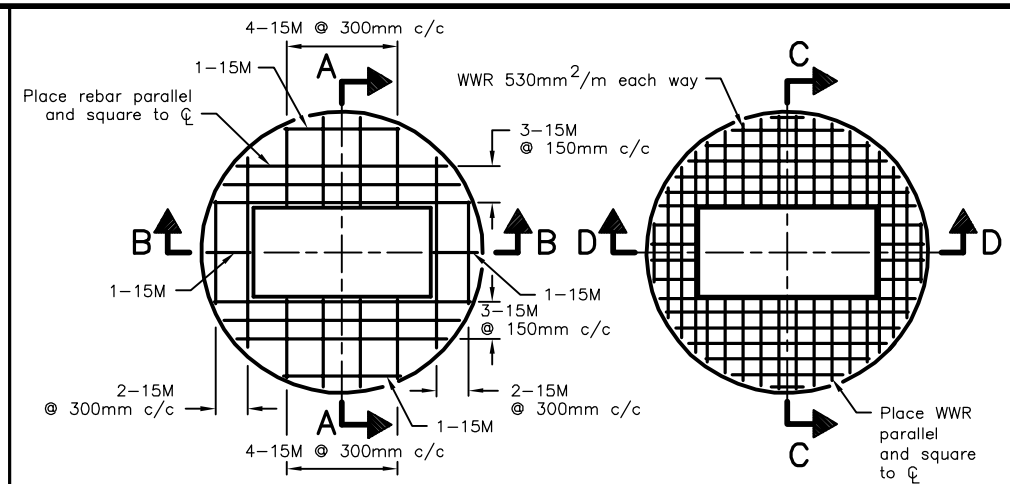
Nov 2014 | Rev 3

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 706.010

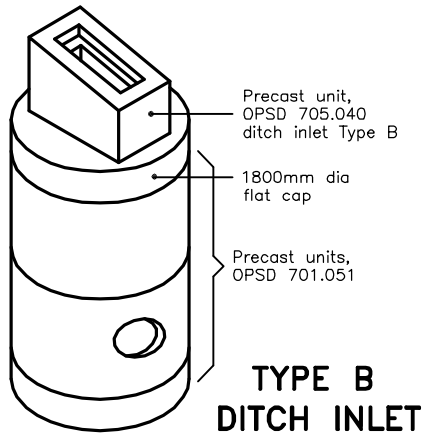



## TYPE A DITCH INLET

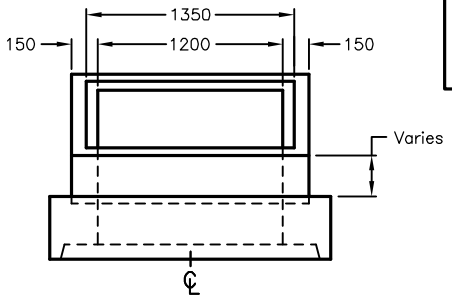



PLAN OF FLAT CAP WITH REINFORCING STEEL BARS

PLAN OF FLAT CAP WITH WWR



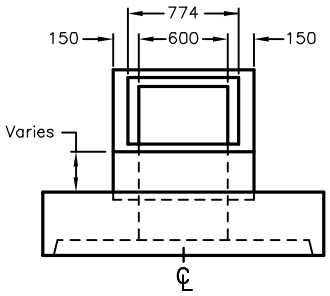

## TYPE B DITCH INLET



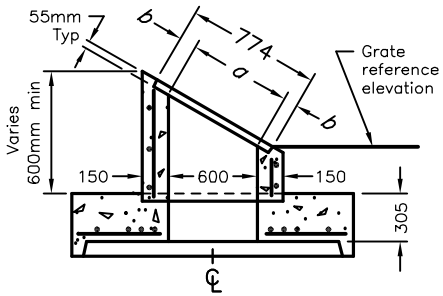

FRONT VIEW

| Opening Dimensions | | | |
|---|---|---|---|
| Grate | | *a* | *b* |
| Type | Slope | | |
| B | 2H:1V | 670 | 52 |
| | 3H:1V | 632 | 72 |
| | 4H:1V | 618 | 79 |
| | Horizontal | 600 | 87 |

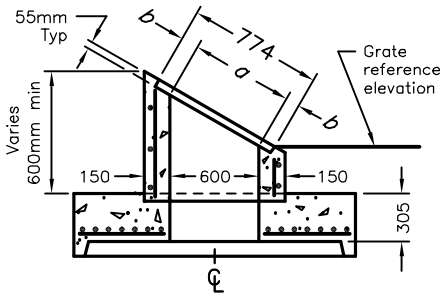
| Opening Dimensions | | | | |
|---|---|---|---|---|
| Grate | | *a* | *b* | *c* |
| Type | Slope | | | |
| C | 2H:1V | 1341 | 66 | 1473 |
| | 3H:1V | 1265 | 104 | 1473 |
| | 4H:1V | 1237 | 118 | 1473 |
| B | 6H:1V | 1216 | 65 | 1346 |
| | Horizontal | 1200 | 73 | 1346 |



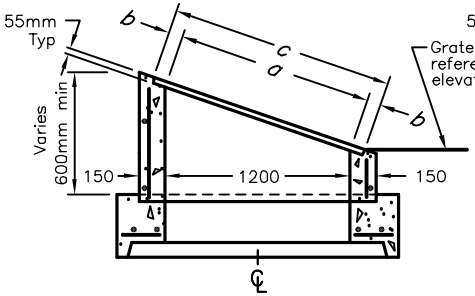

FRONT VIEW



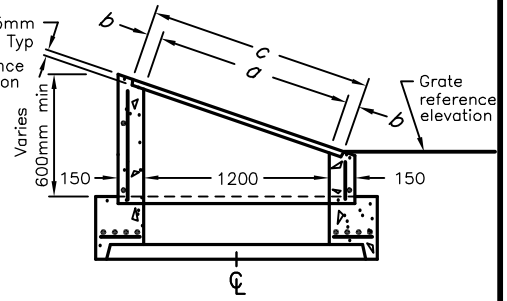

SECTION A–A




SECTION C–C




SECTION B–B




SECTION D–D

## NOTES:

A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

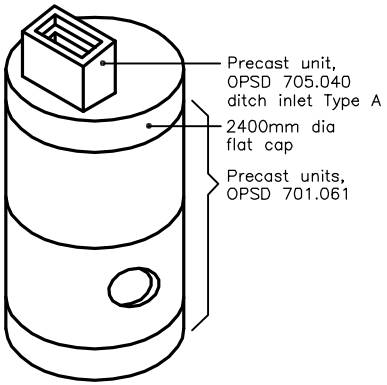
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE DITCH INLETS 600x1200mm WITH 1800mm DIAMETER FLAT CAP

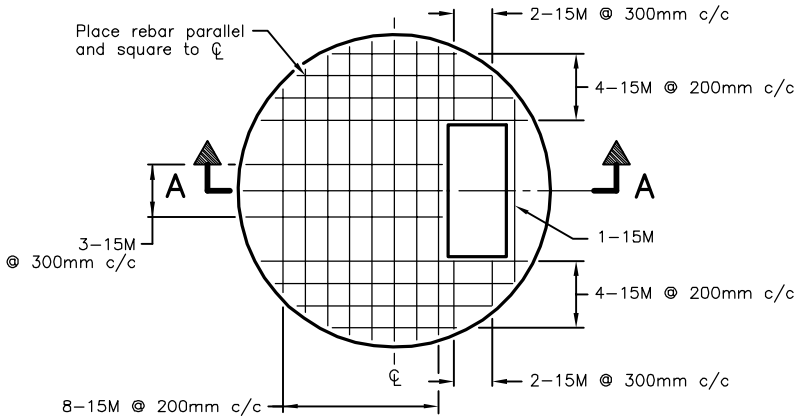
Nov 2014 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

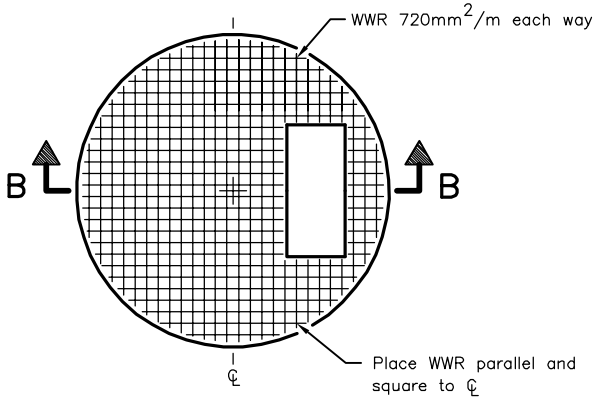
OPSD 706.020



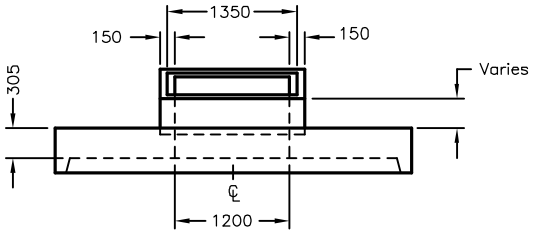

TYPE A
DITCH INLET



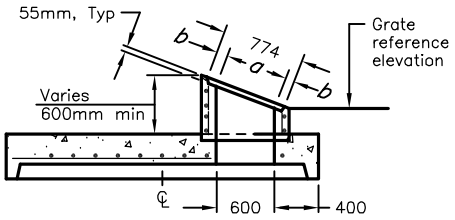

PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS



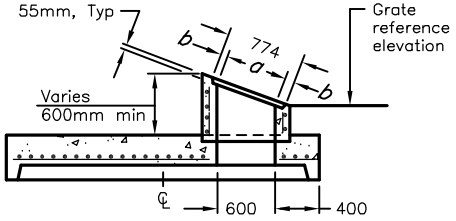

PLAN OF FLAT CAP
WITH WWR




FRONT VIEW




SECTION A–A




SECTION B–B

| Opening Dimensions | | | |
|---|---|---|---|
| Grate | | *a* | *b* |
| Type | Slope | | |
| B | 2H:1V | 670 | 52 |
| | 3H:1V | 632 | 72 |
| | 4H:1V | 618 | 79 |
| | Horizontal | 600 | 87 |

## NOTES:

A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

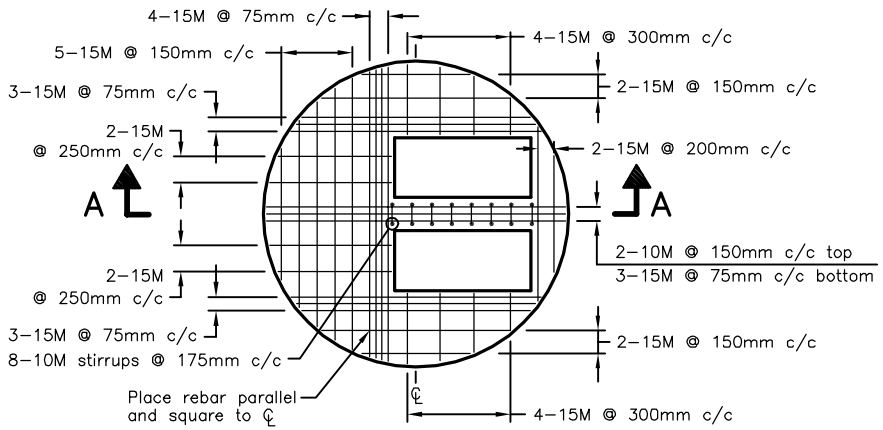
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE DITCH INLET – TYPE A
# 600x1200mm
# WITH 2400mm DIAMETER FLAT CAP

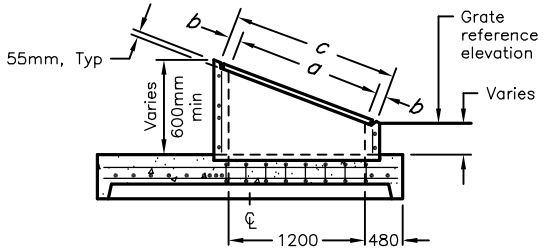
Nov 2014 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 706.030

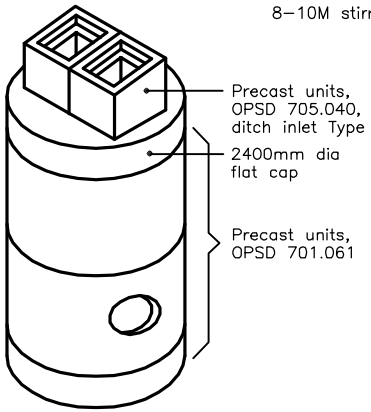



## PLAN OF FLAT CAP WITH REINFORCING STEEL BARS

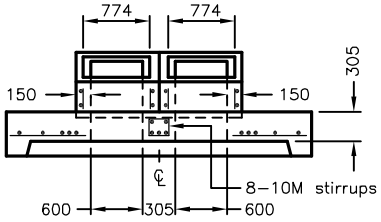



## SECTION A–A

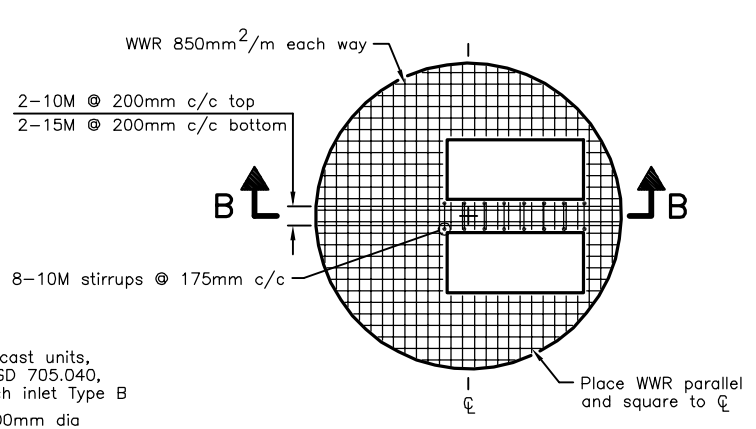
| Opening Dimensions | | | | |
|---|---|---|---|---|
| Grate | | *a* | *b* | *c* |
| Type | Slope | | | |
| C | 2H:1V | 1341 | 66 | 1473 |
| | 3H:1V | 1265 | 104 | 1473 |
| | 4H:1V | 1237 | 118 | 1473 |
| B | 6H:1V | 1216 | 65 | 1346 |
| | Horizontal | 1200 | 73 | 1346 |



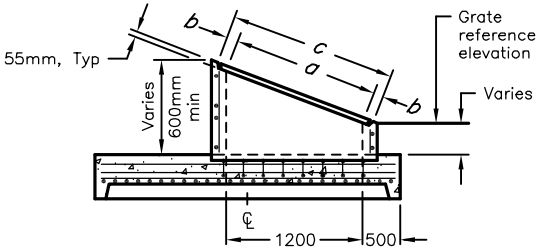

## TYPE B DITCH INLET



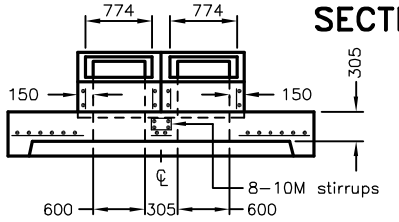

## FRONT VIEW OF FLAT CAP WITH REINFORCING STEEL BARS




## PLAN OF FLAT CAP WITH WWR AND REINFORCING STEEL BARS




## SECTION B–B




## FRONT VIEW OF FLAT CAP WITH WWR

## NOTES:

A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

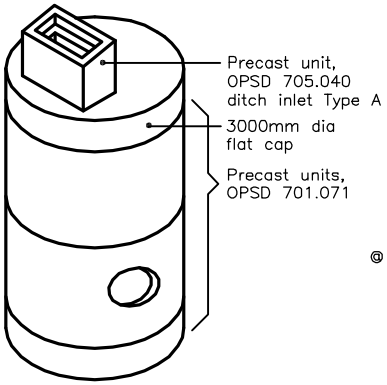
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE DITCH INLET – TYPE B 600x1200mm WITH 2400mm DIAMETER FLAT CAP

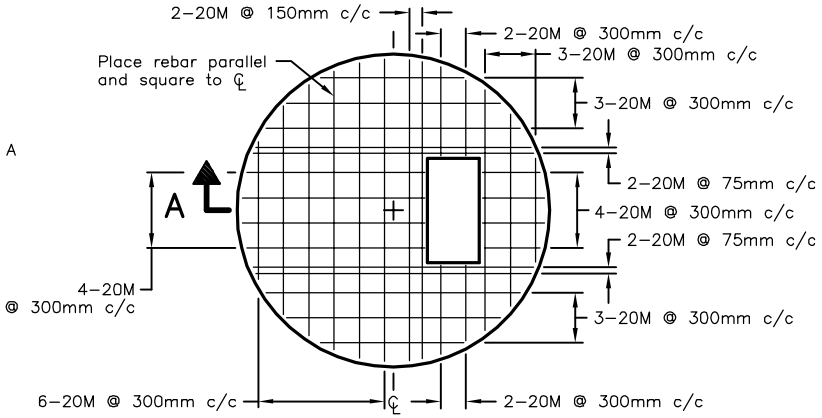
Nov 2014 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

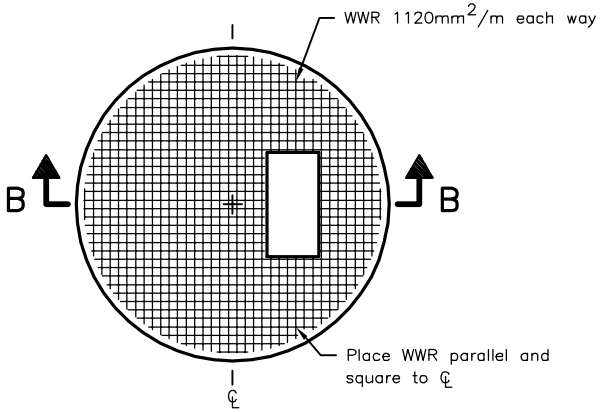
OPSD 706.031



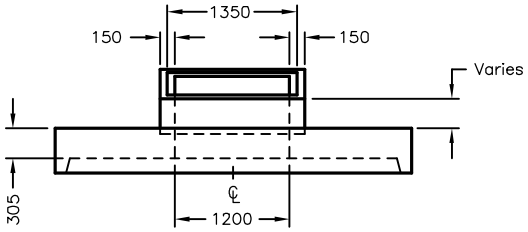

TYPE A
DITCH INLET



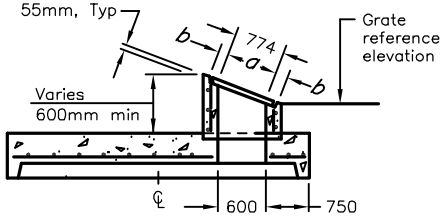

PLAN OF FLAT CAP
WITH REINFORCING STEEL BARS



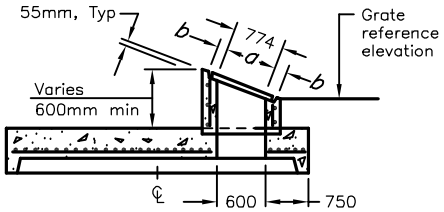

PLAN OF FLAT CAP
WITH WWR




FRONT VIEW




SECTION A–A




SECTION B–B

| Opening Dimensions | | | |
|---|---|---|---|
| Grate | | *a* | *b* |
| Type | Slope | | |
| B | 2H:1V | 670 | 52 |
| | 3H:1V | 632 | 72 |
| | 4H:1V | 618 | 79 |
| | Horizontal | 600 | 87 |

NOTES:

A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

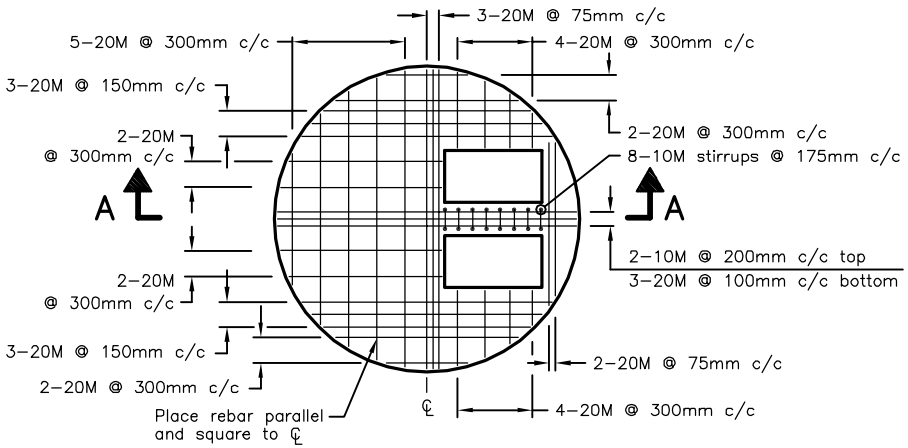
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE DITCH INLET – TYPE A
# 600x1200mm
# WITH 3000mm DIAMETER FLAT CAP

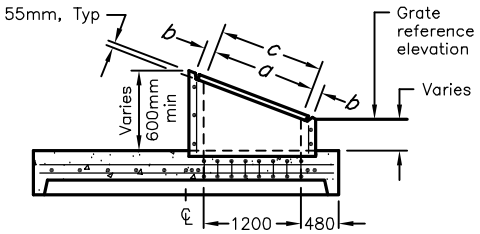
Nov 2014 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

OPSD 706.040

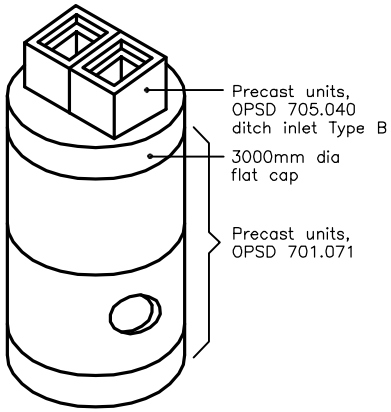



## PLAN OF FLAT CAP WITH REINFORCING STEEL BARS

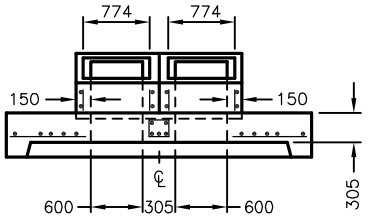



## SECTION A–A

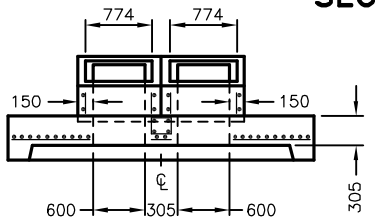
| Opening Dimensions | | | | |
|---|---|---|---|---|
| Grate | | *a* | *b* | *c* |
| Type | Slope | | | |
| C | 2H:1V | 1341 | 66 | 1473 |
| | 3H:1V | 1265 | 104 | 1473 |
| | 4H:1V | 1237 | 118 | 1473 |
| B | 6H:1V | 1216 | 65 | 1346 |
| | Horizontal | 1200 | 73 | 1346 |



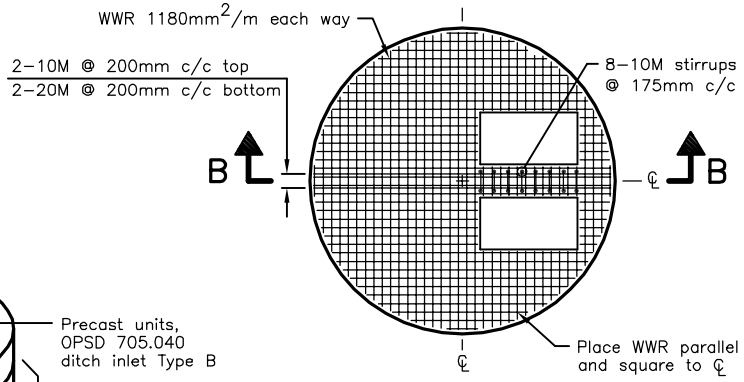

## TYPE B DITCH INLET



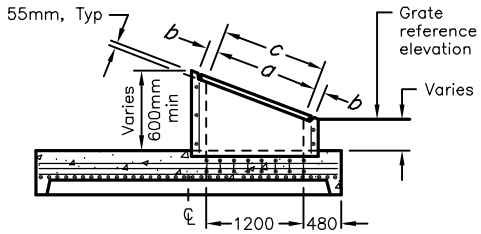

## FRONT VIEW WITH REINFORCING STEEL BARS




## FRONT VIEW WITH WWF




## PLAN OF FLAT CAP WITH WWR




## SECTION B–B

## NOTES:

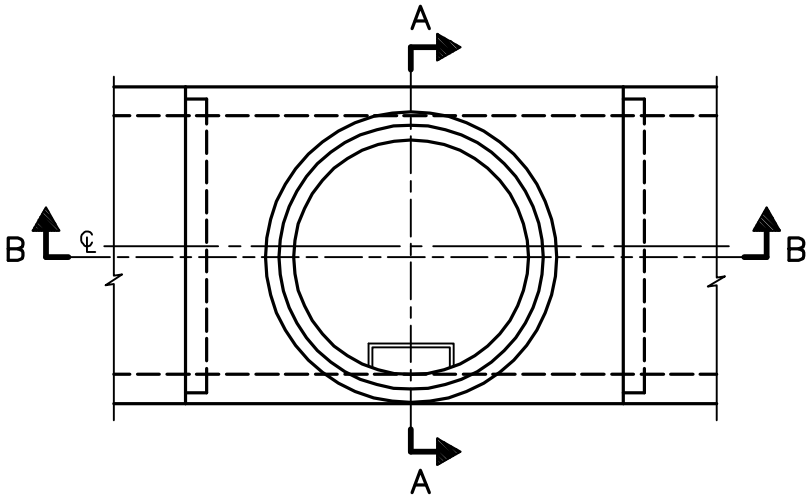
A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.
B All reinforcing steel shall have 25mm minimum cover.
C Grating shall be according to OPSD 403.010.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

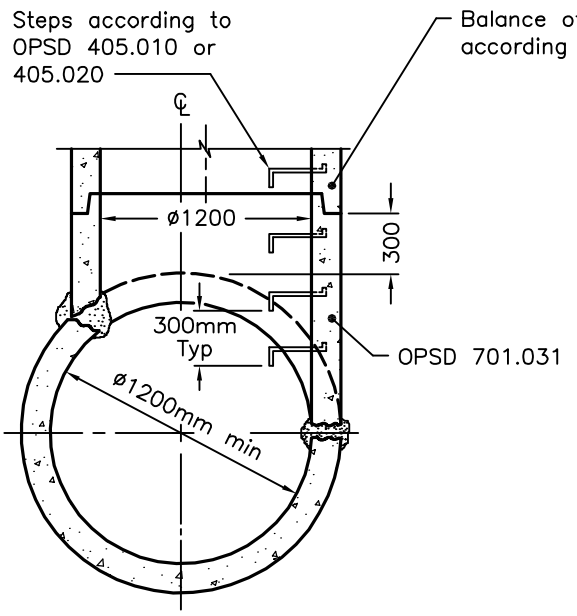
# PRECAST CONCRETE DITCH INLET – TYPE B 600x1200mm WITH 3000mm DIAMETER FLAT CAP

Nov 2014 | Rev 2

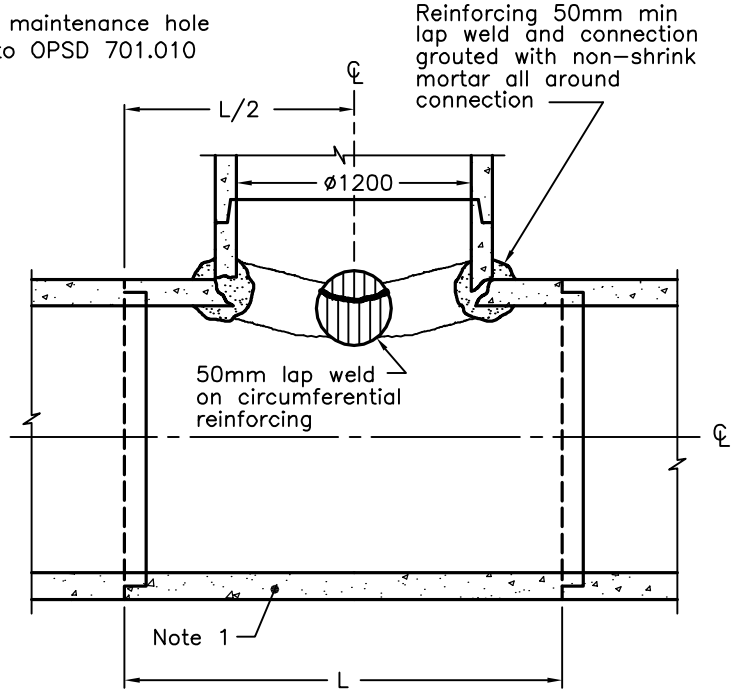
OPSD 706.041




PLAN




SECTION A–A




SECTION B–B

NOTES:

1 Sewer pipe shall be according to CAN/CSA A257.2, class to match that of the higher class adjacent pipe.

A Bedding for MH tee to match pipe bedding either side of tee.

B Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole tee.

C Minimum steel in connection shall equal area of steel in pipe.

D Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.

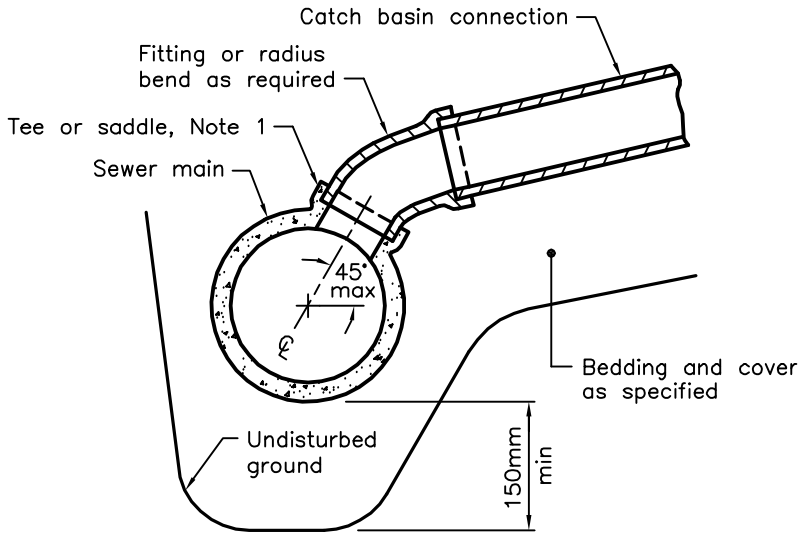
E All dimensions are nominal.

F All dimensions are in millimetres unless otherwise shown.

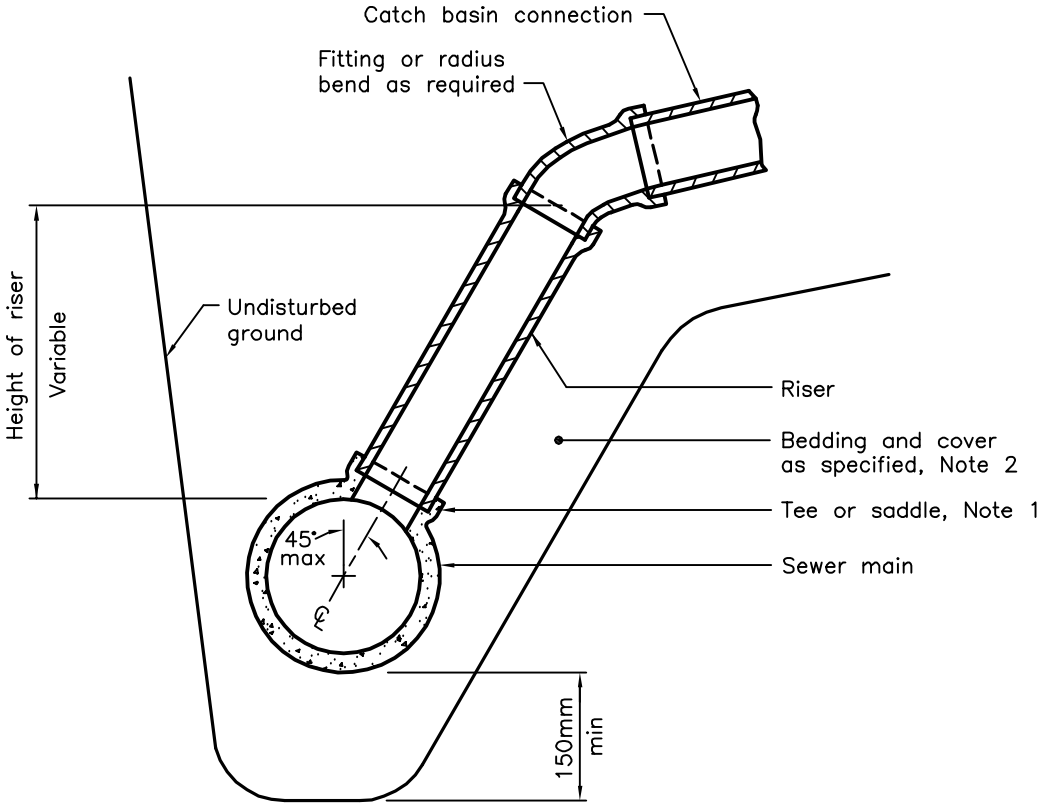
LEGEND:

L = Standard length of pipe

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 3 |
|---|---|---|---|
| PRECAST CONCRETE MAINTENANCE HOLE MANUFACTURED TEE | | | |
| | OPSD 707.010 | | |




## CONNECTION WITHOUT RISER




## CONNECTION WITH RISER

NOTES:

1 For sewers smaller than 450mm dia, connections shall be made using approved factory made tees. For all other sizes, either factory made tees or approved saddles may be used.

2 Riser bedding shall have a minimum width of catch basin connection outside diameter plus 600mm.

A Approved cut–in tool shall be used for field installed tees and saddles.

B Maintenance holes shall be used at the main sewer to connect catch basin connections greater than 300mm.

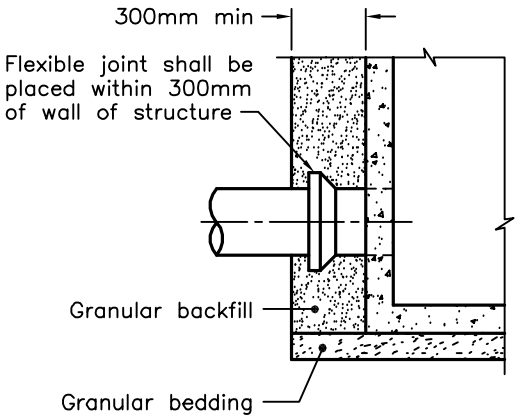
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# CATCH BASIN CONNECTION FOR RIGID MAIN PIPE SEWER

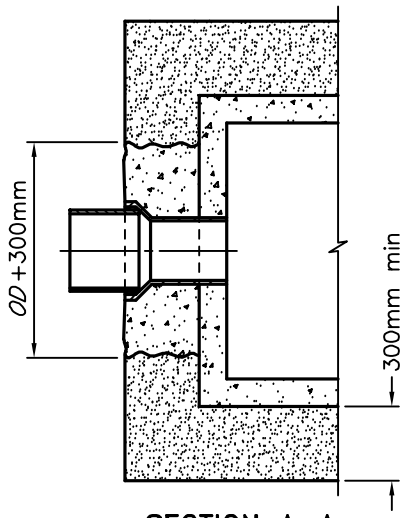
Nov 2011 | Rev 2

OPSD 708.010

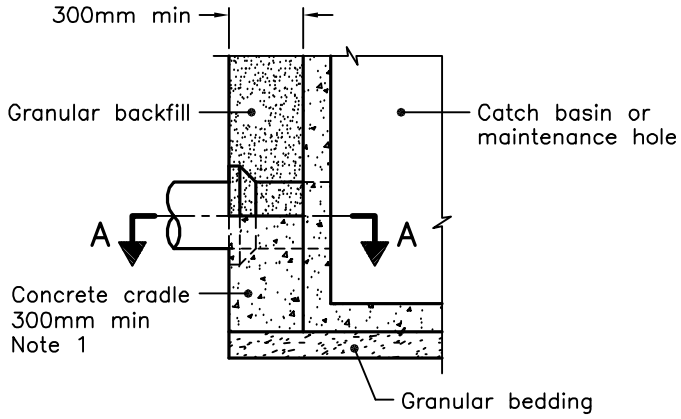



ELEVATION

**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.

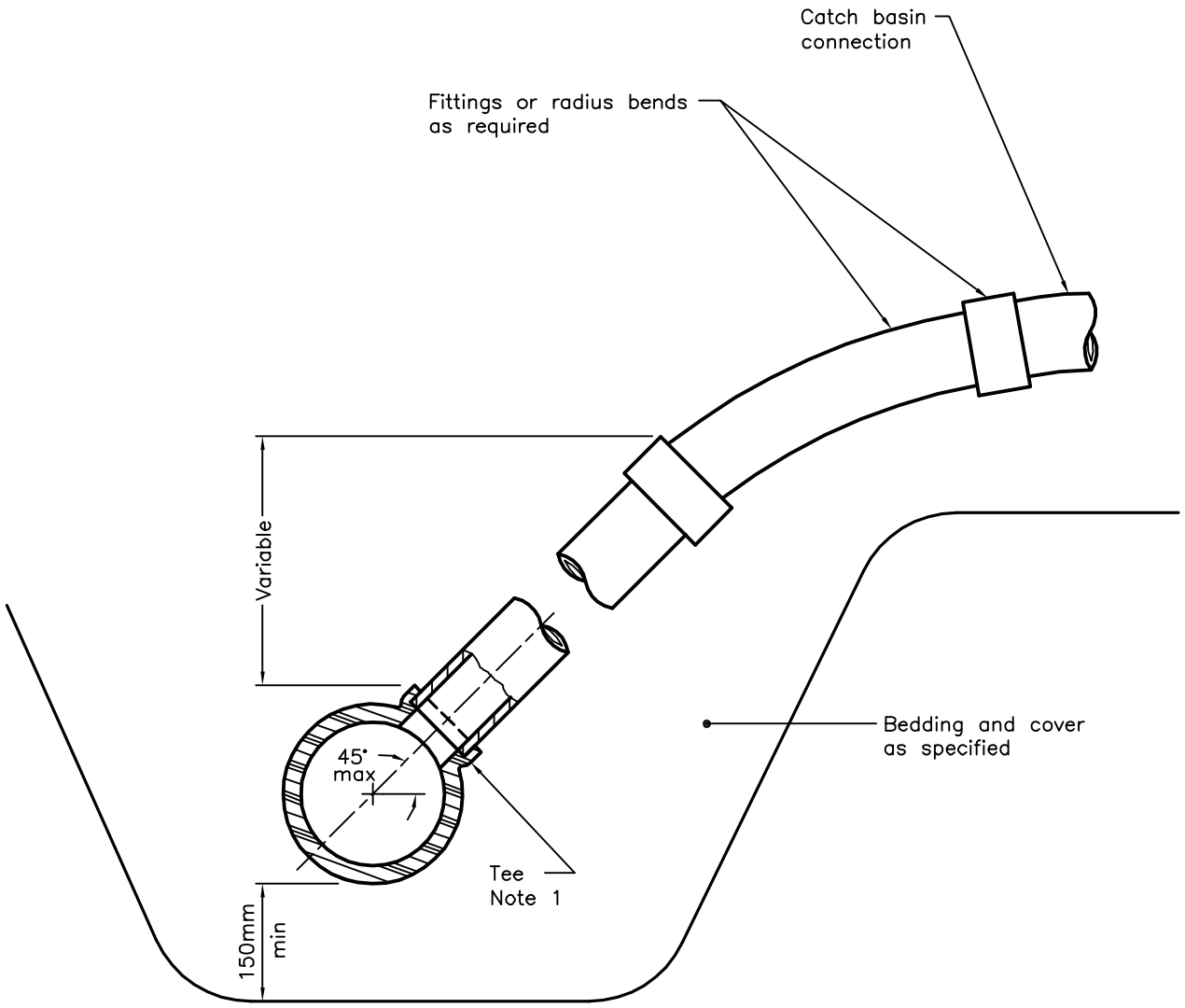
ONTARIO PROVINCIAL STANDARD DRAWING

# SUPPORT FOR PIPE AT CATCH BASIN OR MAINTENANCE HOLE

Nov 2011 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 708.020



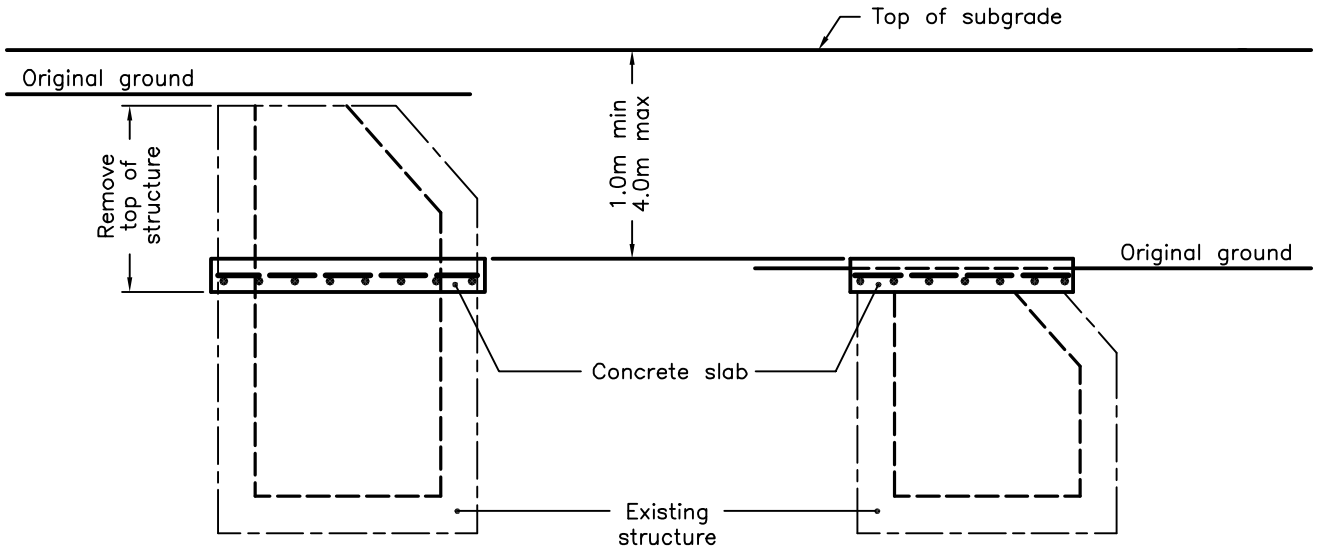

NOTES:

1 For catch basin connections 300mm in diameter or less, factory made tees shall be used.

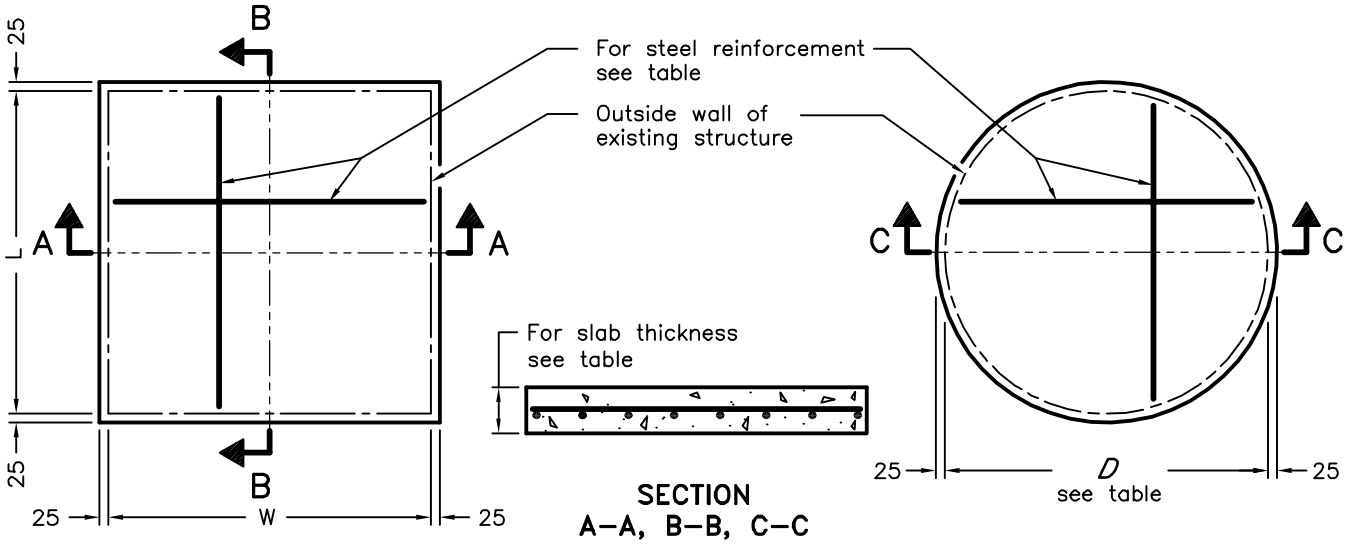
A For catch basin connections greater than 300mm, maintenance holes shall be used at the main sewer.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 2 |
|---|---|---|---|
| CATCH BASIN CONNECTION FOR FLEXIBLE MAIN PIPE SEWER | | | |
| | OPSD 708.030 | | |




## STRUCTURE TREATMENT




RECTANGULAR

SECTION
A–A, B–B, C–C

CIRCULAR

## CONCRETE SLAB DETAIL

| SHAPE OF CAP | EXISTING STRUCTURE INSIDE DIMENSIONS | | SLAB THICKNESS | BOTTOM STEEL REINFORCEMENT | |
|---|---|---|---|---|---|
| | | | | SIZE | SPACING EACH WAY |
| RECTANGULAR | L | W | 150 | 15M | 175 |
| | ≤ 600 | ≤ 1450 | | | |
| | > 600 ≤ 1200 | 1200 | | | |
| CIRCULAR | $D \leq 2400$ | | 200 | 15M | 225 |
| CIRCULAR | $2400 < D \leq 4000$ | | 200 | 25M | 150 |

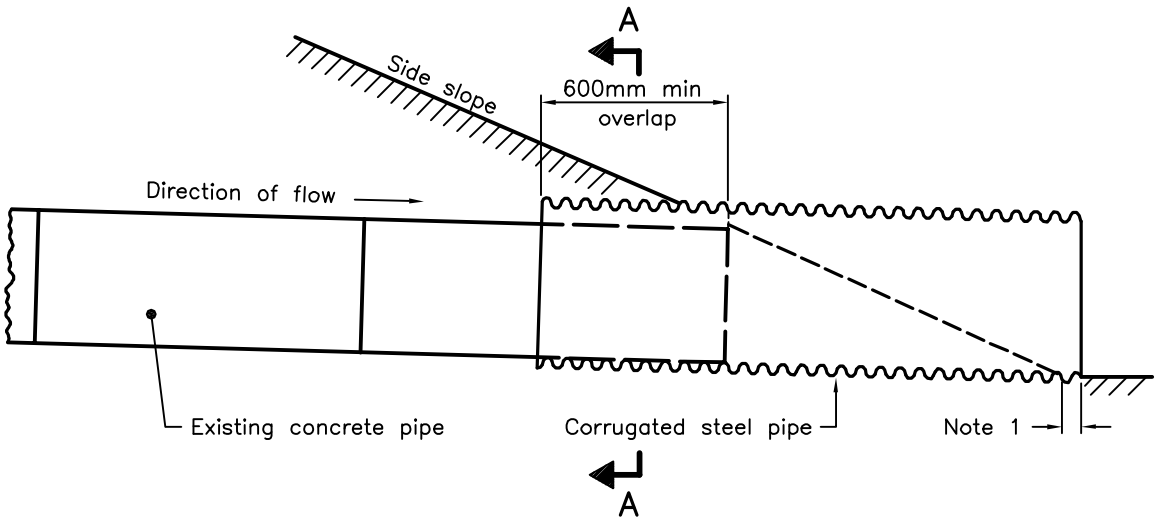
NOTES:

A Class of concrete: 30MPa at 28 Days.

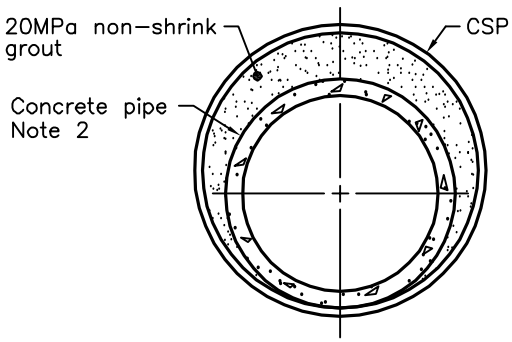
B Clear cover for steel reinforcement: 60mm±20mm.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| CAPPING EXISTING STRUCTURES<br>MAXIMUM 4.0m COVER | | | |
| | OPSD 710.010 | | |




**LONGITUDINAL SECTION**




**SECTION A–A**

| Diameter of Concrete Pipe | Minimum Dia of CSP Extensions |
|---|---|
| 300 | 500 |
| 375 | 600 |
| 450 | 600 |
| 525 | 700 |

NOTES:

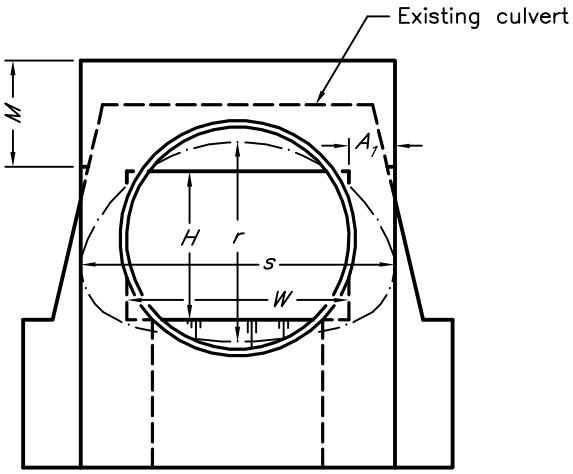
1 Extend pipe beyond the toe of slope as specified.

2 Outside surface of concrete pipe shall be thoroughly scrubbed to ensure proper bond.

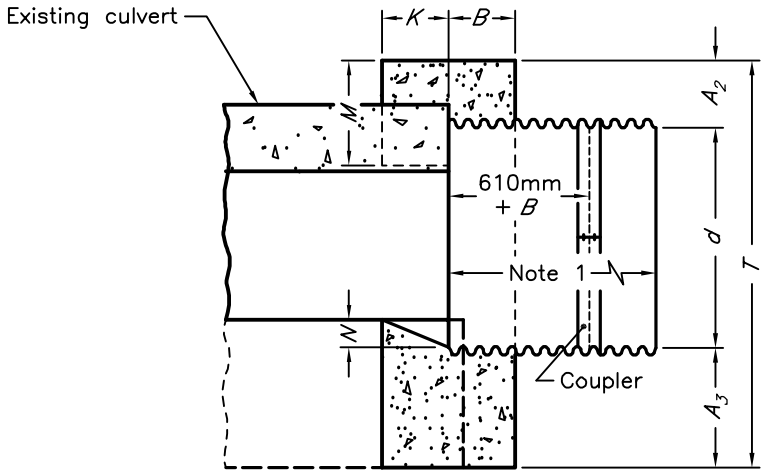
A Bedding and backfill as specified.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **CONCRETE PIPE CULVERT AND SEWER EXTENSIONS USING CORRUGATED STEEL PIPE**<br>TEMPORARY CONDITIONS | | | |
| | **OPSD 800.010** | | |




**FRONT ELEVATION**
**NOTE 2**




**LONGITUDINAL SECTION**
**NOTE 2**

TABLE SHOWING DIMENSIONS

| Culvert *W x H* | CSP *d* | CSP Arch *s x r* | $A_1$ | $A_2$ | $A_3$ | *B,K* | *M* | *N* |
|---|---|---|---|---|---|---|---|---|
| 610x 610 | 800 | — | 300 | 300 | 840 | 300 | 380 | 95 |
| 900x 610 | 900 | — | 300 | 300 | 760 | 300 | 450 | 145 |
| 900x 900 | 1000 | — | 300 | 300 | 840 | 300 | 380 | 50 |
| 1220x 900 | 1200 | — | 300 | 300 | 760 | 300 | 450 | 150 |
| 1220x1220 | 1400 | — | 300 | 300 | 840 | 300 | 380 | 90 |
| 1520x 900 | — | 1390x 970 | 330 | 330 | 840 | 380 | 400 | 35 |
| 1520x1220 | 1500 | — | 330 | 330 | 760 | 380 | 480 | 140 |
| 1520x1520 | 1600 | — | 330 | 330 | 840 | 380 | 400 | 40 |
| 1830x 900 | — | 1880x1260 | 355 | 355 | 815 | 450 | 450 | 180 |
| 1830x1220 | — | *2060x1520 | 355 | 355 | 760 | 450 | 480 | 150 |
| 1830x1520 | 1800 | — | 355 | 355 | 760 | 450 | 500 | 140 |

* Structural plate construction

NOTES:

1 Corrugated steel pipe shall be cut 610mm + *B* from end and installed as in longitudinal section.
2 Open frame culvert shown. For box frame culverts, *K=0*. *T* is the same for open and box frame culverts.

A Culverts with headwalls: *K=0* and *M=0*.
B Class of concrete shall be 30MPa.
C Bedding and backfill as specified.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

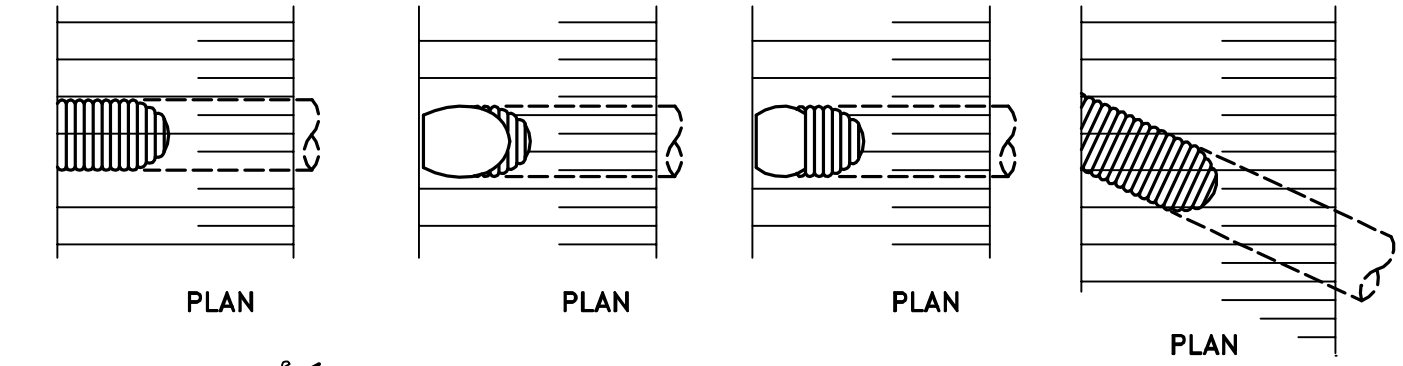
# CONCRETE RIGID FRAME BOX AND OPEN CULVERT EXTENSIONS USING CORRUGATED STEEL PIPE

TEMPORARY CONDITIONS

Nov 2012 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 800.011




SQUARE END END FINISH

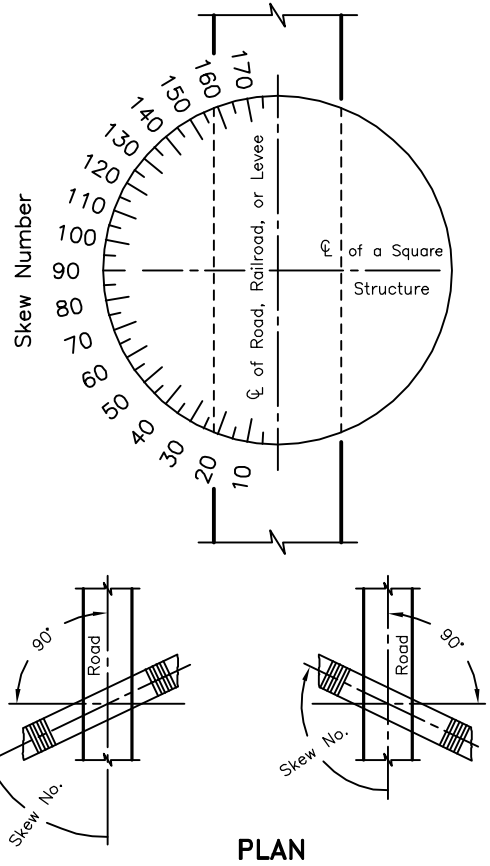
ALL TYPES CORRUGATED STEEL PIPE

PARTIAL BEVEL NOTE 1

STEP–BEVEL NOTE 1

SKEW END

END FINISH
STRUCTURAL PLATE CORRUGATED STEEL PIPE




PLAN

SKEW NUMBER TYPICAL

NOTES:

1 For a partial bevel or a step–bevel cut end finish, this OPSD shall be read in conjunction with OPSD 801.030.

A A skew end cut end finish shall not be combined with a partial bevel or a step–bevel cut end finish.

B Square end, partial bevel, or step–bevel cut end finish may be used on a culvert installed on a skew between skew numbers 60 and 120.

C A skew end cut end finish may be used on a culvert installed on a skew between skew numbers 50 and 130.

D Reinforcement of pipe ends or contour grading of embankment slope shall be as specified.

E Slope protection shall be as specified.

F All dimensions are in millimetres unless otherwise shown.

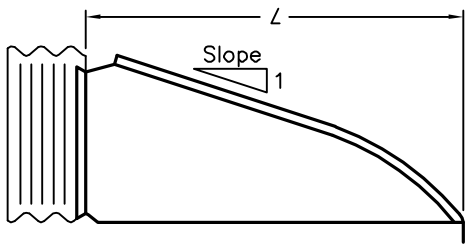
ONTARIO PROVINCIAL STANDARD DRAWING

# CUT END FINISH
# CIRCULAR PIPE AND PIPE–ARCH
# CORRUGATED STEEL PIPE

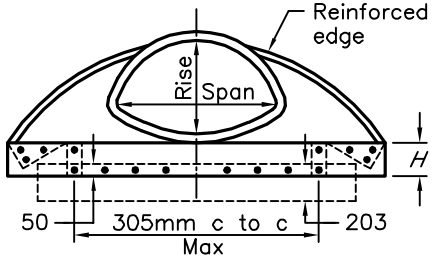
Nov 2012 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

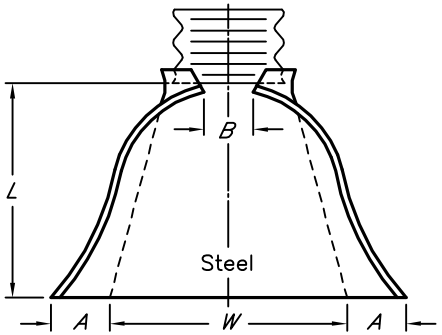
OPSD 801.010



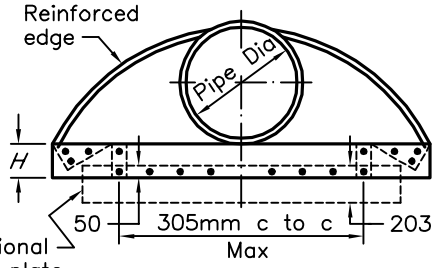

SIDE ELEVATION




FRONT ELEVATION




PLAN




FRONT ELEVATION

## PIPE–ARCH

| Span x Rise | Steel Minimum Thickness | Dimensions | | | | | Approx slope | Body |
|---|---|---|---|---|---|---|---|---|
| | | *A* ± 25 | *B* Max | *H* ± 25 | *L* ± 50 | *W* ± 50 | | |
| 560 x 420 | 1.6 | 175 | 280 | 175 | 610 | 915 | 2.000 | 1Pc |
| 680 x 500 | 1.6 | 205 | 405 | 175 | 810 | 1220 | 2.000 | 1Pc |
| 910 x 660 | 2.0 | 255 | 405 | 175 | 990 | 1525 | 1.875 | 1Pc |
| 1030 x 740 | 2.0 | 305 | 460 | 205 | 1170 | 1905 | 1.875 | 1Pc |
| 1150 x 820 | 2.8 | 330 | 535 | 255 | 1345 | 2130 | 1.750 | 2Pc |
| 1390 x 970 | 2.8 | 430 | 660 | 330 | 1575 | 2285 | 1.875 | 2Pc |
| 1630 x1120 | 2.8 | 455 | 760 | 330 | 1755 | 2590 | 1.875 | 2Pc |
| 1880 x1260 | 2.8/3.5 | 455 | 915 | 330 | 1955 | 3200 | 1.625 | 3Pc |

## CIRCULAR PIPE

| Pipe Dia | Steel Minimum Thickness | Dimensions | | | | | Approx slope | Body |
|---|---|---|---|---|---|---|---|---|
| | | *A* ± 25 | *B* Max | *H* ± 25 | *L* ±50 | *W* ±50 | | |
| 300 | 1.6 | 150 | 150 | 175 | 535 | 610 | 2.250 | 1Pc |
| 400 | 1.6 | 175 | 200 | 175 | 660 | 760 | 2.250 | 1Pc |
| 500 | 1.6 | 225 | 300 | 175 | 915 | 1065 | 2.125 | 1Pc |
| 600 | 1.6 | 250 | 330 | 175 | 1040 | 1220 | 2.125 | 1Pc |
| 800 | 2.0 | 305 | 405 | 225 | 1295 | 1450 | 2.125 | 1Pc |
| 900 | 2.0 | 355 | 485 | 255 | 1525 | 1830 | 2.000 | 1Pc |
| 1000 | 2.8 | 405 | 635 | 320 | 1750 | 2135 | 2.125 | 2Pc |
| 1200 | 2.8 | 455 | 740 | 330 | 1980 | 2285 | 2.000 | 2Pc |
| 1400 | 2.8 | 455 | 840 | 330 | 2135 | 2590 | 2.000 | 2Pc |
| 1600 | 2.8/3.5 | 455 | 915 | 330 | 2210 | 2895 | 1.875 | 3Pc |
| 1800 | 2.8/3.5 | 455 | 1120 | 330 | 2210 | 3100 | 1.500 | 3Pc |
| 2000 | 2.8/3.5 | 455 | 1220 | 330 | 2210 | 3350 | 1.375 | 3Pc |
| 2200 | 2.8/3.5 | 455 | 1320 | 330 | 2210 | 3505 | 1.333 | 3Pc |
| 2400 | 2.8/3.5 | 455 | 1475 | 330 | 2210 | 3710 | 1.125 | 3Pc |

NOTES:

A When a toe plate extension is specified, it shall be the same thickness and material as the end section.

B All 3 piece bodies have 2.8mm sides and 3.5mm centre panels. Multiple panel bodies shall have lap seams that are tightly joined by galvanized rivets or bolts.

C For CSP 1600mm and larger and for CSPA 1880 x 1260mm, reinforced edges shall be supplemented with galvanized stiffener angles. Angles shall be attached by galvanized nuts and bolts.

D All surfaces shall be galvanized.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# END SECTION DETAILS
# CORRUGATED STEEL PIPE

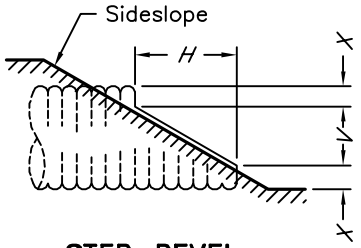
Nov 2012 | Rev 1

OPSD 801.020

| TABLE 1 – Step–Bevel for Circular Structural Plate Pipe | | | | | | |
|---|---|---|---|---|---|---|
| Dia | *H* for bevels of | | *V* for bevels of | | *X* for bevels of | |
| | 1.5H:1V | 2H:1V | 1.5H:1V | 2H:1V | 1.5H:1V | 2H:1V |
| 1500 | 1830 | 1830 | 1220 | 910 | 140 | 295 |
| 1660 | 1830 | 1830 | 1220 | 910 | 220 | 375 |
| 1810 | 1830 | 2440 | 1220 | 1220 | 295 | 295 |
| 1970 | 1830 | 2440 | 1220 | 1220 | 375 | 375 |
| 2120 | 1830 | 3050 | 1220 | 1520 | 450 | 300 |
| 2280 | 1830 | 3050 | 1220 | 1520 | 530 | 380 |
| 2430 | 3050 | 3050 | 2030 | 1520 | 200 | 455 |
| 2590 | 3050 | 3050 | 2030 | 1520 | 280 | 535 |
| 2740 | 3050 | 3660 | 2030 | 1830 | 355 | 455 |
| 3050 | 3050 | 3660 | 2030 | 1830 | 510 | 610 |
| 3360 | 3050 | 3660 | 2030 | 1830 | 665 | 765 |
| 3670 | 3050 | 3660 | 2030 | 1830 | 820 | 920 |
| 3990 | 3050 | 3660 | 2030 | 1830 | 980 | 1080 |
| 4300 | 3660 | 3660 | 2440 | 1830 | 930 | 1235 |
| 4610 | 3660 | 3660 | 2440 | 1830 | 1085 | 1390 |
| 4920 | 3660 | 6100 | 2440 | 3050 | 1240 | 935 |
| 5230 | 6100 | 6100 | 4070 | 3050 | 580 | 1090 |
| 5540 | 6100 | 6100 | 4070 | 3050 | 735 | 1245 |
| 5850 | 6100 | 7320 | 4070 | 3660 | 890 | 1095 |
| 6160 | 6100 | 7320 | 4070 | 3660 | 1045 | 1250 |
| 6470 | 6100 | 7320 | 4070 | 3660 | 1200 | 1405 |
| 6780 | 6100 | 7320 | 4070 | 3660 | 1355 | 1560 |
| 7090 | 6100 | 7320 | 4070 | 3660 | 1510 | 1715 |
| 7400 | 6100 | 7320 | 4070 | 3660 | 1665 | 1870 |
| 7710 | 6100 | 7320 | 4070 | 3660 | 1820 | 2025 |
| 8020 | 6100 | 7320 | 4070 | 3660 | 1975 | 2180 |

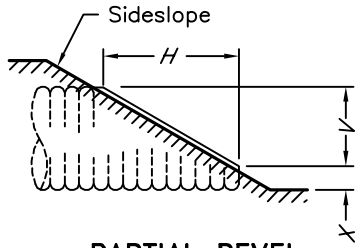
| TABLE 2 – Partial Bevel and Step–Bevel for Pipe–Arch Structural Plate Pipe | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Span | Rise | *X* | *H* for bevels of | | | *V* | *Y* for bevels of | | |
| | | | 1.5H:1V | 2H:1V | 3H:1V | | 1.5H:1V | 2H:1V | 3H:1V |
| 2060 | 1520 | 660 | 1290 | 1720 | 2580 | 860 | — | — | — |
| 2240 | 1630 | 660 | 1450 | 1940 | 2910 | 970 | — | — | — |
| 2440 | 1750 | 710 | 1560 | 2080 | 3050 | 1040 | — | — | 20 |
| 2590 | 1880 | 710 | 1750 | 2340 | 3050 | 1170 | — | — | 150 |
| 2690 | 2080 | 760 | 1980 | 2640 | 3050 | 1320 | — | — | 300 |
| 3100 | 1980 | 810 | 1750 | 2340 | 3050 | 1170 | — | — | 150 |
| 3400 | 2010 | 810 | 1800 | 2400 | 3050 | 1200 | — | — | 180 |
| 3730 | 2290 | 910 | 2070 | 2760 | 3050 | 1380 | — | — | 360 |
| 3890 | 2690 | *1090 | 2400 | 3050 | 3660 | 1600 | — | 80 | 380 |
| 4370 | 2870 | *1300 | 2360 | 3050 | 3660 | 1570 | — | 50 | 350 |
| 4720 | 3070 | *1240 | 2750 | 3050 | 3660 | 1830 | — | 310 | 610 |
| 5050 | 3330 | *1220 | 3050 | 3050 | 3660 | 2110 | 80 | 590 | 890 |
| 5490 | 3530 | *1300 | 3050 | 3660 | 3660 | 2230 | 200 | 400 | 1010 |
| 5890 | 3710 | *1370 | 3050 | 3660 | 3660 | 2340 | 310 | 510 | 1120 |
| 6250 | 3910 | *1300 | 3050 | 3660 | 3660 | 2610 | 580 | 780 | 1390 |
| 7040 | 4060 | 1370 | 3050 | 3660 | — | 2690 | 660 | 860 | — |
| 7620 | 4240 | 1500 | 3050 | 3660 | — | 2740 | 710 | 910 | — |

* Denotes dimension to top of corner plate.

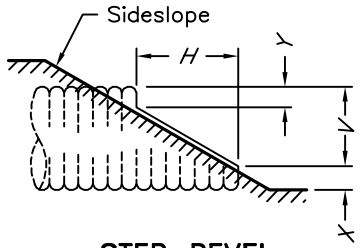



STEP–BEVEL

**CIRCULAR STRUCTURAL PLATE PIPE**




PARTIAL BEVEL




STEP–BEVEL

**PIPE–ARCH STRUCTURAL PLATE PIPE**

NOTES:

A Dimensions X, Y, V, and H are standardized by Corrugated Steel Pipe Institute.

B Dimensions for span and rise are nominal. Dimensions for bevel details are actual.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# BEVEL DETAILS
# CIRCULAR AND PIPE–ARCH
# STRUCTURAL PLATE CORRUGATED STEEL PIPE

Nov 2012 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 801.030

## STEEL END SECTION FOR ELLIPTICAL CONCRETE PIPE

| Equiv. Dia | Ellipse Dimensions | | Steel Minimum Thickness | Toe Plate Dimensions | | | | ∠ Dimensions | |
|---|---|---|---|---|---|---|---|---|---|
| | Span | Rise | | *A* | *H* | *W* | Overall width | 4H:1V Slope | 6H:1V Slope |
| 460 | 585 | 355 | 1.6 | 205 | 150 | 735 | 1145 | 405 | 610 |
| 610 | 760 | 485 | 1.6 | 205 | 150 | 915 | 1320 | 915 | 1370 |
| 685 | 865 | 560 | 2.0 | 305 | 230 | 1015 | 1625 | 1220 | 1830 |
| 760 | 965 | 610 | 2.0 | 305 | 230 | 1120 | 1725 | 1420 | 2135 |
| 840 | 1065 | 685 | 2.8 | 305 | 230 | 1220 | 1830 | 1725 | 2590 |
| 915 | 1145 | 740 | 2.8 | 405 | 305 | 1295 | 2110 | 1930 | 2895 |
| 1065 | 1345 | 865 | 2.8 | 405 | 305 | 1500 | 2310 | 2440 | 3660 |
| 1220 | 1525 | 965 | 2.8 | 405 | 305 | 1675 | 2490 | 2845 | 4265 |
| 1370 | 1730 | 1090 | 2.8 | 405 | 305 | 1880 | 2690 | 3355 | 5030 |
| 1525 | 1930 | 1220 | 2.8 | 405 | 305 | 2030 | 2845 | 3860 | 5790 |

## STEEL END SECTION FOR CIRCULAR PIPE

| Pipe Dia | Steel Minimum Thickness | Toe Plate Dimensions | | | | ∠ Dimensions | |
|---|---|---|---|---|---|---|---|
| | | *A* | *H* | *W* | Overall width | 4H:1V Slope | 6H:1V Slope |
| 300 | 1.6 | 200 | 150 | 450 | 850 | n/a | 700 |
| 400 | 1.6 | 200 | 150 | 550 | 950 | 800 | 1200 |
| 450 | 1.6 | 200 | 150 | 600 | 1000 | 1000 | 1500 |
| 500 | 1.6 | 200 | 150 | 650 | 1050 | 1200 | 1800 |
| 525 | 1.6 | 200 | 150 | 675 | 1075 | 1300 | 1950 |
| 600 | 1.6 | 200 | 150 | 750 | 1150 | 1600 | 2400 |
| 700 | 2.8 | 300 | 225 | 850 | 1450 | 1800 | 2700 |
| 750 | 2.8 | 300 | 225 | 900 | 1500 | 2000 | 3000 |
| 800 | 2.8 | 300 | 225 | 950 | 1550 | 2200 | 3300 |
| 900 | 2.8 | 300 | 225 | 1050 | 1650 | 2600 | 3900 |
| 1000 | 2.8 | 400 | 300 | 1150 | 1950 | 3000 | 4500 |
| 1050 | 2.8 | 400 | 300 | 1200 | 2000 | 3200 | 4800 |
| 1200 | 2.8 | 400 | 300 | 1350 | 2150 | 3800 | 5700 |
| 1350 | 2.8 | 400 | 300 | 1500 | 2300 | 4400 | 6600 |
| 1400 | 2.8 | 400 | 300 | 1550 | 2350 | 4600 | 6900 |

## STEEL END SECTION FOR ARCHED STEEL PIPE

| Equivalent Diameter | Ellipse Dimensions | | Steel Minimum Thickness | Toe Plate Dimensions | | | | ∠ Dimensions | |
|---|---|---|---|---|---|---|---|---|---|
| | Span | Rise | | *A* | *H* | *W* | Overall width | 4H:1V Slope | 6H:1V Slope |
| 400–CSP | 450 | 340 | 1.6 | 200 | 150 | 600 | 1000 | 560 | 840 |
| 450–Spiral Rib | 500 | 390 | 1.6 | 200 | 150 | 650 | 1050 | 760 | 1140 |
| 500–CSP | 560 | 420 | 1.6 | 200 | 150 | 710 | 1110 | 880 | 1320 |
| 525–Spiral Rib | 580 | 465 | 1.6 | 200 | 150 | 730 | 1130 | 1060 | 1590 |
| 600–CSP | 680 | 500 | 1.6 | 200 | 150 | 830 | 1230 | 1200 | 1800 |
| 600–Spiral Rib | 660 | 530 | 1.6 | 200 | 150 | 810 | 1210 | 1320 | 1980 |
| 700–CSP | 800 | 580 | 2.8 | 300 | 225 | 950 | 1550 | 1320 | 1980 |
| 750–Spiral Rib | 830 | 660 | 2.8 | 300 | 225 | 980 | 1580 | 1640 | 2460 |
| 800–CSP | 910 | 660 | 2.8 | 300 | 225 | 1060 | 1660 | 1640 | 2460 |
| 900–CSP | 1030 | 740 | 2.8 | 300 | 225 | 1180 | 1780 | 1960 | 2940 |
| 900–Spiral Rib | 1010 | 790 | 2.8 | 300 | 225 | 1160 | 1760 | 2160 | 3240 |
| 1000–CSP | 1150 | 820 | 2.8 | 400 | 300 | 1300 | 2100 | 2280 | 3420 |
| 1050–Spiral Rib | 1160 | 920 | 2.8 | 400 | 300 | 1310 | 2110 | 2680 | 4020 |
| 1200–CSP | 1390 | 970 | 2.8 | 400 | 300 | 1540 | 2340 | 2880 | 4320 |
| 1200–Spiral Rib | 1340 | 1050 | 2.8 | 400 | 300 | 1490 | 2290 | 3200 | 4800 |
| 1350–Spiral Rib | 1485 | 1190 | 2.8 | 400 | 300 | 1635 | 2435 | 3760 | 5640 |
| 1400–CSP | 1630 | 1120 | 2.8 | 400 | 300 | 1780 | 2580 | 3480 | 5220 |
| 1500–Spiral Rib | 1670 | 1300 | 2.8 | 400 | 300 | 1820 | 2620 | 4200 | 6300 |
| 1600–CSP | 1880 | 1260 | 2.8 | 400 | 300 | 2030 | 2830 | 4040 | 6060 |
| 1650–Spiral Rib | 1815 | 1450 | 2.8 | 400 | 300 | 1965 | 2765 | 4800 | 7200 |
| 1800–CSP | 2130 | 1400 | 2.8 | 400 | 300 | 2280 | 3080 | 4600 | 6900 |

## NOTES:

A This OPSD shall be read in conjunction with OPSD 801.041, 801.042, and 801.043. Notes and tables shown on this standard apply to the noted standards.

B Safety slope end treatment attach to pipes up to 600mm with Type 1 or 3 connector. All other sizes attach with Type 2 or 4 connector.

C Safety bars shall be fabricated from Schedule 40 galvanized steel pipe. Safety bars shall be galvanized after fabrication.

D All surfaces shall be galvanized.

E Details of construction materials and workmanship not shown on this drawing shall be according to CSA G401.

F End sections shall have slotted holes for safety bar attachment.

G Cross drainage structures are perpendicular to the centreline of the road. Parallel drainage structures are parallel to centreline of the road.

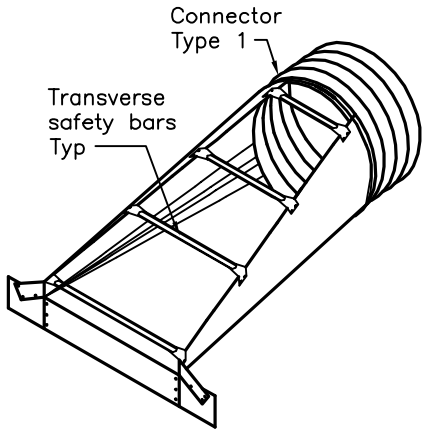
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev 2

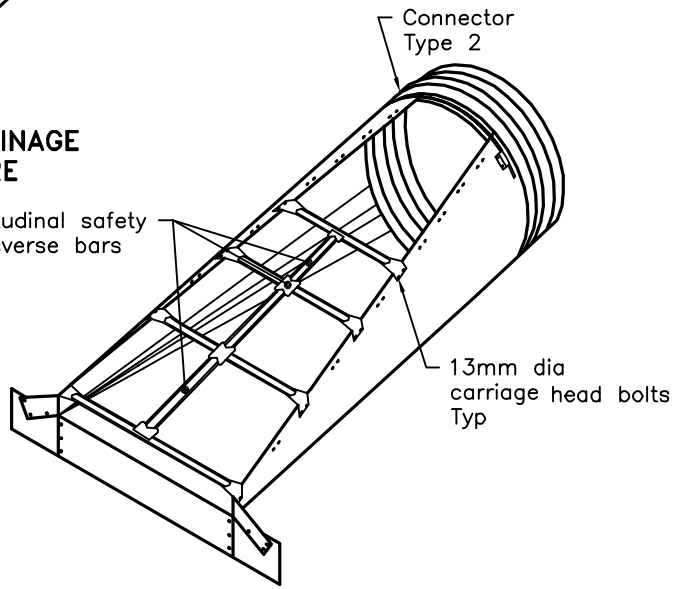
# CULVERT AND SEWER
# SAFETY SLOPE END TREATMENT
# NOTES AND TABLES

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 801.040

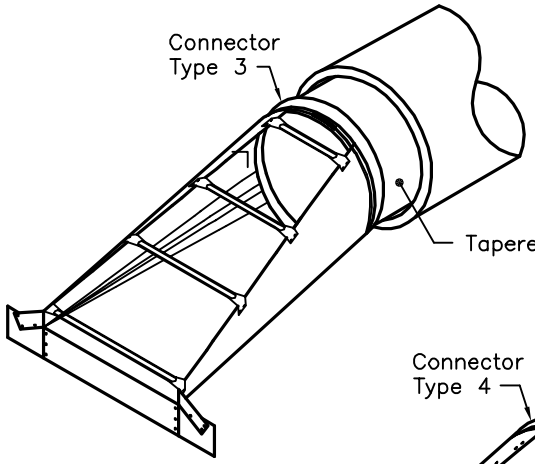



PARALLEL DRAINAGE STRUCTURE

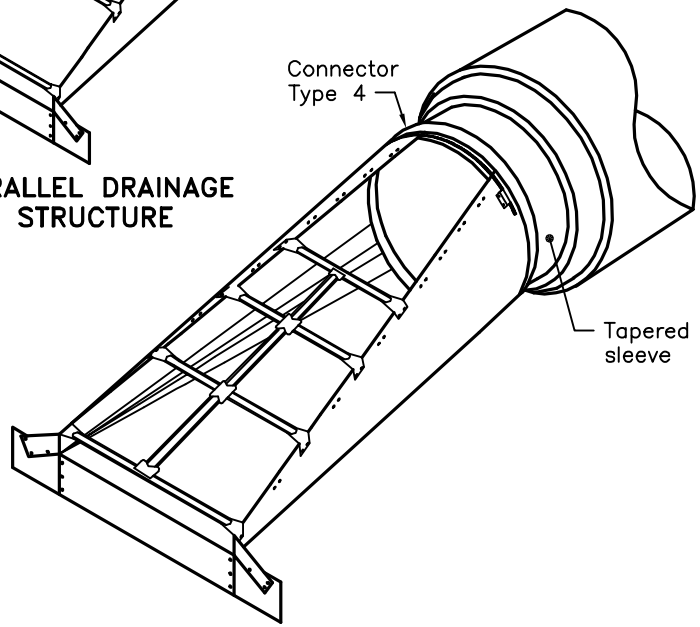



CROSS DRAINAGE STRUCTURE

## CIRCULAR AND ARCHED CORRUGATED PIPES




PARALLEL DRAINAGE STRUCTURE




CROSS DRAINAGE STRUCTURE

## CIRCULAR SMOOTH WALLED AND ELLIPTICAL PIPES

**Concrete Pipe Shown**

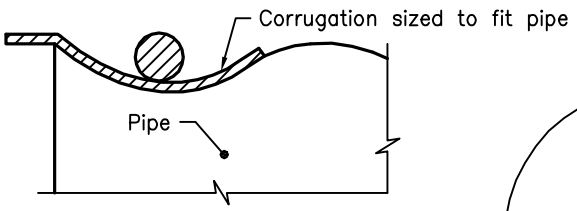
NOTES:

1 Longitudinal safety bar required only when span is greater than 750mm. When the open span of any cross drainage structure is less than 750mm, no longitudinal safety bars are required. Longitudinal bars shall be welded to the transverse bars to make a single piece structure.

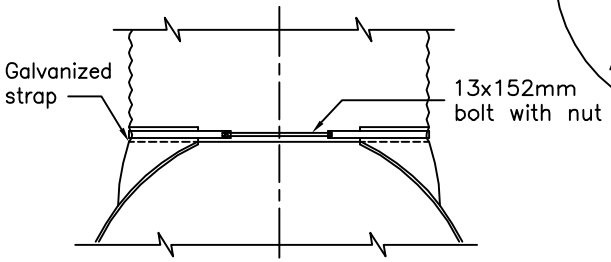
A This OPSD shall be read in conjunction with OPSD 801.040, 801.042, and 801.043.

B All dimensions are in millimetres unless otherwise shown.

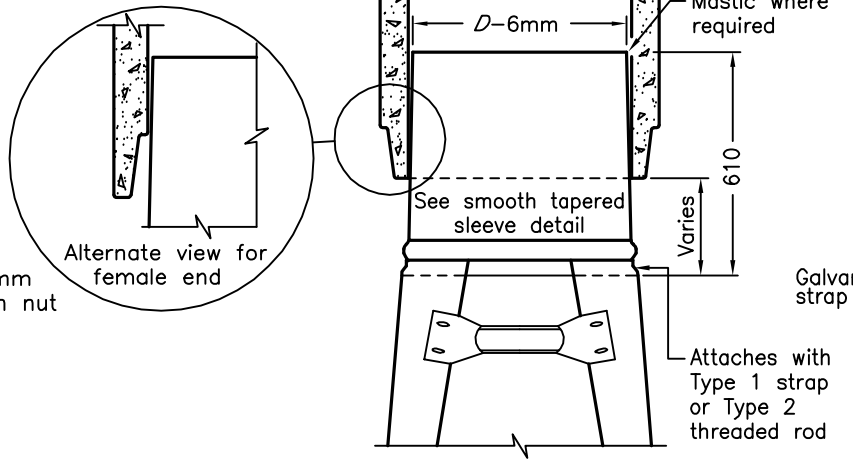
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| CULVERT AND SEWER<br>SAFETY SLOPE END TREATMENT<br>ASSEMBLY DETAILS | | | |
| | OPSD 801.041 | | |



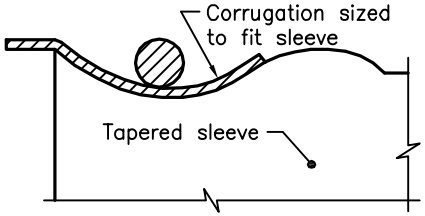

SECTION A–A



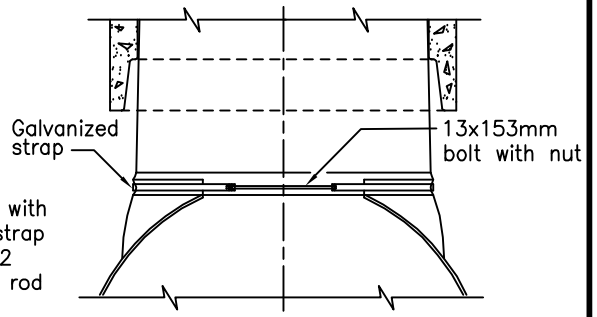

TYPE 1–CONNECTOR DETAIL



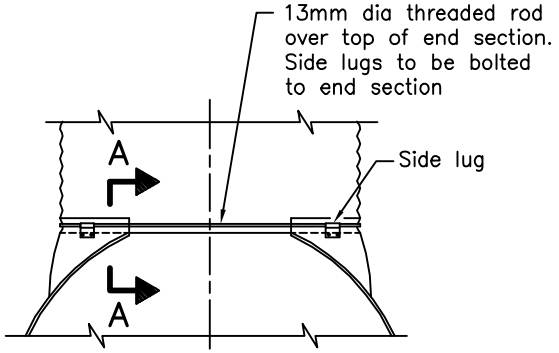

TAPERED SLEEVE FOR ATTACHING
STEEL END SECTIONS TO SMOOTH WALLED PIPE
Concrete Pipe Shown



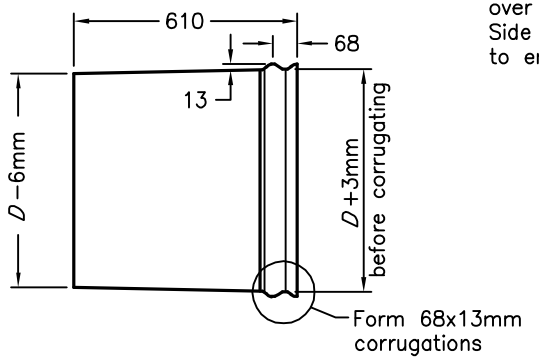

SECTION B–B



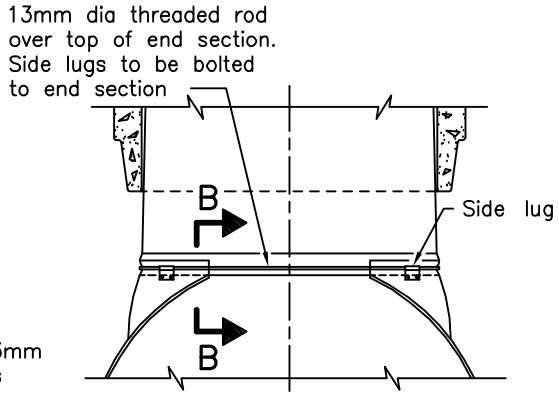

TYPE 3–CONNECTOR DETAIL




TYPE 2–CONNECTOR DETAIL




SMOOTH TAPERED SLEEVE DETAIL




TYPE 4–CONNECTOR DETAIL

## CIRCULAR AND ARCHED CORRUGATED PIPES

## CIRCULAR SMOOTH WALLED AND ELLIPTICAL PIPES

NOTES:

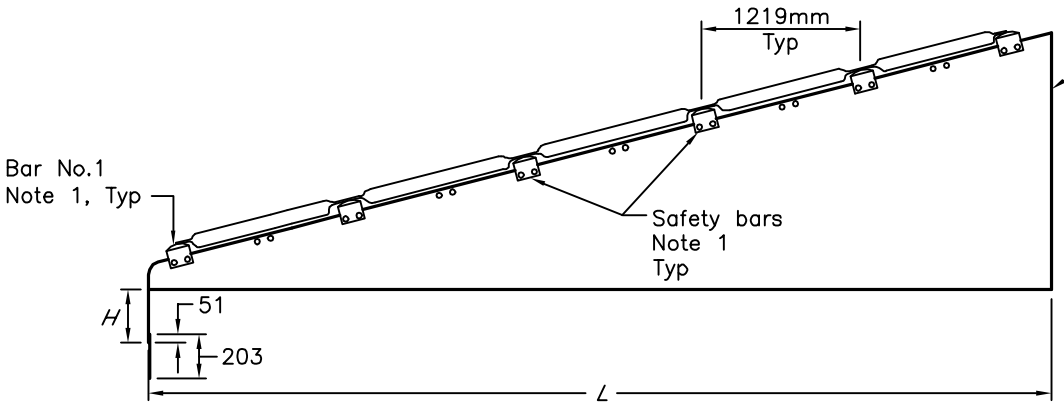
A This OPSD shall be read in conjunction with OPSD 801.040, 801.041, and 801.043.

B All dimensions are in millimetres unless otherwise shown.

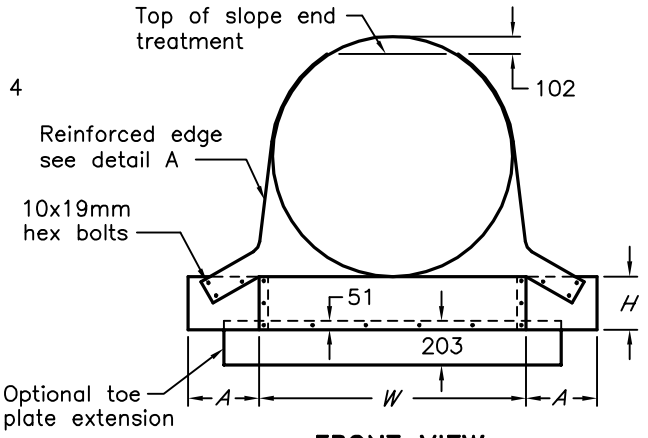
LEGEND:

*D* – Nominal pipe diameter

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| CULVERT AND SEWER<br>SAFETY SLOPE END TREATMENT<br>CONNECTION DETAILS | | | |
| | | | OPSD 801.042 |

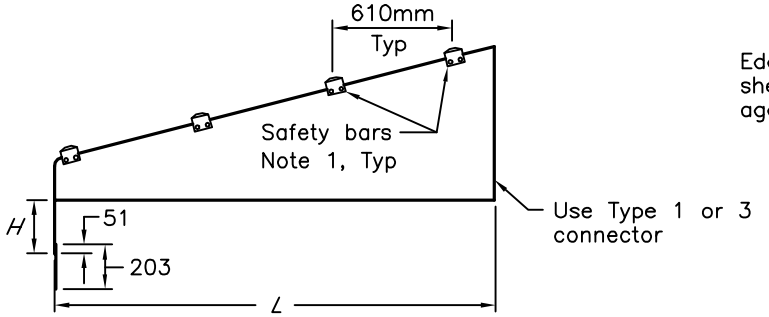



SIDE ELEVATION FOR CROSS DRAINAGE STRUCTURE

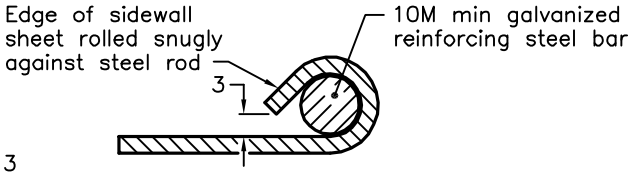



FRONT VIEW

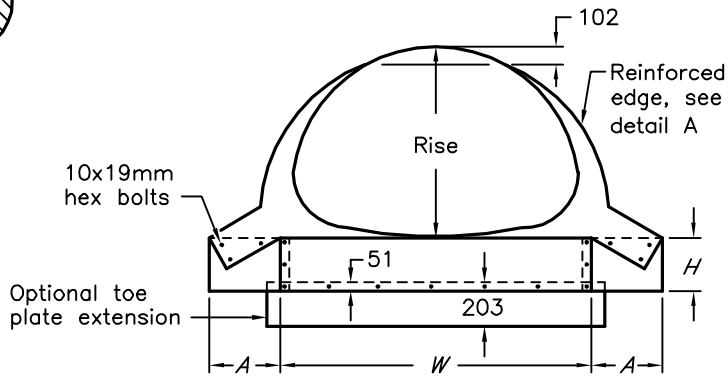
CIRCULAR SMOOTH WALLED PIPE




SIDE ELEVATION OF PARALLEL DRAINAGE STRUCTURE

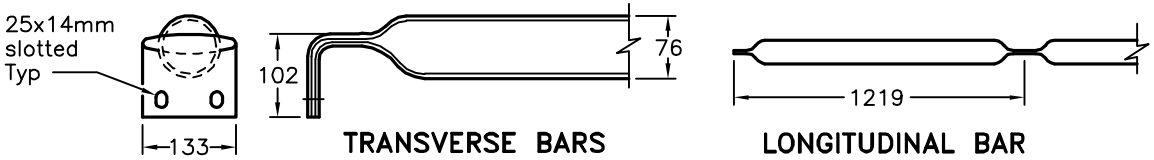



DETAIL A




FRONT VIEW

ARCHED PIPE




TRANSVERSE BARS

LONGITUDINAL BAR

DETAIL OF SAFETY BARS

NOTES:

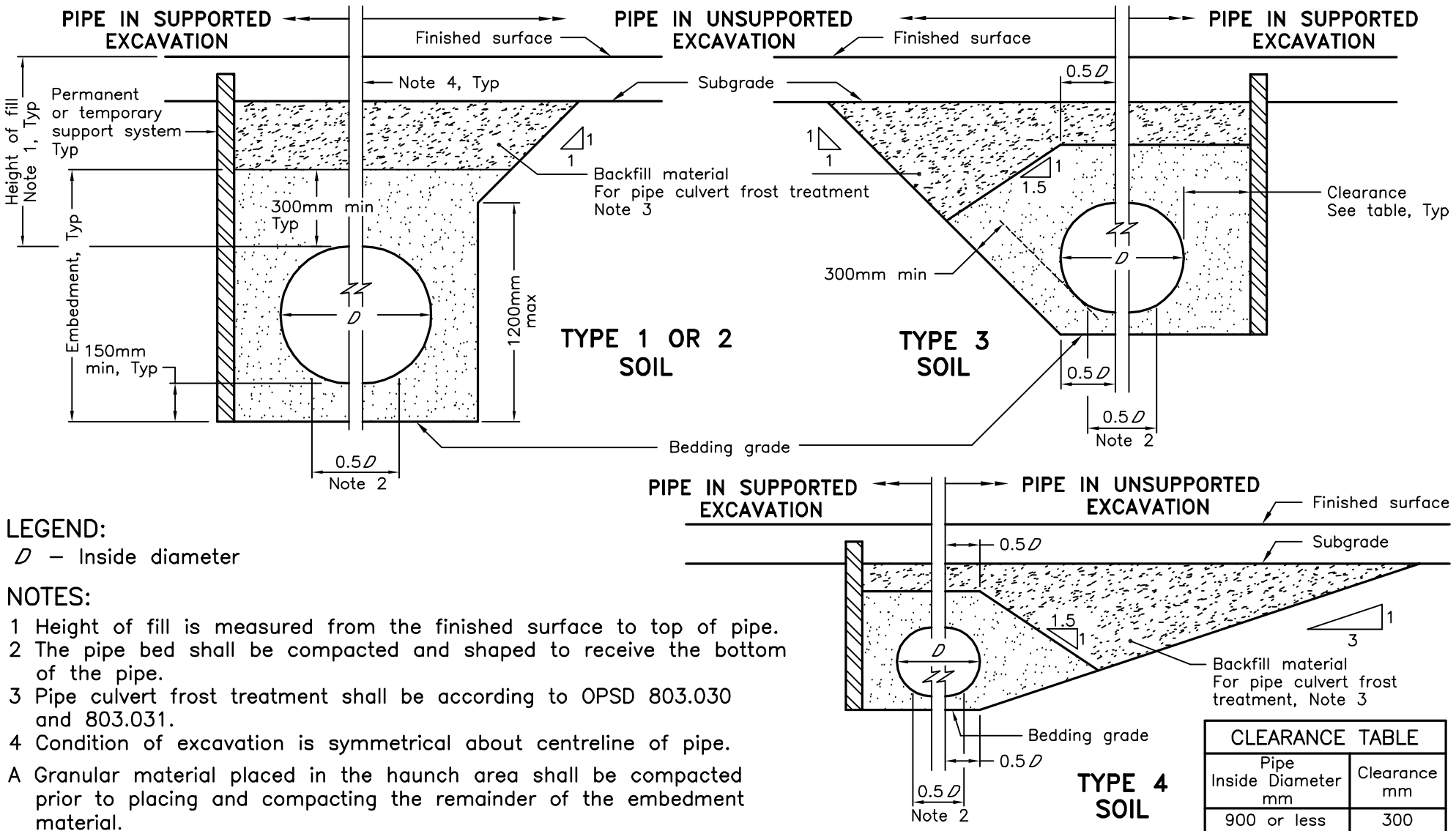
1 Number of bars required will vary depending on the length of the end section. Bar No.1 shall be located 150mm above flow line.

A This OPSD shall be read in conjunction with OPSD 801.040, 801.041, and 801.042.

B Toe plate extensions shall be the same thickness and material as end section. Dimensions shall be overall width less 150mm by 200mm high.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| CULVERT AND SEWER<br>SAFETY SLOPE END TREATMENT<br>INSTALLATION DETAILS | | | |
| | OPSD 801.043 | | |




LEGEND:

$D$ – Inside diameter

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.

A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.

B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

C All dimensions are in metres unless otherwise shown.

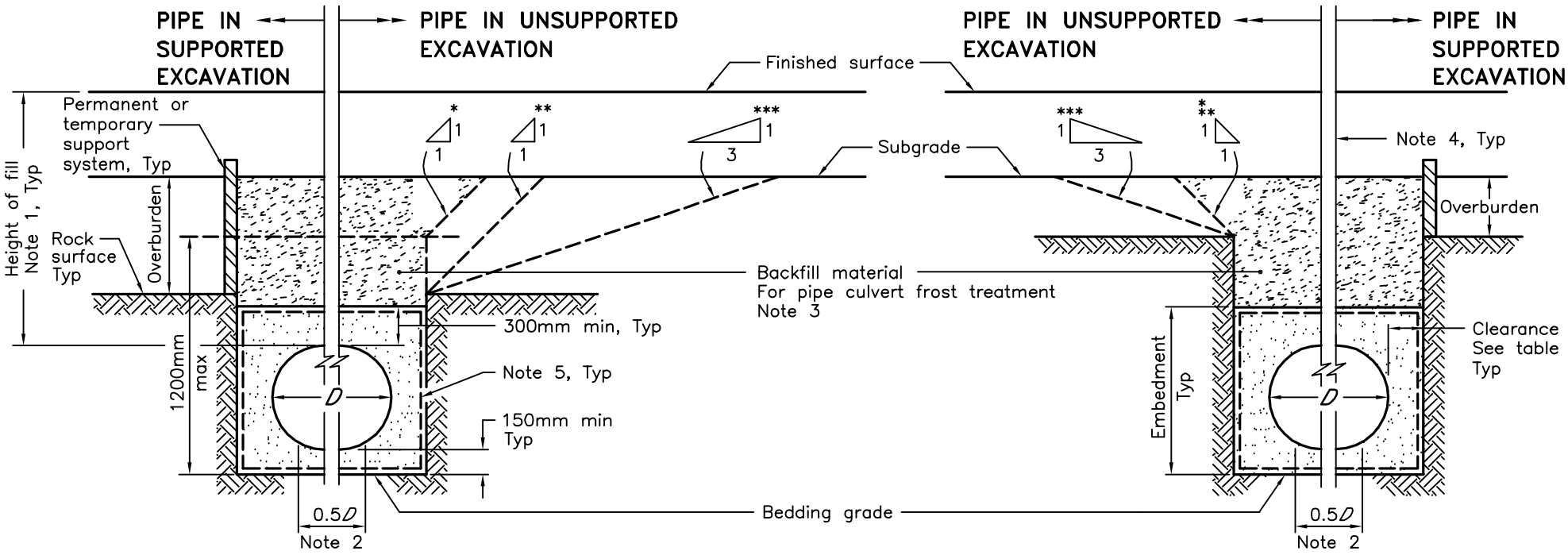
| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2014 | Rev 3

# FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION

OPSD 802.010




**ORIGINAL ROCK < 1200mm ABOVE TRENCH BOTTOM**

**ORIGINAL ROCK ≥ 1200mm ABOVE TRENCH BOTTOM**

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
5 Embedment material shall be wrapped in non–woven geotextile when specified.

A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C Fractured rock shall be treated as Type 1 soil.
D All dimensions are in metres unless otherwise shown.

LEGEND:

*D* – Inside diameter
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

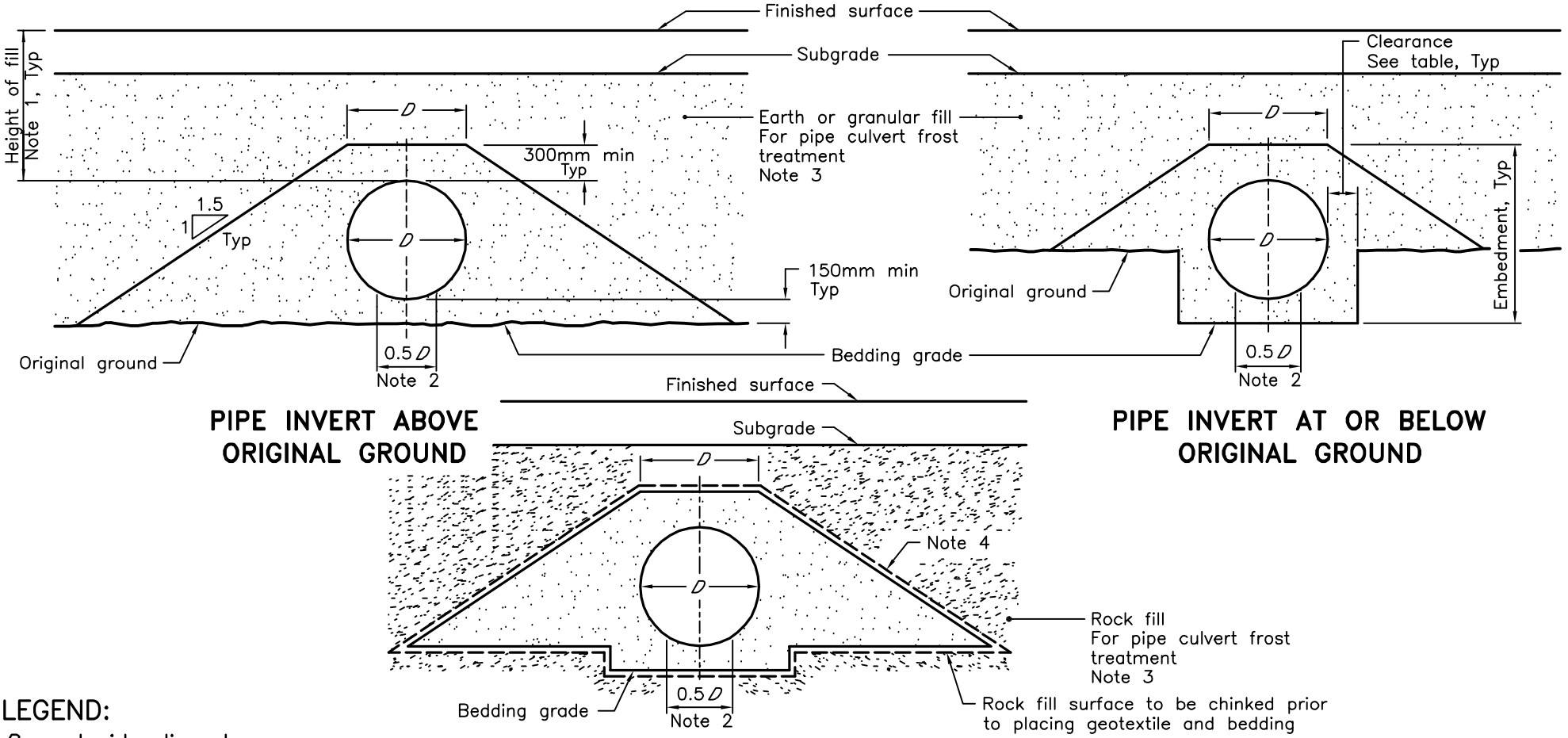
ONTARIO PROVINCIAL STANDARD DRAWING

# FLEXIBLE PIPE EMBEDMENT AND BACKFILL ROCK EXCAVATION

Nov 2014 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 802.013




**PIPE INVERT ABOVE ORIGINAL GROUND**

**PIPE INVERT AT OR BELOW ORIGINAL GROUND**




## PIPE EMBEDMENT WITH ROCK FILL UNDER AND OVER THE PIPE

LEGEND:

*D* – Inside diameter

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Embedment material shall be wrapped in non–woven geotextile when specified.

| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.

B All dimensions are in metres unless otherwise shown.

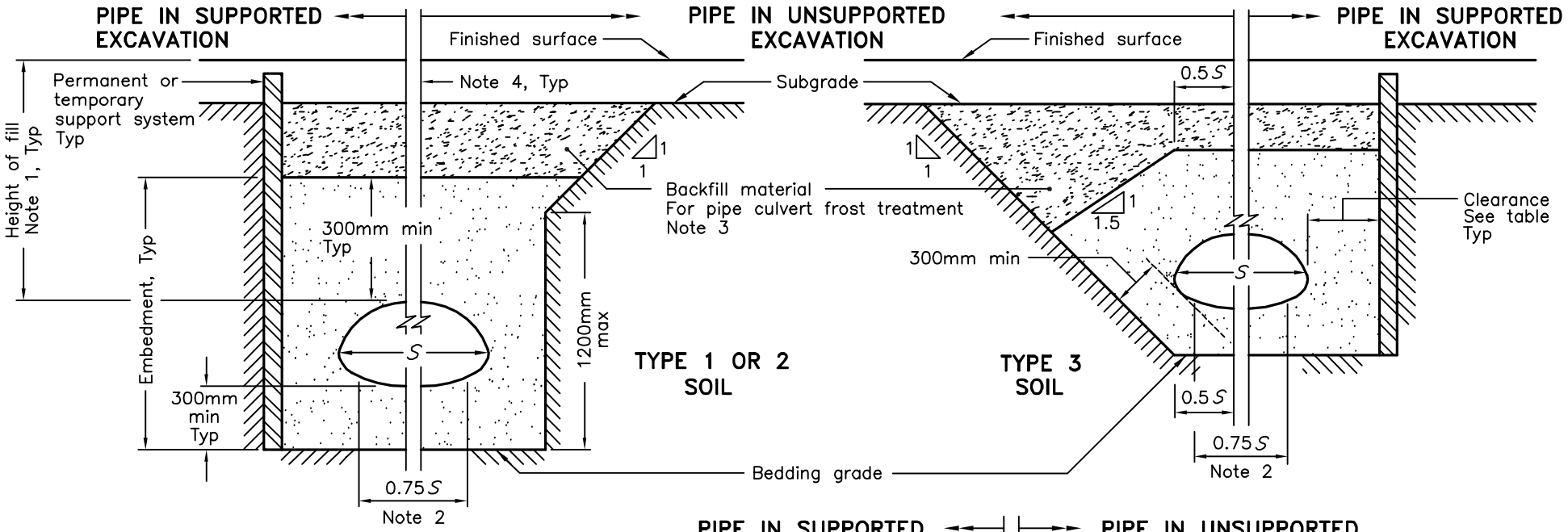
ONTARIO PROVINCIAL STANDARD DRAWING

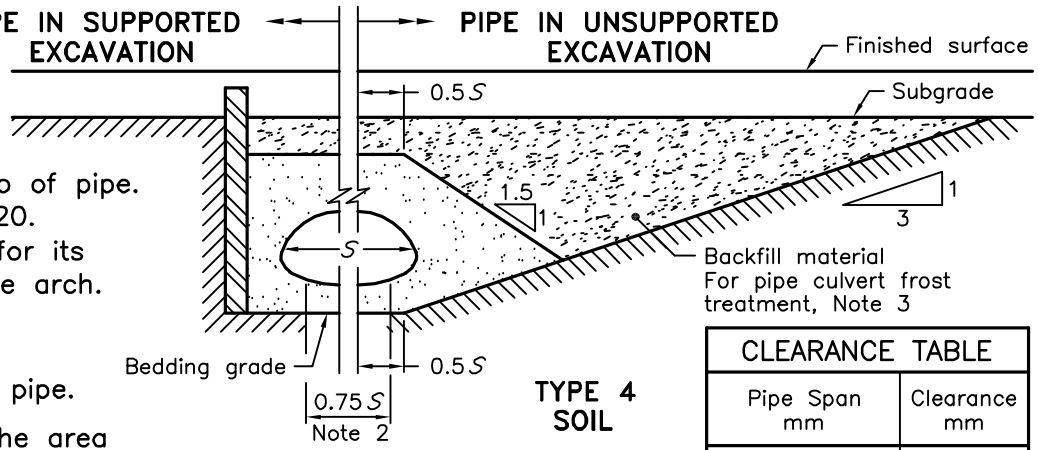
# FLEXIBLE PIPE EMBEDMENT IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK

Nov 2014 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 802.014




## LEGEND:

$S$ – Span of pipe arch

## NOTES:

1 Height of fill is measured from the finished surface to top of pipe. Height of fill over pipe shall be according to OPSD 805.020.

2 For width 0.75$S$, granular material shall be uncompacted for its full depth and fine graded to shape of bottom of the pipe arch.

3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

4 Condition of excavation is symmetrical about centreline of pipe.

A Granular material placed in the haunch area, other than the area included in Note 2, shall be compacted prior to placing and compacting the remainder of the embedment material.

B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

C All dimensions are in metres unless otherwise shown.

| CLEARANCE TABLE | |
|---|---|
| Pipe Span mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

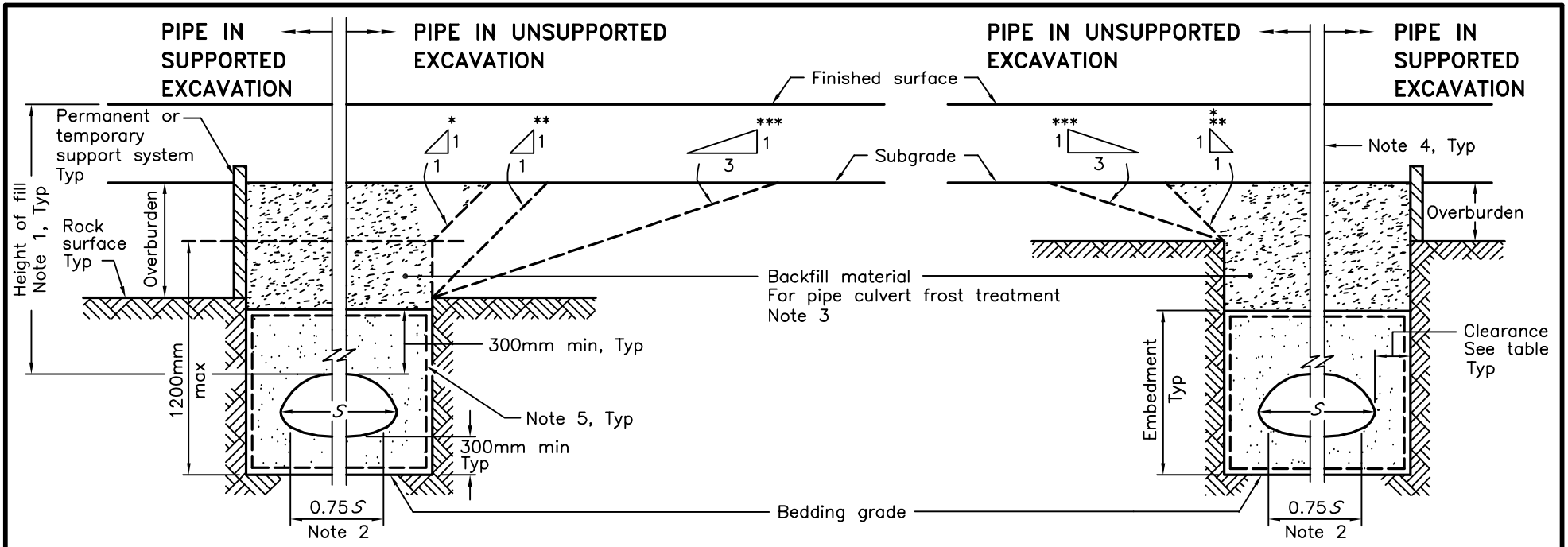
ONTARIO PROVINCIAL STANDARD DRAWING

# FLEXIBLE PIPE ARCH EMBEDMENT AND BACKFILL EARTH EXCAVATION

Nov 2015 | Rev 3

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 802.020




**ORIGINAL ROCK < 1200mm ABOVE TRENCH BOTTOM**

**ORIGINAL ROCK ≥ 1200mm ABOVE TRENCH BOTTOM**

NOTES:

1 Height of fill is measured from the finished surface to top of pipe. Height of fill over pipe shall be according to OPSD 805.020.
2 For width 0.75*S*, granular material shall be uncompacted for its full depth and fine graded to shape of bottom of the pipe arch.
3 Pipe culvert frost treatment shall be according OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
5 Embedment material shall be wrapped in non–woven geotextile when specified.

A Granular material placed in the haunch area, other than the area included in Note 2, shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C Fractured rock shall be treated as Type 1 soil.
D All dimensions are in metres unless otherwise shown.

LEGEND:

*S* – Span of pipe arch
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

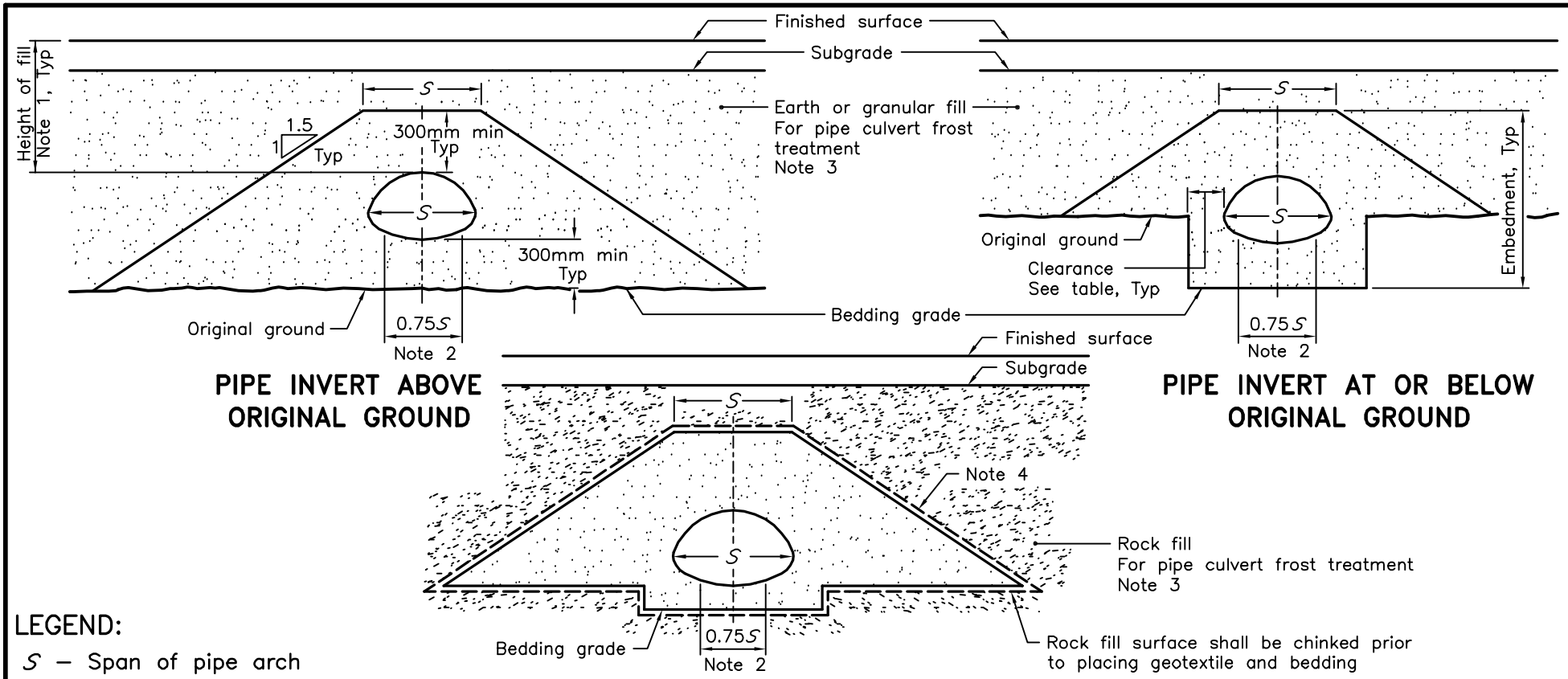
| CLEARANCE TABLE | |
|---|---|
| Pipe Span mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

ONTARIO PROVINCIAL STANDARD DRAWING

# FLEXIBLE PIPE ARCH EMBEDMENT AND BACKFILL ROCK EXCAVATION

Nov 2015 | Rev 3

OPSD 802.023




## PIPE EMBEDMENT
## WITH ROCK FILL UNDER AND OVER THE PIPE

LEGEND:

$S$ – Span of pipe arch

NOTES:

1 Height of fill is measured from the finished surface to top of pipe. Height of fill over pipe shall be according to OPSD 805.020.

2 For width 0.75$S$, granular material shall be uncompacted for its full depth and fine graded to shape of bottom of the pipe arch.

3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

4 Embedment material shall be wrapped in non–woven geotextile when specified.

A Granular material placed in the haunch area, other than the area included in Note 2, shall be compacted prior to placing and compacting the remainder of the embedment material.

B All dimensions are in metres unless otherwise shown.

| CLEARANCE TABLE | |
|---|---|
| Pipe Span mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

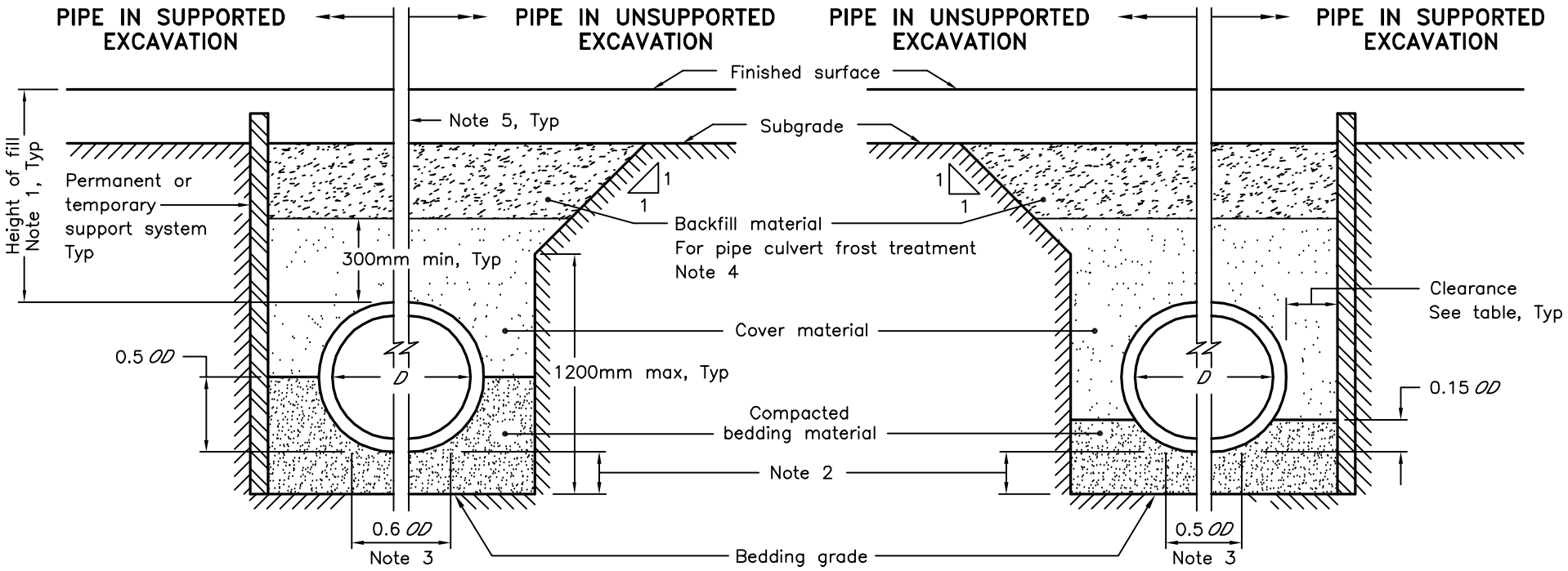
ONTARIO PROVINCIAL STANDARD DRAWING

# FLEXIBLE PIPE ARCH EMBEDMENT IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK

Nov 2015 | Rev 3

ONTARIO STANDARDS – MUNICIPAL – PROVINCIAL

OPSD 802.024




**CLASS B BEDDING**

**CLASS C BEDDING**

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.15*D*. In no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

B All dimensions are in metres unless otherwise shown.

LEGEND:

*D* – Inside diameter
*OD* – Outside diameter

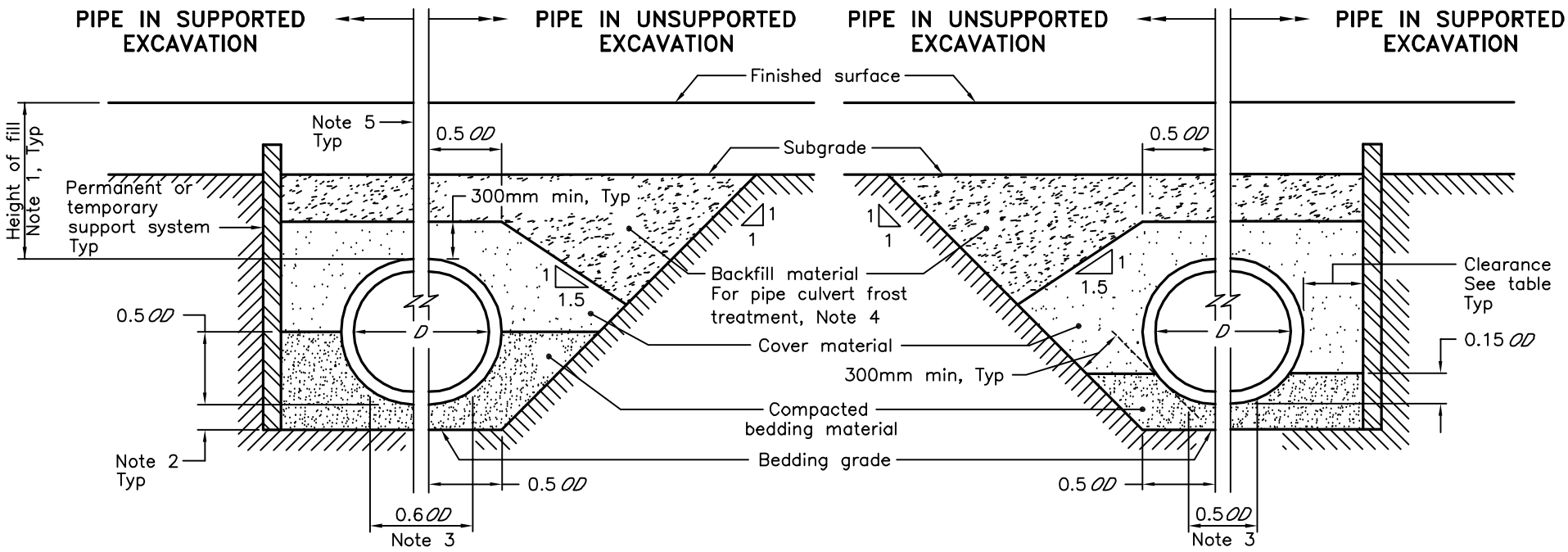
| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 | Rev 3

# RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 1 OR 2 SOIL – EARTH EXCAVATION

# OPSD 802.030




## NOTES:

1 Height of fill is measured from the finished surface to top of pipe.

2 The minimum bedding depth below the pipe shall be $0.15D$. In no case shall this dimension be less than 150mm or greater than 300mm.

3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.

4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

5 Condition of excavation is symmetrical about centreline of pipe.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

B All dimensions are in metres unless otherwise shown.

## LEGEND:

$D$ – Inside diameter

$OD$ – Outside diameter

| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

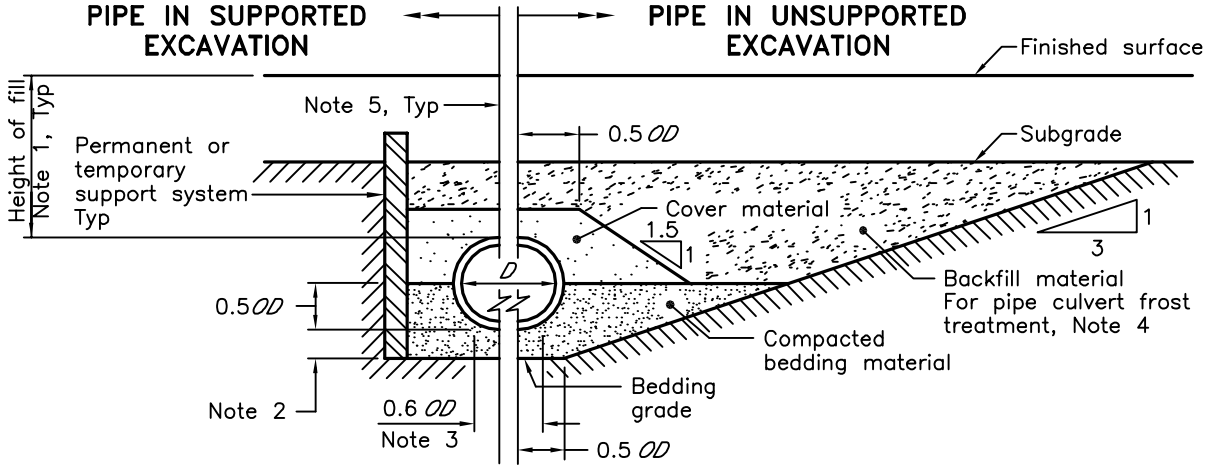
ONTARIO PROVINCIAL STANDARD DRAWING

# RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL – EARTH EXCAVATION

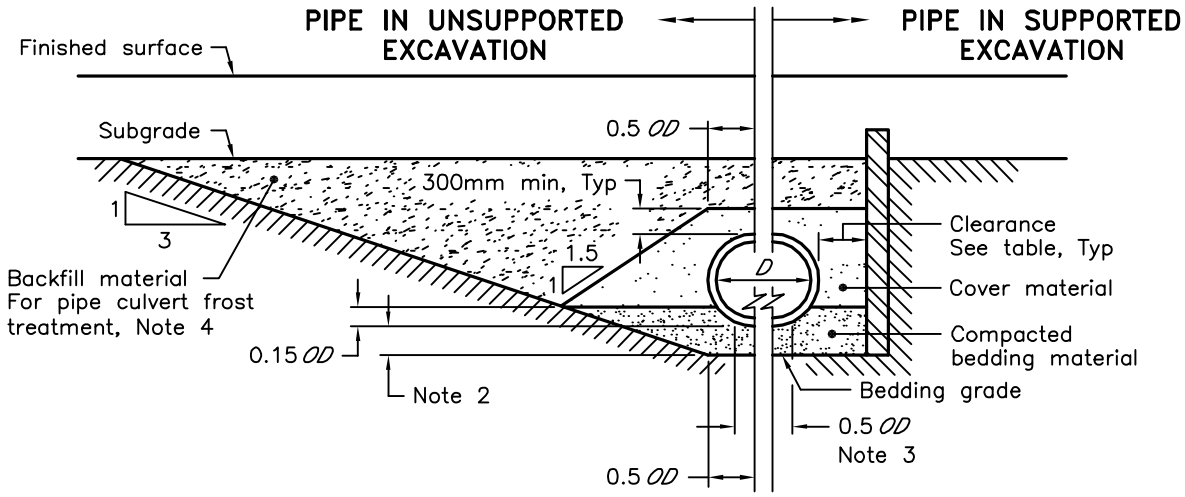
Nov 2015 | Rev 3

ONTARIO STANDARDS MUNICIPAL – PROVINCIAL

OPSD 802.031




## CLASS B BEDDING




## CLASS C BEDDING

| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

LEGEND:

*D* – Inside diameter

*OD* – Outside diameter

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.

2 The minimum bedding depth below the pipe shall be 0.15*D*. In no case shall this dimension be less than 150mm or greater than 300mm.

3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.

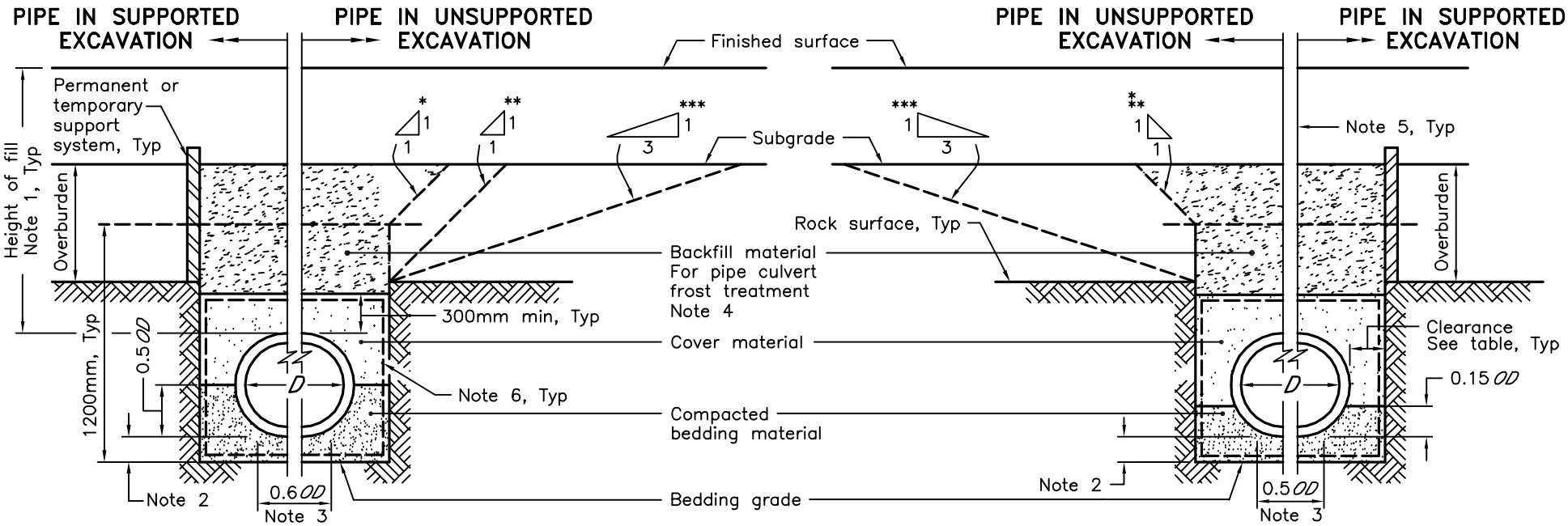
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

5 Condition of excavation is symmetrical about centreline of pipe.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

B All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 3 |
|---|---|---|---|
| RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 4 SOIL – EARTH EXCAVATION | | | |
| | | | OPSD 802.032 |




## NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.25*D*. In no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
6 Embedment material shall be wrapped in non–woven geotextile when specified.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B Fractured rock shall be treated as Type 1 soil.
C All dimensions are in metres unless otherwise shown.

## LEGEND:

*D* – Inside diameter
*OD* – Outside diameter
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

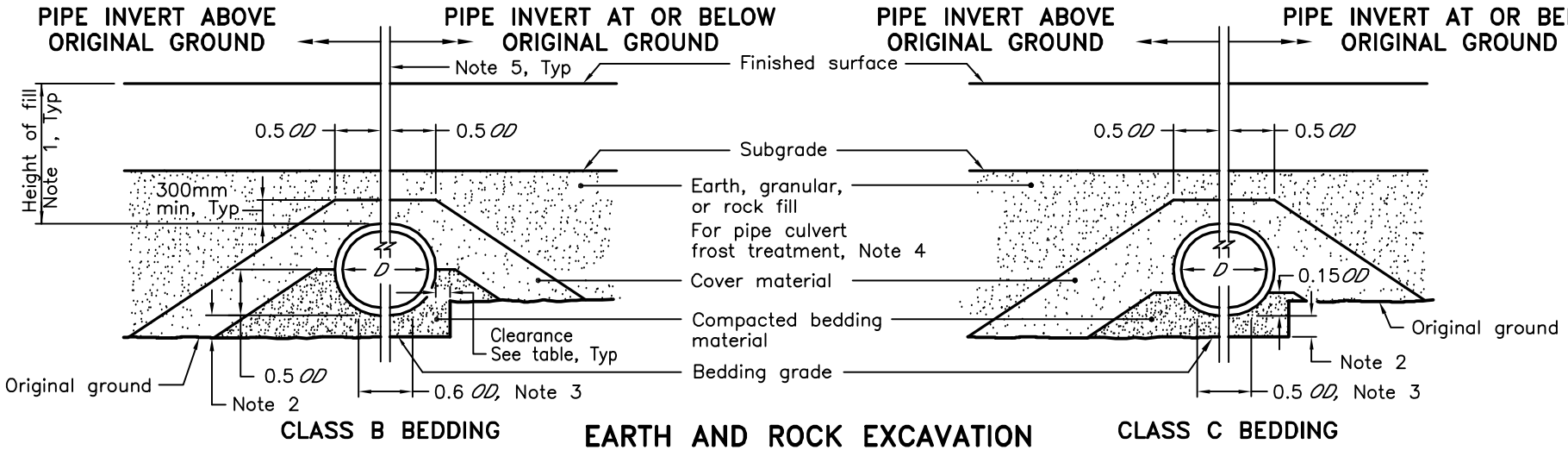
| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

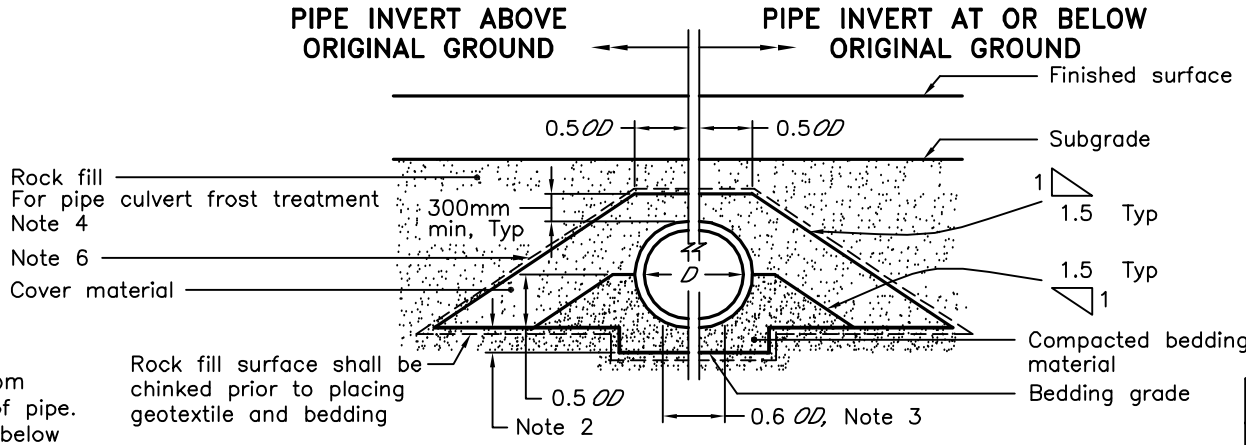
ONTARIO PROVINCIAL STANDARD DRAWING

# RIGID PIPE BEDDING, COVER, AND BACKFILL ROCK EXCAVATION

Nov 2015 | Rev 3

OPSD 802.033




## PIPE BEDDING AND COVER WITH ROCK FILL UNDER AND OVER THE PIPE

**LEGEND:**

*D* – Inside diameter

*OD* – Outside diameter

## NOTES:

1 Height of fill is measured from the finished surface to top of pipe.

2 The minimum bedding depth below the pipe shall be 0.15*D*, except on a rock foundation where the minimum bedding depth shall be 0.25*D*. In no case shall the minimum dimension be less than 150mm or greater than 300mm.

3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.

4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

5 Condition of excavation is symmetrical about centreline of pipe.

6 Bedding and cover material shall be wrapped in non–woven geotextile when specified.

A All dimensions are in metres unless otherwise shown.

| CLEARANCE TABLE | |
|---|---|
| Pipe Inside Diameter mm | Clearance mm |
| 900 or less | 300 |
| Over 900 | 500 |

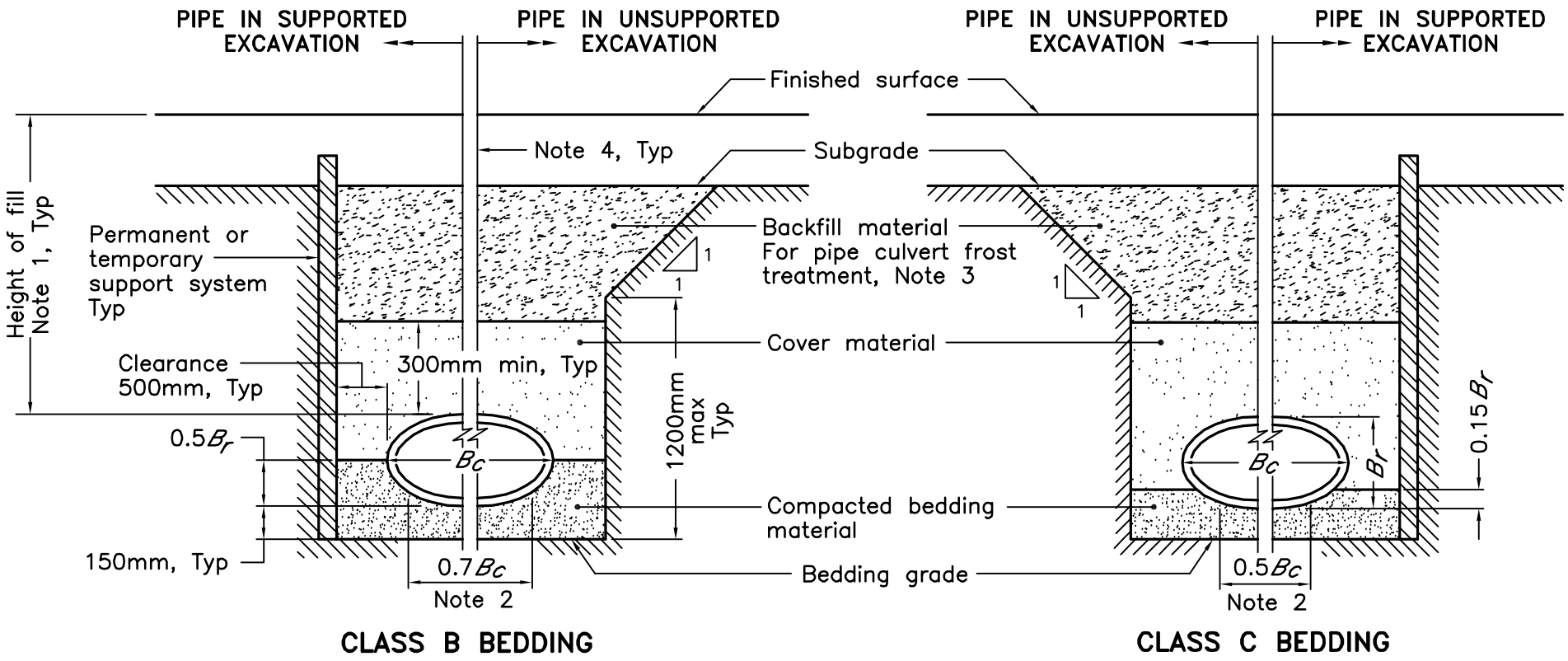
ONTARIO PROVINCIAL STANDARD DRAWING

# RIGID PIPE BEDDING AND COVER IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK

Nov 2015 | Rev 3

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 802.034




NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.

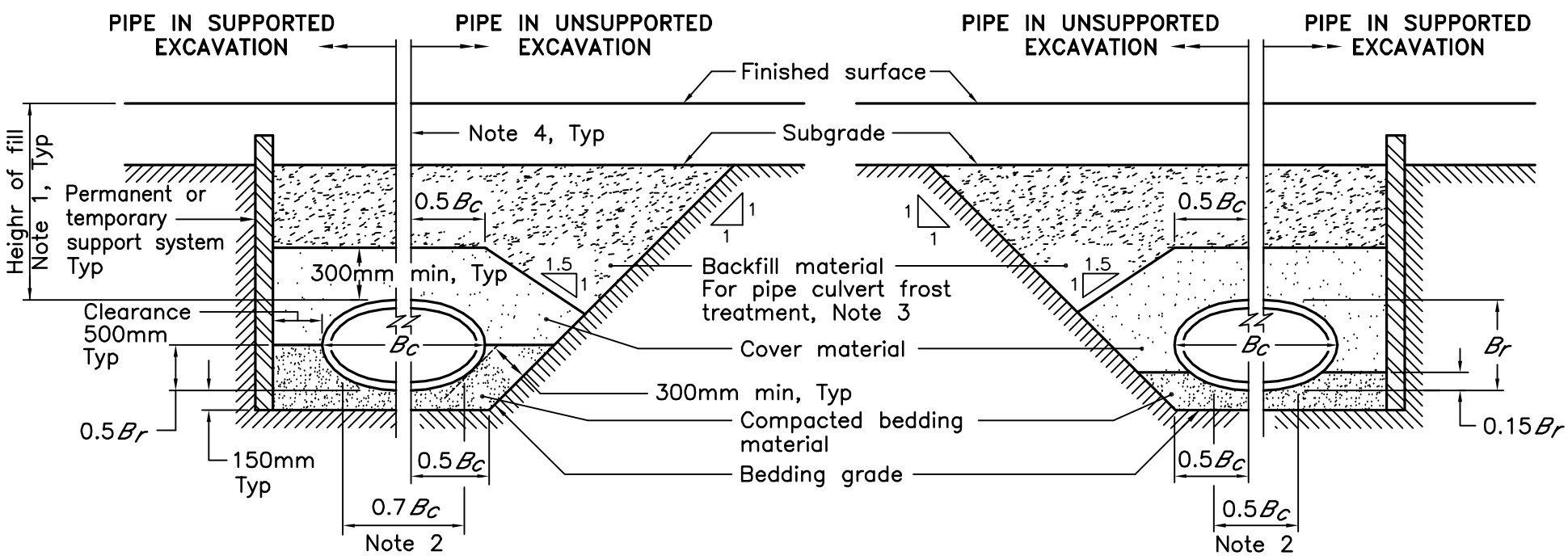
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

B All dimensions are in metres unless otherwise shown.

LEGEND:

$B_c$ = Outside horizontal span
$B_r$ = Outside vertical rise

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 3 |
|---|---|---|---|
| HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 1 OR 2 SOIL – EARTH EXCAVATION | | | |
| | OPSD 802.050 | | |




NOTES:

1 Height of fill is measured from the finished surface to top of pipe.

2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.

3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

4 Condition of excavation is symmetrical about centreline of pipe.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

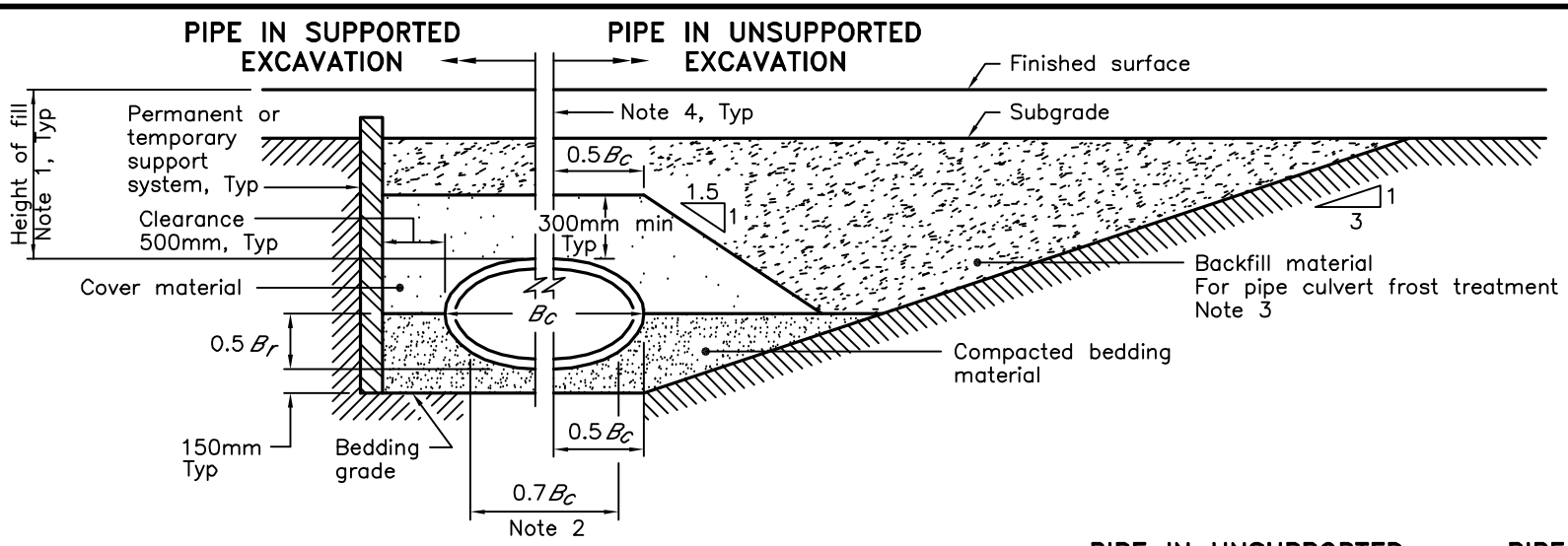
B All dimensions are in metres unless otherwise shown.

LEGEND:

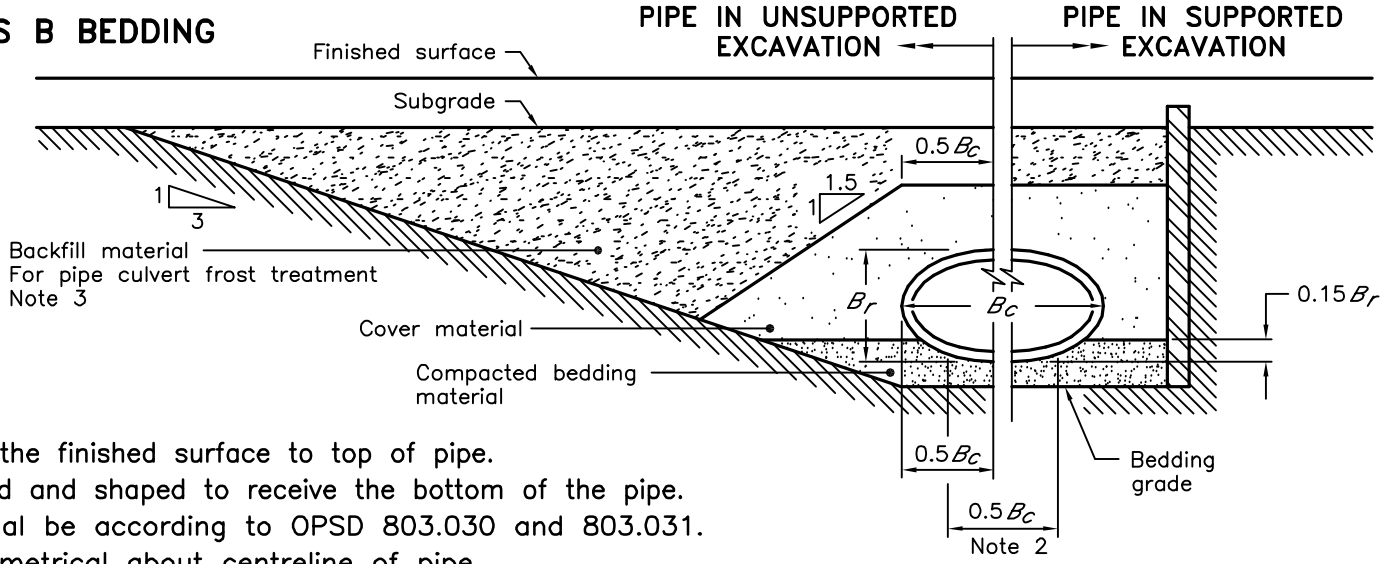
$B_c$ = Outside horizontal span

$B_r$ = Outside vertical rise

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 3 |
|---|---|---|---|
| HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL – EARTH EXCAVATION | | | |
| | OPSD 802.051 | | |




CLASS B BEDDING




CLASS C BEDDING

LEGEND:

$B_c$ = Outside horizontal span

$B_r$ = Outside vertical rise

NOTES:

1 Height of fill is measured from the finished surface to top of pipe.

2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.

3 Pipe culvert frost treatment shal be according to OPSD 803.030 and 803.031.

4 Condition of excavation is symmetrical about centreline of pipe.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

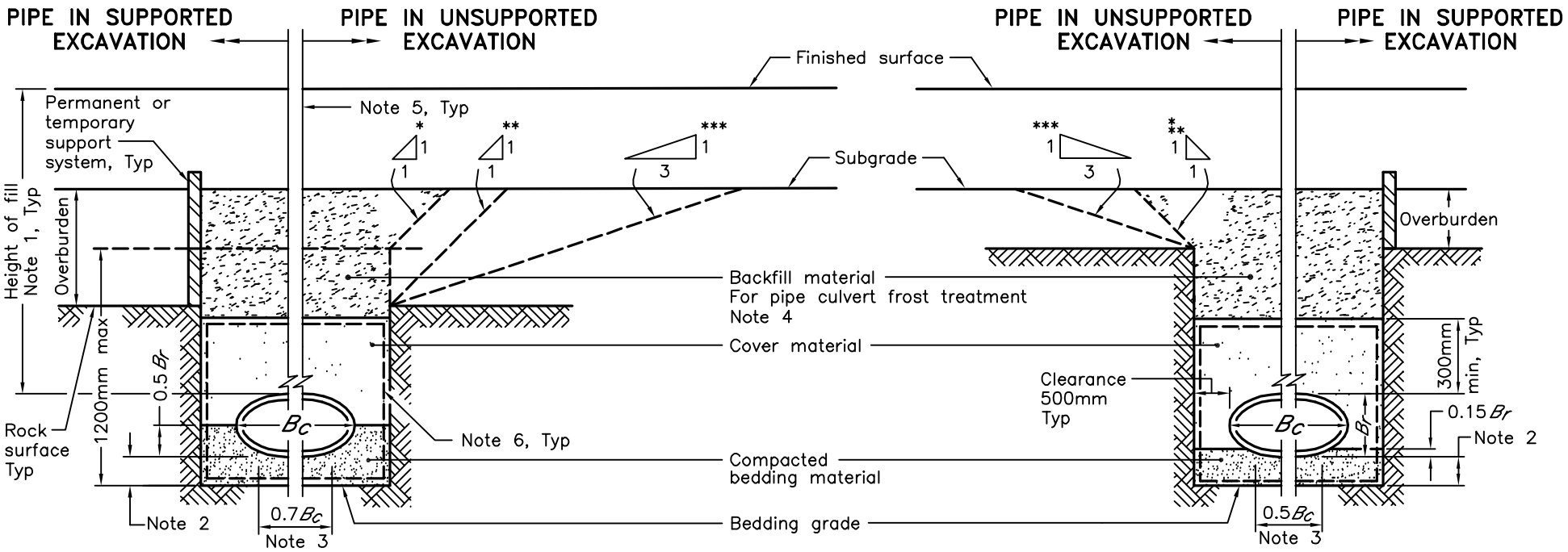
B All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 4 SOIL – EARTH EXCAVATION

Nov 2015 | Rev 3

OPSD 802.052




## NOTES:

1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be $0.25B_c$. In no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
6 Embedment material shall be wrapped in non–woven geotextile when specified.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B Fractured rock shall be treated as Type 1 soil.
C All dimensions are in metres unless otherwise shown.

## LEGEND:

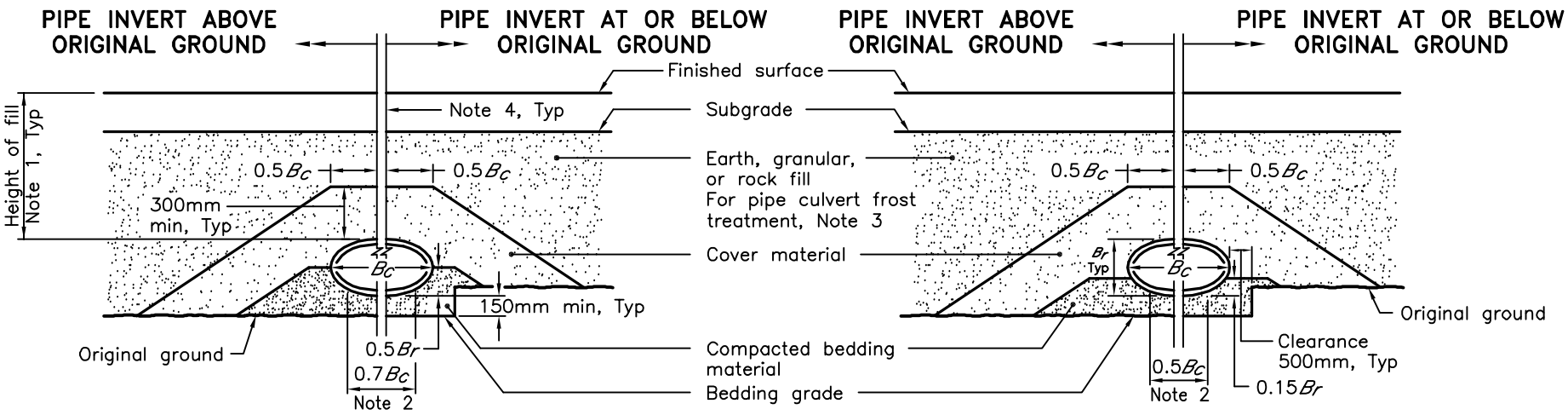
$B_c$ = Outside horizontal span
$B_r$ = Outside vertical rise
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

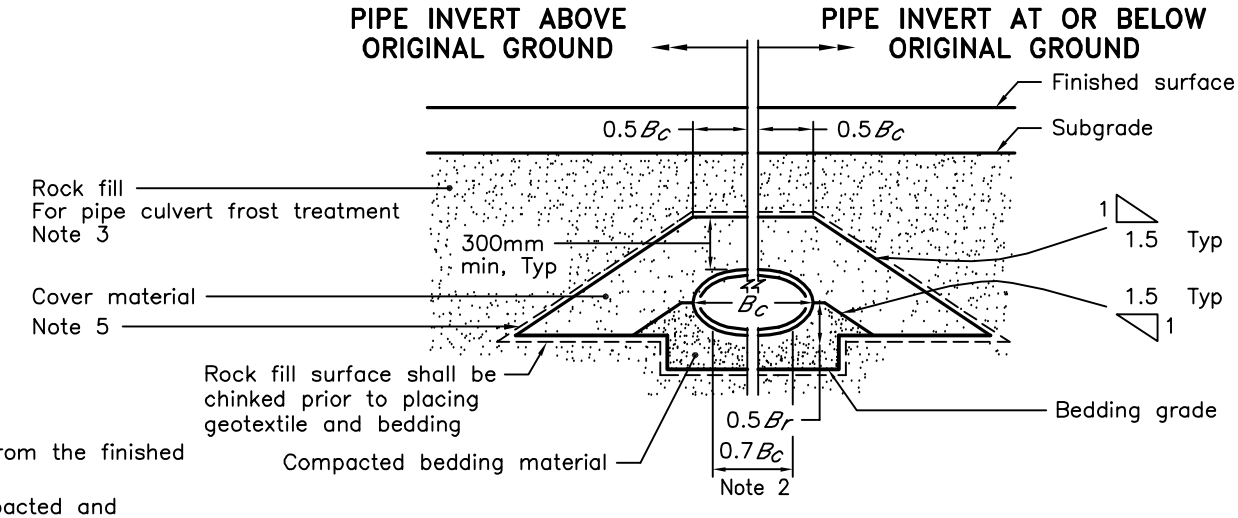
ONTARIO PROVINCIAL STANDARD DRAWING

# HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING, COVER, AND BACKFILL ROCK EXCAVATION

Nov 2015 | Rev 3

OPSD 802.053




## PIPE BEDDING AND COVER WITH ROCK FILL UNDER AND OVER THE PIPE

## LEGEND:

$B_c$ = Outside horizontal span

$B_r$ = Outside vertical rise

## NOTES:

1 Height of fill is measured from the finished surface to top of pipe.

2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.

3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.

4 Condition of excavation is symmetrical about centreline of pipe.

5 Bedding and cover material shall be wrapped in non–woven geotextile when specified.

A All dimensions are in metres unless otherwise shown.

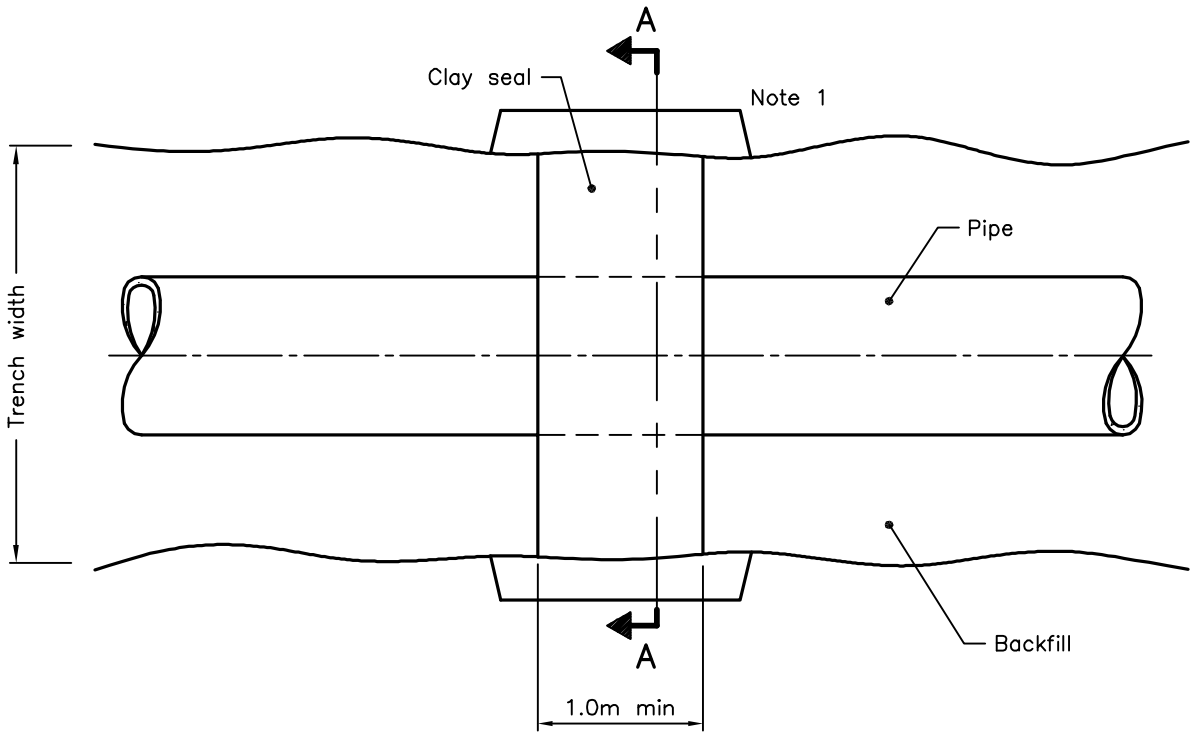
ONTARIO PROVINCIAL STANDARD DRAWING

# HORIZONTAL ELLIPTICAL RIGID PIPE BEDDING AND COVER IN EMBANKMENT ORIGINAL GROUND: EARTH OR ROCK

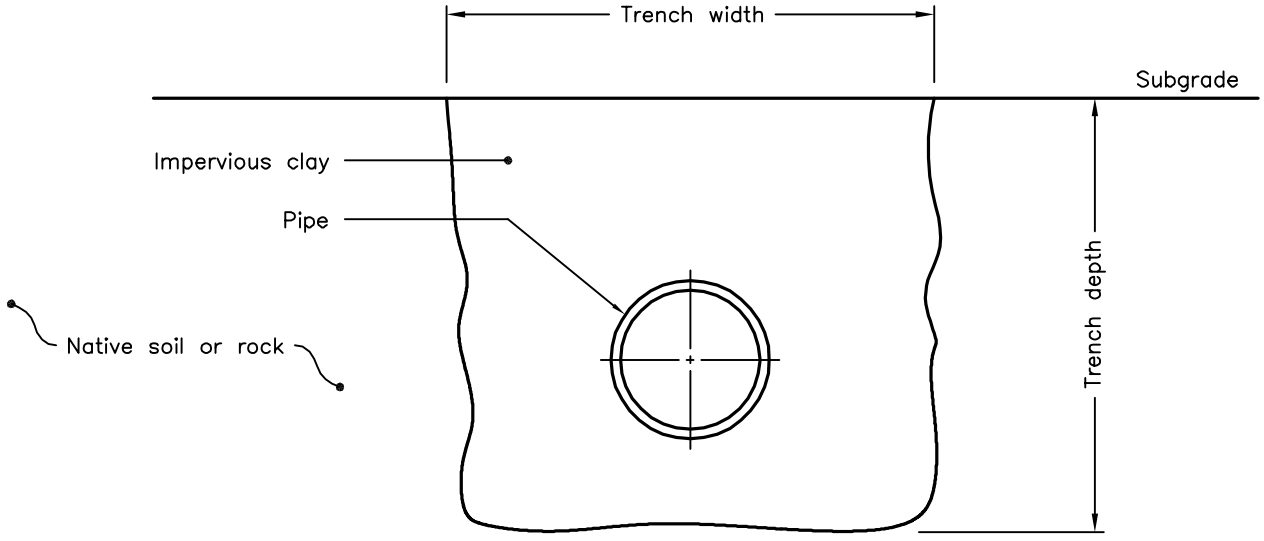
Nov 2015 | Rev 3

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 802.054




**PLAN**




**SECTION A–A**

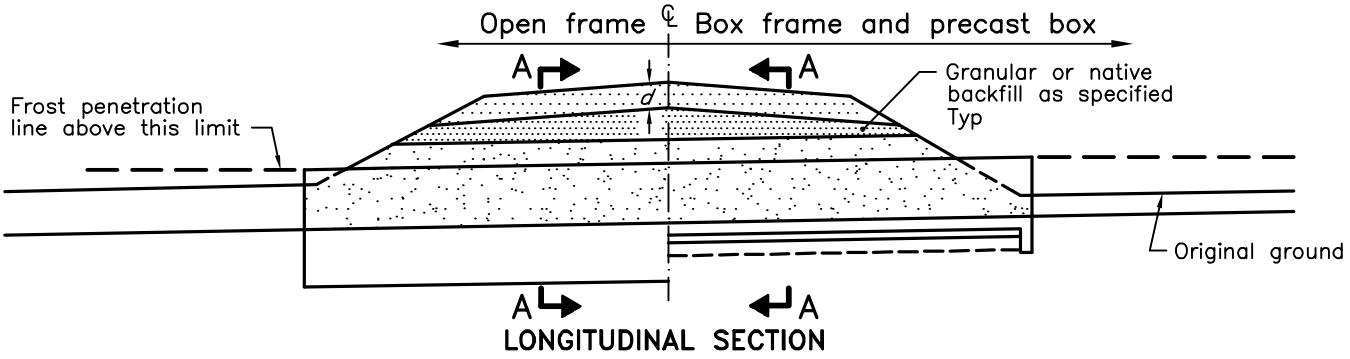
NOTES:

1. Key into undisturbed trench soil.

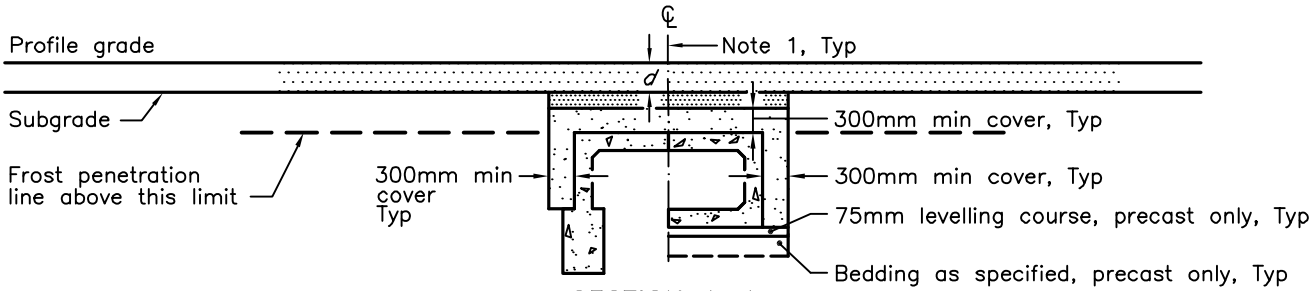
A Clay seal shall extend from bottom of trench excavation to the subgrade.
B Clay seal shall be located so that no pipe joints are within the clay seal material.
C All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| CLAY SEAL FOR PIPE TRENCHES | | | |
| | OPSD 802.095 | | |

## FROST PENETRATION LINE AT OR ABOVE TOP OF CULVERT

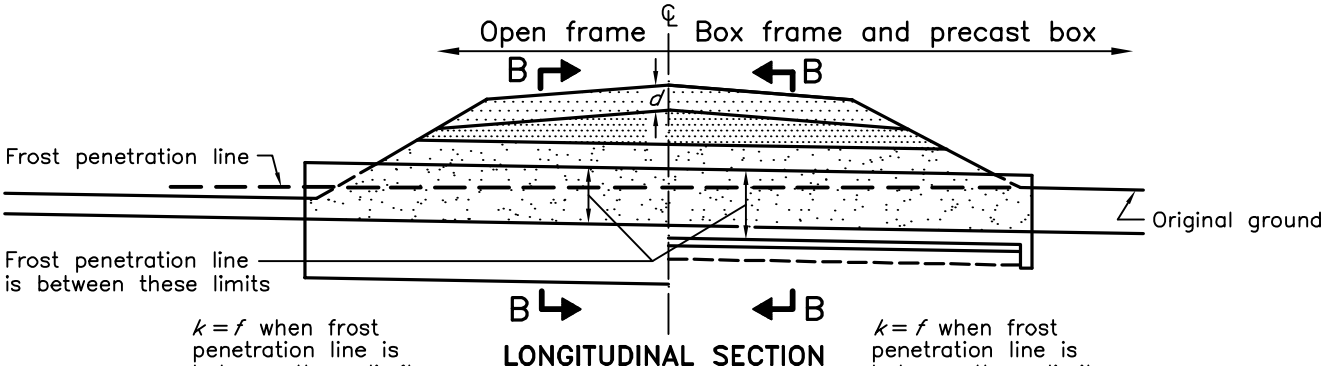



LONGITUDINAL SECTION

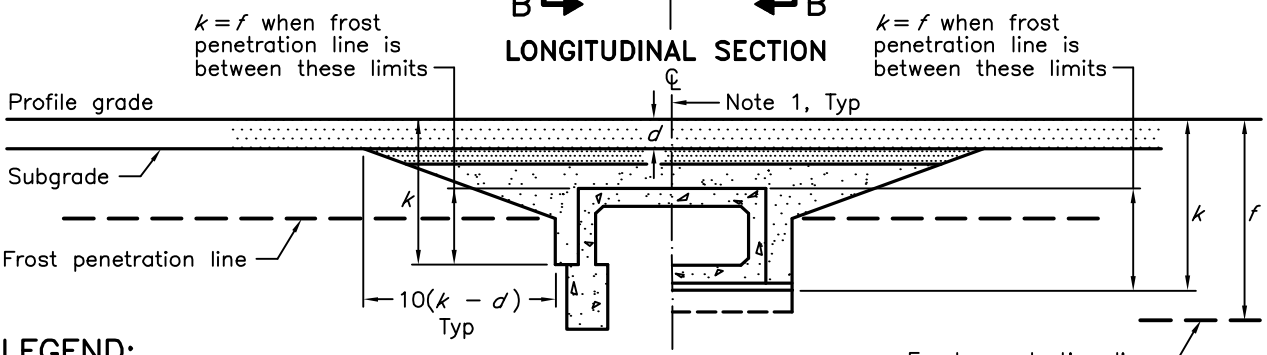



SECTION A–A

## FROST PENETRATION LINE BELOW TOP OF CULVERT




LONGITUDINAL SECTION




SECTION B–B

## LEGEND:

$d$ = depth of roadbed granular
$k$ = depth of frost treatment below profile grade
$f$ = depth of frost penetration below profile grade

## NOTES:

1 Condition of frost treatment symmetrical about centreline of culvert.

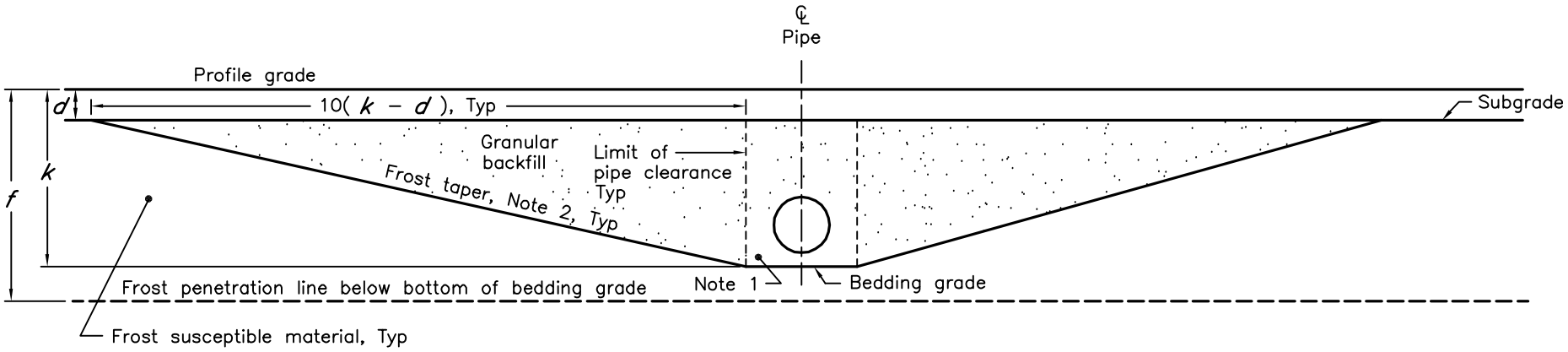
A Bedding, levelling, and cover material shall be granular as specified.

B The depth of roadbed granular shall be 600mm minimum.

C The maximum depth of frost treatment shall be bottom of box frame or top of footing.

D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 3 |
|---|---|---|---|
| **BACKFILL AND COVER FOR CONCRETE CULVERTS WITH SPANS LESS THAN OR EQUAL TO 3.0M** | | | |
| | | | **OPSD 803.010** |




## FROST TREATMENT
## RIGID AND FLEXIBLE PIPE

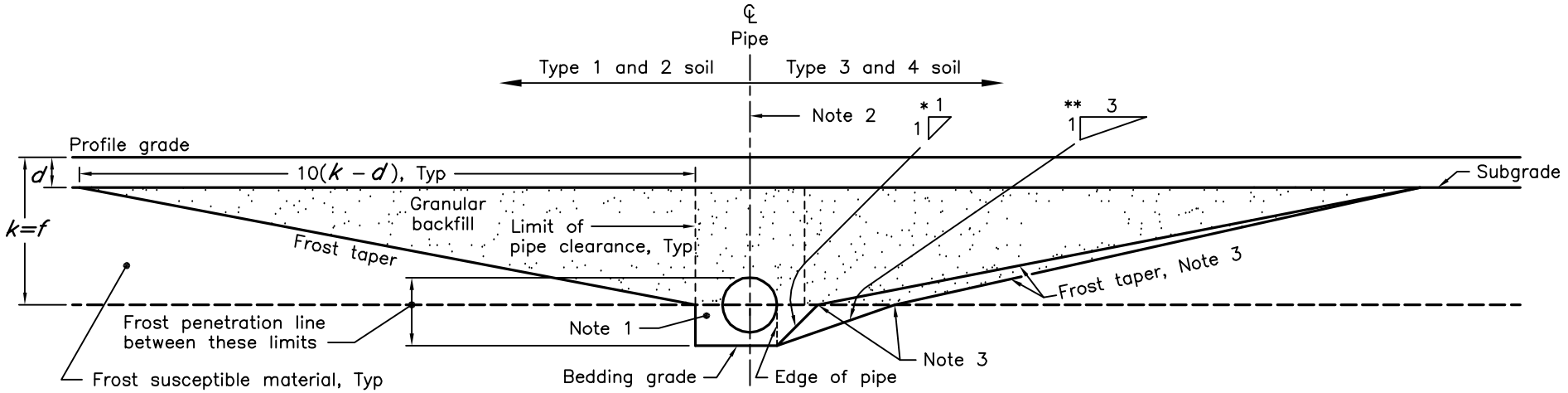
NOTES:

1 Pipe embedment or bedding, cover, and backfill shall be according to:
   a) Flexible OPSD 802.010, 802.013, 802.014, 802.020, 802.023, and 802.024.
   b) 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 2015 | Rev | 3 |
|---|---|---|---|
| FROST TREATMENT – PIPE CULVERTS<br>FROST PENETRATION LINE BELOW<br>BEDDING GRADE | | | |
| | OPSD 803.030 | | |




# FROST TREATMENT
# RIGID AND FLEXIBLE PIPE

## NOTES:

1 Pipe embedment or bedding, cover, and backfill shall be according to:
   a) Flexible OPSD 802.010, 802.013, 802.014, 802.020, 802.023, and 802.024.
   b) Rigid – OPSD 802.030, 802.031, 802.032, 802.033, 802.034, 802.050, 802.051, 802.052, 802.053, and 802.054.

2 Condition of frost treatment symmetrical about centreline of pipe.

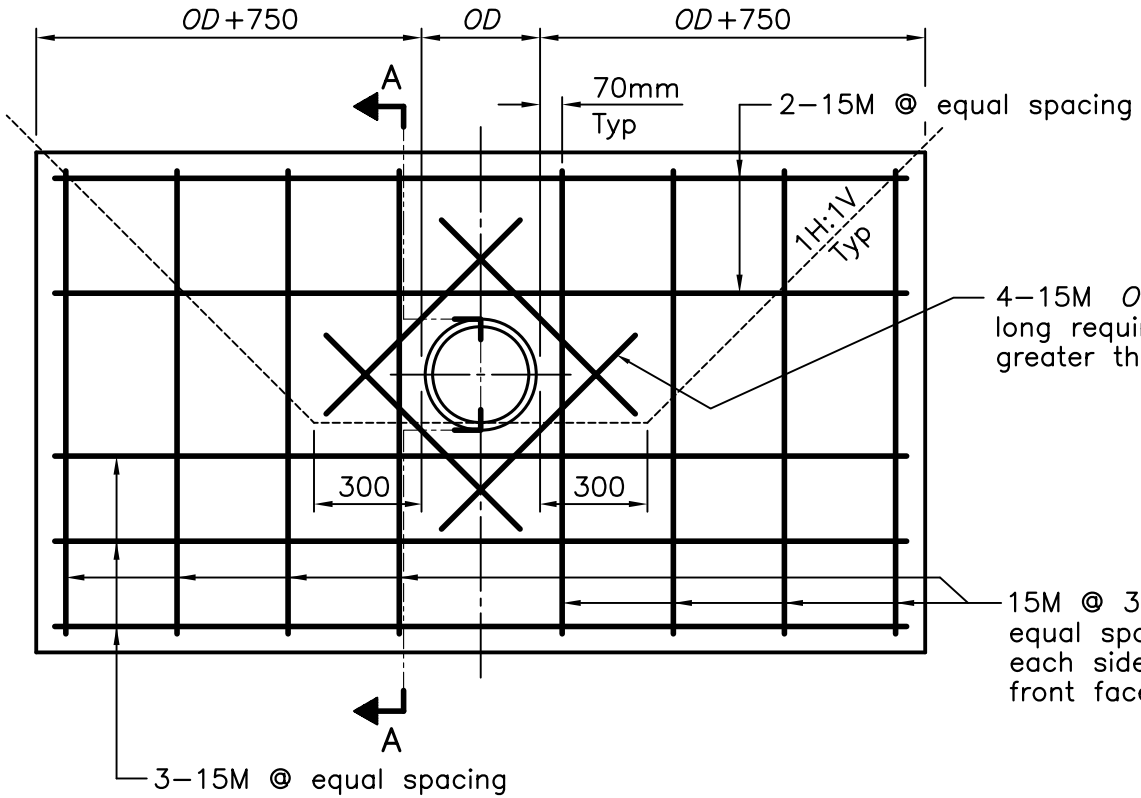
3 Frost tapers shall start at the intersection of the 1H:1V or 3H:1V slope and the frost penetration line.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

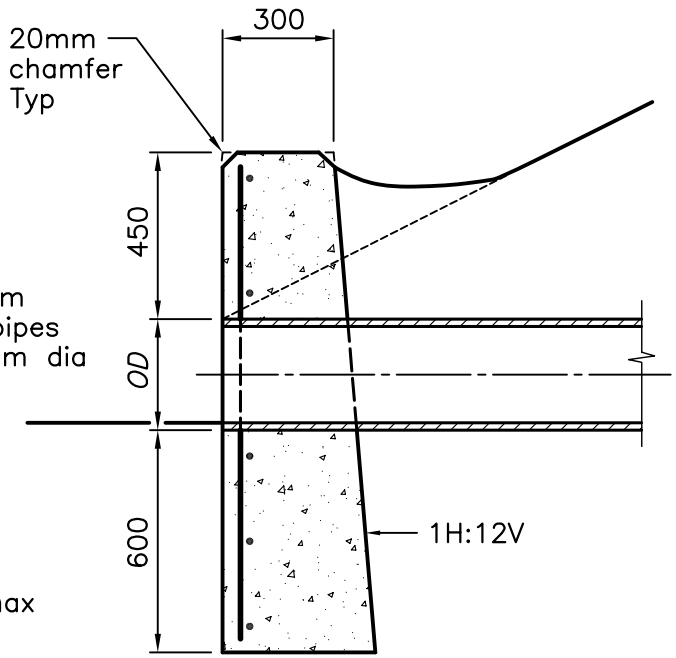
## LEGEND:

*d* – depth of roadbed granular
*k* – depth of frost treatment below profile grade
*f* – depth of frost penetration below profile grade
* – Type 3 soil
** – Type 4 soil

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 4 |
|---|---|---|---|
| FROST TREATMENT – PIPE CULVERTS<br>FROST PENETRATION LINE BETWEEN<br>TOP OF PIPE AND BEDDING GRADE | | | |
| | OPSD 803.031 | | |




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

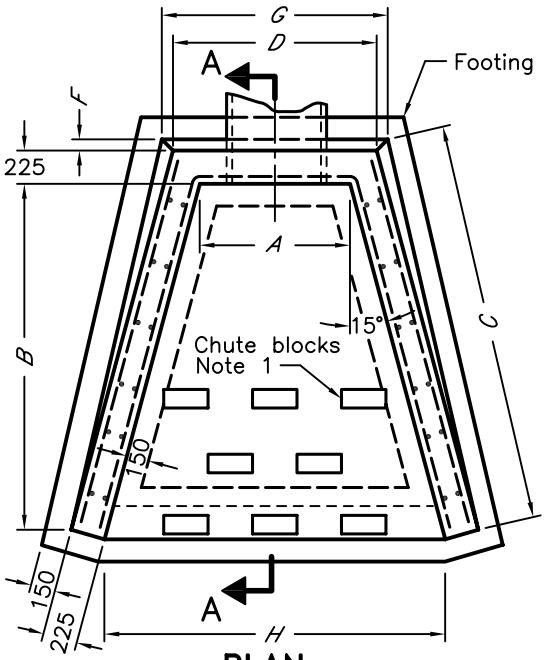
# CONCRETE HEADWALL

FOR PIPE LESS THAN 900mm DIAMETER

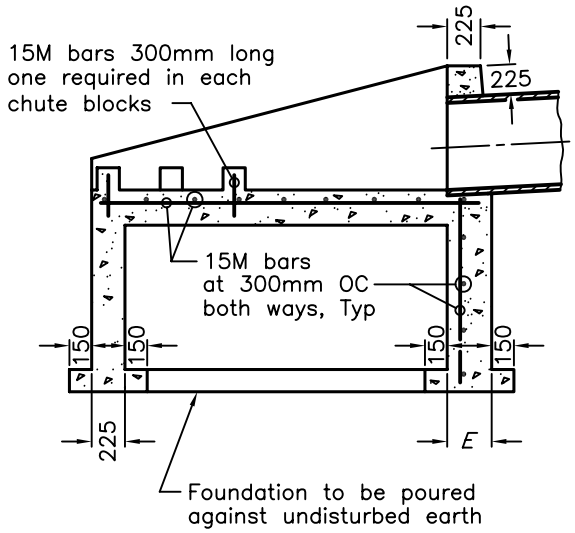
Nov 2006 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 804.030

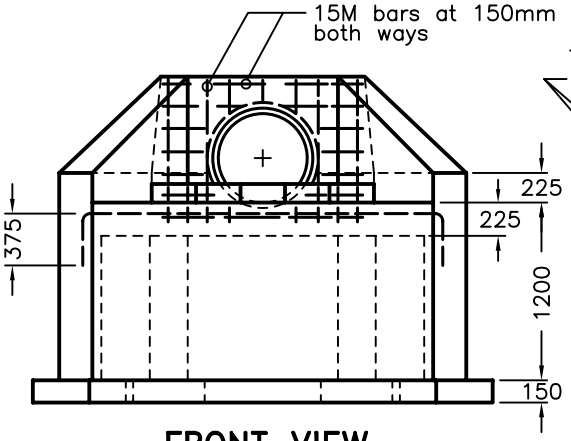



PLAN

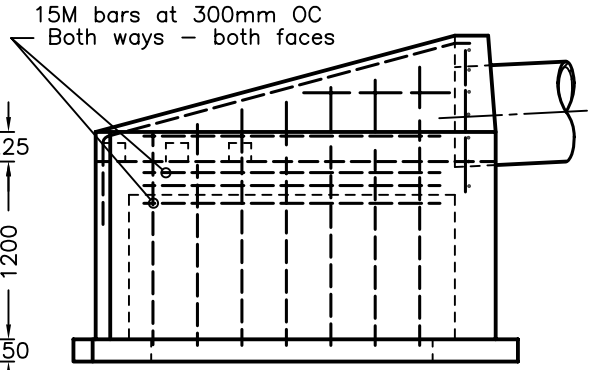



SECTION A–A

| 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 |




FRONT VIEW




SIDE VIEW

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

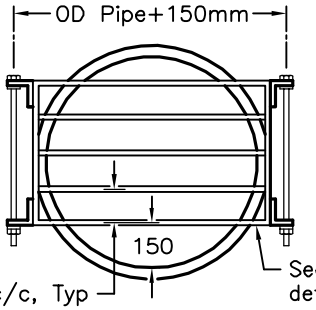
Nov 2006 | Rev 0

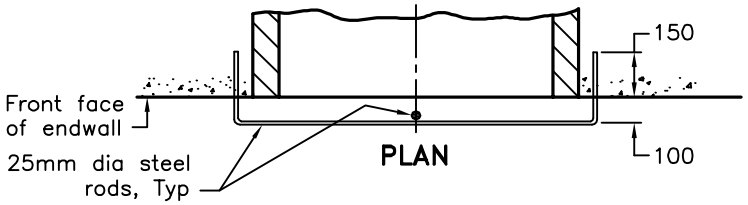
# CONCRETE HEADWALL

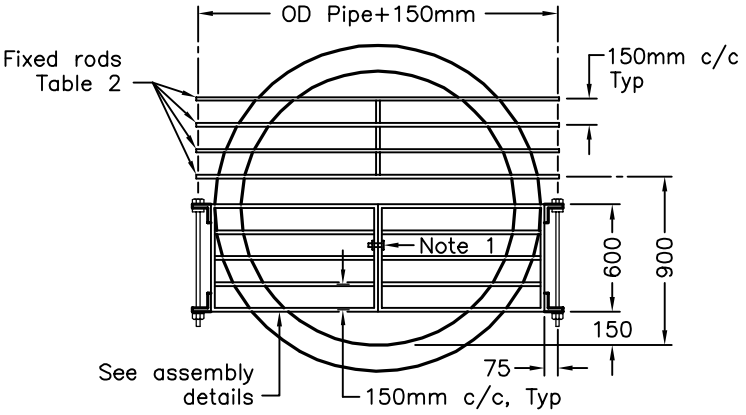
FOR SEWER OR CULVERT PIPE OUTLET

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 804.040



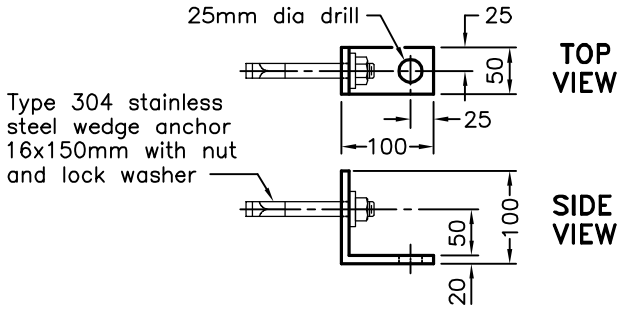




| TABLE 1 – NUMBER OF RODS IN FRAME | |
|---|---|
| PIPE DIA | No of RODS |
| 450 | 1 |
| 525 | 1 |
| 600 | 2 |
| 675 | 3 |
| 750 | 3 |
| 825 | 4 |
| 900 | 4 |
| 975 | 5 |
| 1050 | 6 |
| 1200 | 7 |

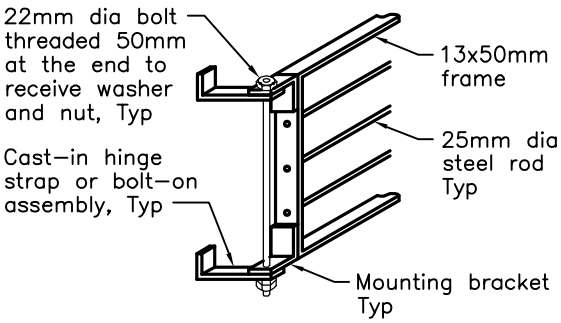
**PIPE DIA up to 1200mm**

| 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 |

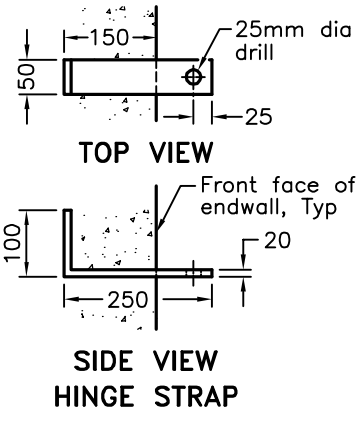
**PIPE DIA 1350 to 2400mm**

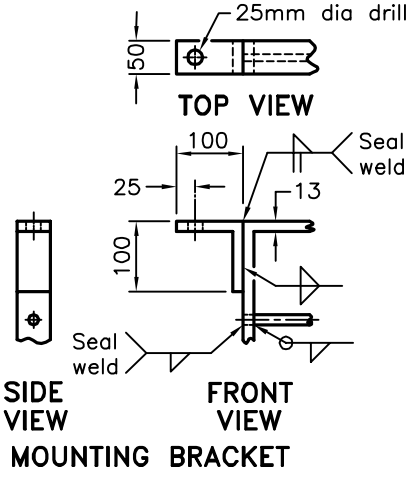



**BOLT–ON ASSEMBLY DETAIL**




**ASSEMBLY**




**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** | | |

| Pipe Type | Corrugation Profile | Diameter | Min. Height of Fill | Area $m^2$ | Metal Thickness | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Corrugated Steel Pipe | | | | | Structural Plate | | | | |
| | | | | | 1.6 | 2.0 | 2.8 | 3.5 | 4.2 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 |
| | | | | | Maximum Height of Fill Over Pipe m | | | | | | | | | |
| Round Corrugated Steel Pipe (Note 1) | 68 x 13mm | 300 | 300 | 0.07 | 61.3 | 79.7 | | | | | | | | |
| | | 400 | 300 | 0.13 | 45.9 | 59.7 | | | | | | | | |
| | | 450 | 300 | 0.16 | 40.8 | 53.1 | | | | | | | | |
| | | 500 | 300 | 0.20 | 36.8 | 47.8 | 69.3 | | | | | | | |
| | | 600 | 300 | 0.28 | 30.6 | 39.8 | 57.8 | | | | | | | |
| | | 700 | 300 | 0.38 | 26.2 | 34.1 | 49.5 | | | | | | | |
| | | 750 | 300 | 0.44 | 24.5 | 31.9 | 46.5 | | | | | | | |
| | | 800 | 300 | 0.50 | 23.0 | 29.9 | 43.3 | | | | | | | |
| | | 900 | 300 | 0.64 | 20.4 | 26.5 | 38.5 | 48.9 | | | | | | |
| | | 1000 | 300 | 0.79 | 18.4 | 23.9 | 34.7 | 44.0 | 53.6 | | | | | |
| | | 1200 | 300 | 1.13 | | 19.9 | 28.9 | 36.7 | 44.7 | | | | | |
| | | 1400 | 300 | 1.54 | | | 23.8 | 30.3 | 37.0 | | | | | |
| | | 1500 | 300 | 1.77 | | | 21.3 | 27.2 | 33.2 | | | | | |
| | | 1600 | 300 | 2.01 | | | 19.1 | 24.4 | 29.8 | | | | | |
| | | 1800 | 300 | 2.54 | | | | 19.5 | 23.9 | | | | | |
| | | 2000 | 350 | 3.14 | | | | | 18.9 | | | | | |
| | 125 x 25mm | 1200 | 300 | 1.13 | | 20.4 | 29.6 | 37.6 | 45.8 | | | | | |
| | | 1400 | 300 | 1.54 | | 17.5 | 25.4 | 32.2 | 39.2 | | | | | |
| | | 1500 | 300 | 1.77 | | 16.3 | 23.7 | 30.1 | 36.6 | | | | | |
| | | 1600 | 300 | 2.01 | | 15.3 | 22.2 | 28.2 | 34.3 | | | | | |
| | | 1800 | 300 | 2.54 | | 13.6 | 19.7 | 25.0 | 30.5 | | | | | |
| | | 2000 | 350 | 3.14 | | 12.2 | 17.7 | 22.5 | 27.5 | | | | | |
| | | 2200 | 400 | 3.80 | | 11.1 | 16.1 | 20.5 | 25.0 | | | | | |
| | | 2400 | 400 | 4.52 | | 10.0 | 14.8 | 18.8 | 22.9 | | | | | |
| | | 2700 | 450 | 5.73 | | | 13.1 | 16.7 | 20.3 | | | | | |
| | | 3000 | 500 | 7.07 | | | 11.3 | 14.4 | 17.5 | | | | | |
| Round Structural Plate Corrugated Steel Pipe | 152 x 51mm | 1500 | 300 | 1.77 | | | | | | 26.2 | 39.1 | 49.8 | 60.5 | 70.6 |
| | | 1660 | 300 | 2.16 | | | | | | 23.7 | 35.3 | 45.0 | 54.6 | 63.8 |
| | | 1810 | 350 | 2.58 | | | | | | 21.7 | 32.4 | 41.3 | 50.1 | 58.5 |
| | | 1970 | 350 | 3.04 | | | | | | 19.9 | 29.8 | 37.9 | 46.0 | 53.8 |
| | | 2120 | 400 | 3.54 | | | | | | 18.5 | 27.7 | 35.3 | 42.8 | 50.0 |
| | | 2280 | 400 | 4.07 | | | | | | 17.2 | 25.7 | 32.8 | 39.8 | 46.4 |
| | | 2430 | 450 | 4.65 | | | | | | 16.1 | 24.1 | 30.8 | 37.3 | 43.6 |
| | | 2590 | 450 | 5.26 | | | | | | 15.1 | 22.6 | 28.8 | 35.0 | 40.9 |
| | | 2740 | 500 | 5.91 | | | | | | 14.3 | 21.4 | 27.3 | 33.1 | 38.6 |

NOTES:

1 Refer to manufacturer for non–standard sizes. For non–standard sizes, use the next larger standard diameter for estimating maximum height of fill over pipe.

A Fill height values are based on the American Iron and Steel Institute design method.

B This OPSD shall be read in conjunction with OPSD 802.010, 802.013, and 802.014.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 2

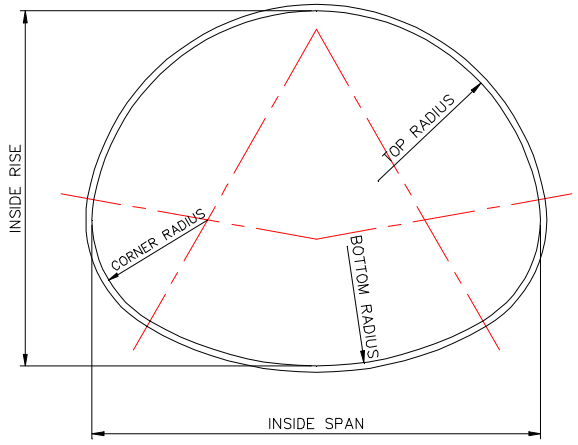
# HEIGHT OF FILL TABLE

## ROUND CORRUGATED STEEL PIPE AND STRUCTURAL PLATE CORRUGATED STEEL PIPE

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 805.010

| Corrugation Profile | Inside Span | Inside Rise | Area $m^2$ | Equivalent Round | Minimum Height of Fill | Metal Thickness | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Corrugated Steel Pipe | | | | | Structural Plate | | | | |
| | | | | | | 1.6 | 2.0 | 2.8 | 3.5 | 4.2 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 |
| | | | | | | Maximum Height of Fill Over Pipe m<br>Corner Bearing Pressure Limited to 200 kPa (Note 1) | | | | | | | | | |
| 68 x 13 mm (Note 1) | 560 | 420 | 0.19 | 500 | 300 | 4.1 | | | | | | | | | |
| | 680 | 500 | 0.27 | 600 | 300 | 4.2 | | | | | | | | | |
| | 800 | 580 | 0.37 | 700 | 300 | 4.1 | | | | | | | | | |
| | 910 | 660 | 0.48 | 800 | 300 | 4.1 | | | | | | | | | |
| | 1030 | 740 | 0.61 | 900 | 300 | 4.0 | | | | | | | | | |
| | 1150 | 820 | 0.74 | 1000 | 300 | | 4.0 | | | | | | | | |
| | 1390 | 970 | 1.06 | 1200 | 300 | | 3.9 | | | | | | | | |
| | 1630 | 1120 | 1.44 | 1400 | 300 | | | 3.9 | | | | | | | |
| | 1880 | 1260 | 1.87 | 1600 | 350 | | | | 3.8 | | | | | | |
| | 2130 | 1400 | 2.36 | 1800 | 400 | | | | 3.7 | | | | | | |
| 125 x 25 mm (Note 1) | 1330 | 1030 | 1.09 | 1200 | 300 | | | 4.4 | | | | | | | |
| | 1550 | 1200 | 1.48 | 1400 | 300 | | | 4.4 | | | | | | | |
| | 1780 | 1360 | 1.93 | 1600 | 300 | | | 4.4 | | | | | | | |
| | 2010 | 1530 | 2.44 | 1800 | 350 | | | 4.3 | | | | | | | |
| | 2230 | 1700 | 2.97 | 2000 | 400 | | | 4.6 | | | | | | | |
| | 2500 | 1830 | 3.44 | 2200 | 450 | | | 4.5 | | | | | | | |
| | 2800 | 1950 | 4.27 | 2400 | 500 | | | 4.4 | | | | | | | |
| 152 x 51 mm (Note 2) | 2060 | 1520 | 2.49 | | 350 | | | | | | 5.1 | | | | |
| | 2240 | 1630 | 2.90 | | 400 | | | | | | 4.8 | | | | |
| | 2440 | 1750 | 3.36 | | 450 | | | | | | 4.6 | | | | |
| | 2590 | 1880 | 3.87 | | 450 | | | | | | 4.6 | | | | |
| | 2690 | 2080 | 4.49 | | 450 | | | | | | 5.0 | | | | |




NOTES:

1 For heights of fill approaching the above maximums for 200kPa corner bearing pressure, consideration should be given to round pipes since they reduce the load being applied to the foundation.

A Fill height values are based on American Iron and Steel Institute design method.

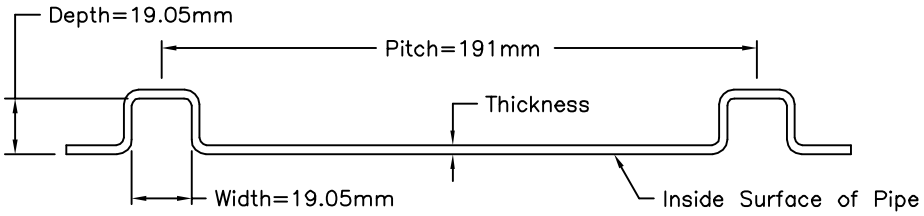
B This OPSD shall be read in conjunction with OPSD 802.020, 802.023, and 802.024.

C Sizes greater than 3000mm are available subject to design by Canadian Highway Bridge Design Code (CHBDC CSA S6).

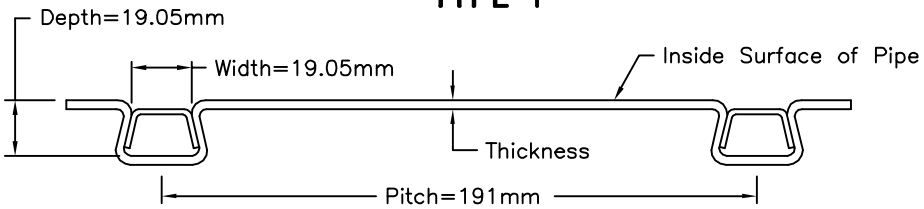
D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| HEIGHT OF FILL TABLE<br>CORRUGATED STEEL PIPE–ARCH AND<br>STRUCTURAL PLATE CORRUGATED STEEL PIPE–ARCH | | | |
| | OPSD 805.020 | | |

| Diameter | Area $m^2$ | Minimum Height of Fill | Metal Thickness | | |
|---|---|---|---|---|---|
| | | | 1.6 | 2.0 | 2.8 |
| | | | Maximum Height of Fill Over Pipe m | | |
| 450 | 0.16 | 300 | 22.7 | 33.6 | |
| 525 | 0.22 | 300 | 19.4 | 28.8 | 50.6 |
| 600 | 0.28 | 300 | 17.0 | 25.2 | 44.3 |
| 750 | 0.44 | 300 | 13.6 | 20.2 | 35.4 |
| 900 | 0.64 | 300 | 11.3 | 16.8 | 29.5 |
| 1050 | 0.87 | 300 | 9.7 | 14.4 | 25.3 |
| 1200 | 1.13 | 300 | 8.5 (Notes 1 and 2) | 12.6 | 22.1 |
| 1350 | 1.43 | 350 | 7.5 (Notes 1 and 2) | 11.2 | 19.7 |
| 1500 | 1.77 | 400 | 6.8 (Notes 1 and 2) | 10.1 (Notes 1 and 2) | 17.7 |
| 1650 | 2.14 | 450 | | 9.1 (Notes 1 and 2) | 16.1 |
| 1800 | 2.54 | 450 | | 8.4 (Notes 1 and 2) | 14.7 |
| 2100 | 3.46 | 550 | | | 12.6 (Notes 1 and 2) |
| 2400 | 4.52 | 600 | | | 11.0 (Notes 1 and 2) |




**SPIRAL RIB STEEL PIPE PROFILE**
**TYPE I**



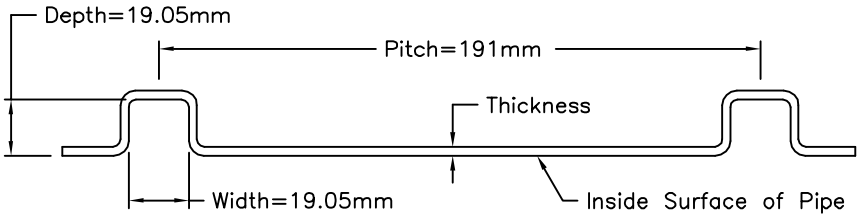

**SPIRAL RIB STEEL PIPE PROFILE**
**TYPE II**

## NOTES:

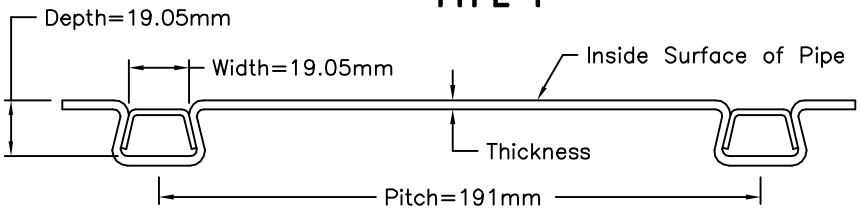
1 Installation shall be in trench–like conditions as shown for Type 1 and 2 soil in OPSD 802.010 or as shown in OPSD 802.013, provided the rock trench has a minimum depth of 0.75 times the diameter of the pipe.
2 Compaction of embedment material shall be obtained by hand, walk behind equipment, or by saturation and vibration in order to limit the compaction effort while maintaining pipe shape.

A Fill height values based on the requirements of ASTM A796/A796M.
B This OPSD shall be read in conjunction with OPSD 802.010, 802.013, and 802.014.
C Refer to manufacturer for non–standard sizes. For non–standard sizes, use the next larger standard diameter for estimating maximum height of fill over pipe.
D All dimensions are in millimetres unless otherwise shown.

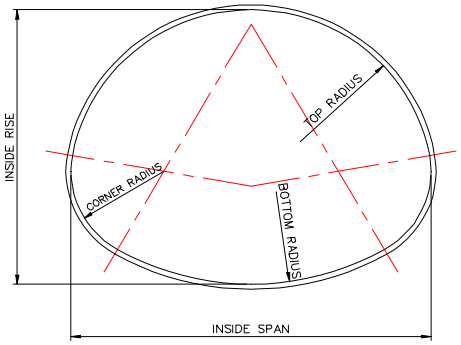
| Span | Rise | Equivalent Diameter | Area $m^2$ | Minimum Height of Fill | Metal Thickness | | |
|---|---|---|---|---|---|---|---|
| | | | | | 1.6 | 2.0 | 2.8 |
| | | | | | Maximum Height of Fill Over Pipe m Corner Bearing Pressure Limited to 200 kPa (Note 3) | | |
| 500 | 410 | 450 | 0.15 | 300 | 4.0 | | |
| 580 | 490 | 525 | 0.21 | 300 | 5.2 | | |
| 680 | 540 | 600 | 0.27 | 300 | 5.2 | | |
| 830 | 660 | 750 | 0.43 | 300 | 5.2 | | |
| 1010 | 790 | 900 | 0.62 | 300 | 4.4 | | |
| 1160 | 920 | 1050 | 0.85 | 300 | 5.1 | | |
| 1340 | 1050 | 1200 | 1.12 | 300 | | 4.4 | |
| 1520 | 1200 | 1350 | 1.44 | 350 | | 5.3 (Notes 1 and 2) | 5.3 |
| 1670 | 1300 | 1500 | 1.79 | 400 | | 5.1 (Notes 1 and 2) | 5.1 |
| 1850 | 1400 | 1650 | 2.15 | 450 | | 4.7 (Notes 1 and 2) | 4.7 |




SPIRAL RIB STEEL PIPE PROFILE
TYPE I




SPIRAL RIB STEEL PIPE PROFILE
TYPE II




## NOTES:

1 Installation shall be in trench–like conditions as shown for Type 1 and 2 soil in OPSD 802.020 or as shown in OPSD 802.023, provided the rock trench has a minimum depth of 0.75 times the diameter of the pipe.
2 Compaction of embedment material shall be obtained by hand, walk behind equipment, or by saturation and vibration in order to limit the compaction effort while maintaining pipe shape.
3 For heights of fill approaching the above maximums for 200kPa corner bearing pressure, consideration should be given to round pipes since they reduce the load being applied to the foundation.

A Fill height values based on the requirements of ASTM A796/A796M.
B This OPSD shall be read in conjunction with OPSD 802.020, 802.023, and 802.024.
C Refer to manufacturer for non–standard sizes. For non–standard sizes, use the next larger standard diameter for estimating maximum height of fill over pipe.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 2

# HEIGHT OF FILL TABLE
SPIRAL RIB PIPE–ARCH

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 805.040

| PIPE DIA mm | TRENCH WIDTH | MAXIMUM HEIGHT OF FILL | | | |
|---|---|---|---|---|---|
| | | 320 kPa | | RSC 160 | |
| | | Granular A | Granular B (Type I and II) | Granular A | Granular B (Type I and II) |
| 100 | 0.5 | 11.3 | 7.6 | – | – |
| 150 | 0.6 | 13.4 | 8.8 | – | – |
| 200 | 0.7 | 9.8 | 6.7 | – | – |
| 250 | 0.7 | 11.6 | 7.9 | – | – |
| 300 | 0.8 | 11.6 | 7.9 | – | – |
| 375 | 0.9 | 12.8 | 8.5 | – | – |
| 450 | 1.0 | 11.0 | 7.6 | – | – |
| 525 | 1.1 | 11.9 | 7.9 | – | – |
| 600 | 1.2 | 14.0 | 9.1 | – | – |
| 750 | 1.4 | 12.8 | 8.5 | – | – |
| 900 | 1.6 | 7.9 | 5.8 | – | – |
| 1050 | 1.8 | – | – | 8.2 | 5.8 |
| 1200 | 2.0 | – | – | 7.6 | 5.5 |
| 1500 | 2.4 | – | – | 8.8 | 6.1 |

NOTES:

A The table applies to dual wall corrugated polyethylene gravity sewer pipe according to CSA B182.6 and CSA B182.8.

B Pipe diameters 1050 to 1500 have a constant ring stiffness of RSC 160, but variable pipe stiffness. The minimum pipe stiffness values are listed in Table 2A of CSA B182.8.

C Trench width is based on Class I compacted material for Granular A and Class II compacted material to 95% of the maximum dry density for Granular B.

D The table is based on backfill density of 1922 kg/m$^2$.

E The table presumes groundwater is at or below the springline of the pipe.

F Minimum height of fill over the pipe shall be 600mm or one half of the internal pipe diameter, whichever is greater. Height of fill is measured from the finished surface to top of pipe.

G This OPSD shall be read in conjunction with OPSD 802.010.

H For pipe sizes greater than shown or for other design conditions, the height of fill shall be calculated from first principles.

J All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# HEIGHT OF FILL TABLE

DUAL WALL CORRUGATED POLYETHYLENE GRAVITY SEWER PIPE – 320 kPa and RSC 160

Nov 2014 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 806.020

| PIPE DIA mm | AREA $m^2$ | TRENCH WIDTH | RSC 160 | | RSC 250 | |
|---|---|---|---|---|---|---|
| | | | MINIMUM HEIGHT OF FILL | MAXIMUM HEIGHT OF FILL | MINIMUM HEIGHT OF FILL | MAXIMUM HEIGHT OF FILL |
| 460 | 0.17 | 0.97 | 0.4 | 14.3 | NA | NA |
| 500 | 0.20 | 1.03 | 0.5 | 14.0 | NA | NA |
| 530 | 0.22 | 1.08 | 0.5 | 14.0 | NA | NA |
| 610 | 0.29 | 1.18 | 0.5 | 14.0 | NA | NA |
| 690 | 0.37 | 1.29 | 0.5 | 14.0 | NA | NA |
| 760 | 0.45 | 1.39 | 0.6 | 14.0 | NA | NA |
| 840 | 0.55 | 1.51 | 0.6 | 14.0 | 0.5 | 14.0 |
| 910 | 0.65 | 1.61 | 0.8 | 14.0 | 0.6 | 14.0 |
| 1020 | 0.82 | 1.75 | 0.8 | 14.0 | 0.6 | 14.0 |
| 1070 | 0.90 | 1.82 | 0.9 | 14.0 | 0.7 | 14.0 |
| 1220 | 1.17 | 2.03 | 0.9 | 14.0 | 0.7 | 14.0 |
| 1370 | 1.47 | 2.24 | 0.9 | 14.0 | 0.8 | 14.0 |
| 1520 | 1.81 | 2.46 | 1.0 | 13.7 | 0.8 | 14.0 |
| 1680 | 2.22 | 2.67 | 1.0 | 12.8 | 0.9 | 14.0 |
| 1830 | 2.63 | 2.89 | 1.1 | 12.2 | 0.9 | 14.0 |
| 1980 | 3.08 | 3.08 | 1.2 | 11.6 | 0.9 | 14.0 |
| 2130 | 3.56 | 3.30 | 1.2 | 11.0 | 0.9 | 14.0 |
| 2290 | 4.12 | 3.49 | 1.2 | 10.4 | 0.9 | 14.0 |
| 2440 | 4.68 | 3.71 | 1.2 | 10.1 | 1.0 | 13.7 |
| 2590 | 5.27 | 3.92 | 1.3 | 9.4 | 1.0 | 13.7 |
| 2740 | 5.90 | 4.11 | 1.3 | 9.1 | 1.0 | 13.7 |

NOTES:

A The table applies to closed profile wall polyethylene pipe manufactured according to ASTM F894.
B The table presumes groundwater is at or below the springline of the pipe.
C The table is based on backfill density of 1922 $kg/m^3$.
D Installation shall be according to OPSD 802.010 requirements.
E Sizes greater than 3000mm are available, subject to design by the Canadian Highway Bridge Design Code (CHBDC CSA S6).
F Minimum height of fill over the pipe shall be one pipe diameter.
G Trench width is based on the higher pipe stiffness and is according to ASTM D2321.
H All dimensions are in meters unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# HEIGHT OF FILL TABLE

CLOSED PROFILE WALL POLYETHYLENE PIPE
RSC 160 AND RSC 250

Nov 2014 | Rev 2

OPSD 806.021

| PIPE DIA mm | TRENCH WIDTH | MAXIMUM HEIGHT OF FILL | | | |
|---|---|---|---|---|---|
| | | RSC 100 | | RSC 160 | |
| | | Granular A | Granular B (Type I and II) | Granular A | Granular B (Type I and II) |
| 300 | 0.8 | 7 | 7 | N/A | N/A |
| 375 | 0.9 | 7 | 7 | N/A | N/A |
| 450 | 1.0 | 7 | 7 | N/A | N/A |
| 600 | 1.2 | 7 | 5.5 | 7 | 5.5 |
| 750 | 1.4 | 7 | 5.5 | 7 | 5.5 |
| 900 | 1.6 | 7 | 5.5 | 7 | 5.5 |
| 1050 | 1.8 | 7 | 5.5 | 7 | 5.5 |
| 1200 | 2.0 | 7 | 5.5 | 7 | 5.5 |
| 1500 | 2.4 | 7 | 5.5 | 7 | 5.5 |

LEGEND:

N/A – Not Available

NOTES:

A The table applies to dual wall corrugated polyethylene gravity sewer pipe according to AASHTO M294 Type S.

B Trench width is based on Class I compacted material for Granular A and Class II compacted material to 95% of the maximum dry density for Granular B.

C The table is based on backfill density of 1922 kg/m$^3$.

D The table presumes groundwater is at or below the springline of the pipe.

E Minimum height of fill over the pipe shall be 600mm or one half of the internal pipe diameter, whichever is greater. Height of fill is measured from the finished surface to top of pipe.

F This OPSD shall be read in conjunction with OPSD 802.010.

G For height of fill and pipe sizes greater than shown or for other design conditions shall be calculated from first principles.

H All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| HEIGHT OF FILL TABLE<br>DUAL WALL CORRUGATED POLYETHYLENE<br>GRAVITY SEWER PIPE RSC 100 AND RSC 160 | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 806.022 | | |

| PIPE DIA mm | AREA $m^2$ | TRENCH WIDTH | MINIMUM HEIGHT OF FILL mm | HEIGHT OF FILL SDR 32.5 95% Compaction |
|---|---|---|---|---|
| 254 | 0.05 | 1.454 | 310 | 19.8 |
| 305 | 0.07 | 1.505 | 310 | 19.8 |
| 356 | 0.10 | 1.556 | 310 | 19.8 |
| 406 | 0.13 | 1.606 | 310 | 19.8 |
| 457 | 0.16 | 1.657 | 310 | 19.8 |
| 508 | 0.20 | 1.708 | 310 | 19.8 |
| 559 | 0.25 | 1.759 | 310 | 19.8 |
| 610 | 0.29 | 1.810 | 310 | 19.8 |
| 711 | 0.40 | 1.911 | 310 | 19.8 |
| 762 | 0.46 | 1.962 | 310 | 19.8 |
| 914 | 0.66 | 2.114 | 310 | 19.8 |
| 1067 | 0.89 | 2.267 | 310 | 19.8 |
| 1219 | 1.17 | 2.419 | 310 | 19.8 |
| 1372 | 1.48 | 2.572 | 310 | 19.8 |
| 1600 | 2.01 | 2.800 | 460 | 19.8 |

NOTES:

A The table applies to solid wall polyethylene pipe manufactured according to ASTM F714.

B The table presumes groundwater is at or below the springline of the pipe.

C The table is based on backfill density of 2294 kg/$m^2$ for 95% compaction.

D Installation shall be according to OPSD 802.010 requirements.

E Height of fill shall be calculated from first principles for pipe sizes greater than shown or for other design conditions.

F All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# HEIGHT OF FILL TABLE

SOLID WALL POLYETHYLENE PIPE
SDR 32.5

Nov 2014 | Rev 0

OPSD 806.023

| PIPE DIA mm | TRENCH WIDTH | MAXIMUM HEIGHT OF FILL | |
|---|---|---|---|
| | | 320 kPa | |
| | | Granular A | Granular B (Type I and II) |
| 300 | 0.8 | 11.9 | 7.6 |
| 375 | 0.9 | 12.8 | 8.5 |
| 450 | 1.0 | 11.0 | 7.3 |
| 600 | 1.2 | 9.5 | 6.7 |
| 750 | 1.4 | 9.1 | 6.7 |
| 900 | 1.6 | 8.2 | 5.8 |
| 1050 | 1.8 | 9.8 | 6.7 |
| 1200 | 2.0 | 6.4 | 4.9 |
| 1500 | 2.4 | 9.1 | 6.7 |

NOTES:

A The table applies to dual wall corrugated polypropylene gravity sewer pipe, 300 to 750 mm; and triple wall corrugated polypropylene gravity sewer pipe, 750 to 1,500 mm according to CSA B182.13.

B Trench width is based on Class I compacted material for Granular A and Class II compacted material to 95% of the maximum dry density for Granular B, Type I and Type II.

C The table is based on backfill density of 1,922 kg/m³.

D The table presumes groundwater is at or below the springline of the pipe.

E Minimum height of fill over the pipe shall be 600 mm or one half of the internal pipe diameter, whichever is greater.

F This OPSD shall be read in conjunction with OPSD 802.010, 802.013 and 802.014.

G For height of fill and pipe sizes greater than shown or for other design conditions shall be calculated from first principles.

H All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev 0

# HEIGHT OF FILL TABLE
# DUAL AND TRIPLE WALL CORRUGATED POLYPROPYLENE GRAVITY SEWER PIPE 320 kPa

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 806.030

| PIPE DIA mm | AREA $m^2$ | TRENCH WIDTH | MAXIMUM HEIGHT OF FILL | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 210 kPa Stiffness PSM DR 41 | | 320 kPa Stiffness PSM DR 35 and PS 320 | | 625 kPa Stiffness PSM DR 28 | |
| | | | ≤ Trench Width | > Trench Width | ≤ Trench Width | > Trench Width | ≤ Trench Width | > Trench Width |
| 100 | 0.008 | 0.40 | 9 | 7.2 | 9 | 7.5 | 13.5 | 8.2 |
| 135 | 0.014 | 0.54 | 9 | 7.2 | 9 | 7.5 | 13.5 | 8.2 |
| 150 | 0.020 | 0.95 | 9 | 7.2 | 9 | 7.5 | 13.5 | 8.2 |
| 200 | 0.030 | 1.00 | 9 | 7.2 | 9 | 7.5 | N/A | N/A |
| 250 | 0.050 | 1.05 | 9 | 7.2 | 9 | 7.5 | N/A | N/A |
| 300 | 0.070 | 1.10 | 9 | 7.2 | 9 | 7.5 | N/A | N/A |
| 375 | 0.110 | 1.20 | 9 | 7.2 * | 9 | 7.5 * | N/A | N/A |
| 450 | 0.160 | 1.25 | 9 | 7.2 ** | 9 | 7.5 ** | N/A | N/A |
| 525 | 0.220 | 1.30 | 9 * | 7.2 ** | 9 * | 7.5 ** | N/A | N/A |
| 600 | 0.280 | 1.40 | 9 * | 7.2 ** | 9 * | 7.5 ** | N/A | N/A |
| 675 | 0.360 | 1.50 | 9 * | 7.2 ** | 9 * | 7.5 ** | N/A | N/A |
| 750 | 0.440 | 1.60 | 9 * | 7.2 ** | 9 * | 7.5 ** | N/A | N/A |
| 900 | 0.640 | 1.70 | 9 ** | 7.2 ** | 9 ** | 7.5 ** | N/A | N/A |

NOTES:

1 For installations in Type 4 soil, height of fill shall be calculated from first principles.

2 For installations in Type 3 soil, height of fill shall be calculated from first principles.

A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

B Minimum height of fill over top of pipe shall be 300mm or one pipe diameter, whichever is greater.

C The table is based on backfill density of 1900 $kg/m^3$.

D This OPSD shall be read in conjunction with OPSD 802.010 and 802.013.

E Height of fill greater than 9.0m shall be calculated from first principles.

F All dimensions are in metres unless otherwise shown.

LEGEND:

* Note 1
** Note 1 and 2
N/A Not Available

ONTARIO PROVINCIAL STANDARD DRAWING

# HEIGHT OF FILL TABLE

POLYVINYL CHLORIDE GRAVITY SEWER PIPE
210, 320, and 625kPa

Nov 2015 | Rev 3

OPSD 806.040

| DR | MAXIMUM HEIGHT OF FILL | |
|---|---|---|
| | Embankment Condition | Trench Condition |
| 51 | 7.0 | 11.5 |
| 41 | 7.2 | 11.8 |
| 32.5 | 7.7 | 12.6 |
| 26 | 8.6 | 14.2 |
| 25 | 8.9 | 14.6 |
| 21 | 10.4 | 17.1 |
| 18 | 12.7 | 21.0 |
| 14 | 20.2 | 33.1 |

LEGEND:

$$\text{DR} = \text{Dimension ratio} = \frac{\text{Average outside diameter of the pipe, mm}}{\text{Minimum wall thickness, mm}}$$

NOTES:

A For installation in Type 4 and Type 3 soil, or if E' < 6864kN/$m^2$, the height of fill shall be calculated from first principles.

B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

C The transition width, width of trench above the pipe when trench condition transitions to embankment condition, shall be calculated from first principles.

D The maximum height of fill is dependent on the DR of the pipe, regardless of the diameter of the pipe.

E Minimum height of fill over top of pipe shall be 300mm or one pipe diameter, whichever is greater.

F This OPSD shall be read in conjunction with OPSD 802.010 and OPSD 802.013.

G All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev 1

# HEIGHT OF FILL TABLE

POLYVINYL CHLORIDE PRESSURE PIPE
FOR DIFFERENT DIMENSION RATIOS

OPSD 806.060

| PIPE DIA mm | BEDDING CLASS | CONFINED TRENCH | | | |
|---|---|---|---|---|---|
| | | 50–D | 65–D | 100–D | 140–D |
| | | MAXIMUM HEIGHT OF FILL | | | |
| 300 | A | 5.1 | 11.8 | NL | NL |
| | B | 2.9 | 3.9 | 7.4 | NL |
| | C | 2.2 | 3.1 | 5.1 | 10.2 |
| 375 | A | 6.5 | NL | NL | NL |
| | B | 3.0 | 4.1 | 8.8 | NL |
| | C | 2.4 | 3.2 | 5.7 | 12.8 |
| 450 | A | 7.6 | NL | NL | NL |
| | B | 3.1 | 4.4 | 10.0 | NL |
| | C | 2.5 | 3.4 | 6.2 | 13.2 |
| 525 | A | 8.5 | NL | NL | NL |
| | B | 3.3 | 4.7 | 10.9 | NL |
| | C | 2.6 | 3.5 | 6.6 | 17.6 |
| 600 | A | 9.2 | NL | NL | NL |
| | B | 3.4 | 4.9 | 11.5 | NL |
| | C | 2.6 | 3.7 | 7.0 | 18.6 |
| 675 | A | 9.7 | NL | NL | NL |
| | B | 3.5 | 5.1 | 11.8 | NL |
| | C | 2.7 | 3.8 | 7.2 | 18.6 |
| 750 | A | 10.0 | NL | NL | NL |
| | B | 3.6 | 5.2 | 12.0 | NL |
| | C | 2.8 | 3.8 | 7.2 | 18.0 |
| 825 | A | 10.2 | NL | NL | NL |
| | B | 3.6 | 5.2 | 12.0 | NL |
| | C | 2.8 | 3.8 | 7.4 | 17.4 |
| 900 | A | 9.8 | NL | NL | NL |
| | B | 3.8 | 5.4 | 11.6 | NL |
| | C | 2.8 | 4.0 | 7.4 | 16.0 |
| 975 | A | 6.2 | 9.6 | NL | NL |
| | B | 3.4 | 4.6 | 8.0 | 14.4 |
| | C | 2.8 | 3.8 | 6.0 | 9.6 |
| 1050 | A | 6.4 | 9.8 | NL | NL |
| | B | 3.6 | 4.6 | 8.2 | 14.6 |
| | C | 2.8 | 3.8 | 6.2 | 9.8 |
| 1200 | A | 6.8 | 10.4 | NL | NL |
| | B | 3.6 | 4.8 | 8.4 | 15.0 |
| | C | 3.0 | 3.8 | 6.4 | 10.2 |
| 1350 | A | 7.0 | 10.8 | NL | NL |
| | B | 3.8 | 5.0 | 8.6 | 15.2 |
| | C | 3.2 | 4.0 | 6.4 | 10.4 |
| 1500 | A | 7.2 | 11.0 | NL | NL |
| | B | 3.8 | 5.0 | 8.8 | 15.2 |
| | C | 3.2 | 4.0 | 6.6 | 10.4 |
| 1650 | A | 7.4 | 11.2 | NL | NL |
| | B | 4.0 | 5.2 | 9.0 | 15.2 |
| | C | 3.4 | 4.2 | 6.8 | 10.6 |
| 1800 | A | 7.6 | 11.4 | NL | NL |
| | B | 4.0 | 5.2 | 9.0 | 15.2 |
| | C | 3.4 | 4.2 | 6.8 | 10.6 |

## LEGEND:

NL = No Limit

## NOTES:

A Height of fill is measured from the finished surface to top of pipe.

B The load factor used for the calculation of the variable bedding factor is: Class A bedding=2.8, Class B bedding=1.9, and Class C bedding=1.5.

C The excavation width is based on OPSD 802.030 and is the width of the excavation measured at the top of the pipe.

D Minimum height of fill over top of pipe shall be 600mm.

E Strength designations are 50–D, 65–D, 100–D, and 140–D according to CSA A257.2.

F The table is based on backfill density of 1900 kg/m$^3$.

G For confined trench K$\mu$=0.130.

H Conditions other than those indicated shall be calculated from first principles.

I All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev 3

# HEIGHT OF FILL TABLE

REINFORCED CONCRETE PIPE – CONFINED TRENCH
CLASS 50–D, 65–D, 100–D, and 140–D

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 807.010

| PIPE DIA mm | BEDDING CLASS | POSITIVE PROJECTING EMBANKMENT | | | |
|---|---|---|---|---|---|
| | | 50–D | 65–D | 100–D | 140–D |
| | | MAXIMUM HEIGHT OF FILL | | | |
| 300 | A | 4.5 | 6.0 | 9.0 | 12.9 |
| | B | 2.4 | 3.6 | 5.7 | 7.8 |
| | C | 1.8 | 2.7 | 4.5 | 6.3 |
| 375 | A | 4.8 | 6.0 | 9.6 | 13.5 |
| | B | 2.7 | 3.6 | 5.7 | 8.1 |
| | C | 2.1 | 3.0 | 4.8 | 6.6 |
| 450 | A | 4.8 | 6.3 | 9.9 | 13.8 |
| | B | 2.7 | 3.9 | 6.0 | 8.4 |
| | C | 2.1 | 3.0 | 4.8 | 6.9 |
| 525 | A | 4.8 | 6.6 | 9.9 | 14.1 |
| | B | 3.0 | 3.9 | 6.0 | 8.7 |
| | C | 2.4 | 3.0 | 5.1 | 7.2 |
| 600 | A | 5.1 | 6.6 | 10.2 | 14.4 |
| | B | 3.0 | 3.9 | 6.3 | 8.7 |
| | C | 2.4 | 3.3 | 5.1 | 7.2 |
| 675 | A | 5.1 | 6.6 | 10.2 | 14.4 |
| | B | 3.0 | 3.9 | 6.3 | 9.0 |
| | C | 2.4 | 3.3 | 5.1 | 7.2 |
| 750 | A | 5.1 | 6.6 | 10.5 | 14.7 |
| | B | 3.0 | 4.2 | 6.3 | 9.0 |
| | C | 2.4 | 3.3 | 5.1 | 7.5 |
| 825 | A | 5.1 | 6.9 | 10.5 | 14.7 |
| | B | 3.0 | 4.2 | 6.6 | 9.0 |
| | C | 2.4 | 3.3 | 5.4 | 7.5 |
| 900 | A | 5.1 | 6.9 | 10.5 | 15.0 |
| | B | 3.3 | 4.2 | 6.6 | 9.3 |
| | C | 2.4 | 3.3 | 5.4 | 7.5 |
| 975 | A | 5.4 | 6.9 | 10.8 | 15.0 |
| | B | 3.3 | 4.2 | 6.6 | 9.3 |
| | C | 2.4 | 3.3 | 5.4 | 7.5 |
| 1050 | A | 5.4 | 6.9 | 10.8 | 15.0 |
| | B | 3.3 | 4.2 | 6.6 | 9.3 |
| | C | 2.7 | 3.3 | 5.4 | 7.5 |
| 1200 | A | 5.4 | 7.2 | 11.1 | 15.6 |
| | B | 3.3 | 4.5 | 6.9 | 9.6 |
| | C | 2.7 | 3.6 | 5.7 | 7.8 |
| 1350 | A | 5.4 | 7.2 | 11.1 | 15.6 |
| | B | 3.3 | 4.5 | 6.9 | 9.6 |
| | C | 2.7 | 3.6 | 5.7 | 8.1 |
| 1500 | A | 5.7 | 7.2 | 11.1 | 15.6 |
| | B | 3.3 | 4.5 | 6.9 | 9.9 |
| | C | 3.0 | 3.6 | 5.7 | 8.1 |
| 1650 | A | 5.7 | 7.2 | 11.4 | 15.9 |
| | B | 3.6 | 4.5 | 6.9 | 9.9 |
| | C | 3.0 | 3.6 | 5.7 | 8.1 |
| 1800 | A | 5.7 | 7.2 | 11.4 | 15.9 |
| | B | 3.6 | 4.5 | 7.2 | 9.9 |
| | C | 3.0 | 3.9 | 5.7 | 8.1 |

## NOTES:

A Height of fill is measured from the finished surface to top of pipe.

B For the positive projecting embankment, the load factor used for the calculation of the variable bedding factor is: Class A bedding=2.8, Class B bedding=1.9, and Class C bedding=1.5.

C Minimum height of fill over top of pipe shall be 600mm.

D Strength designations are 50–D, 65–D, 100–D, and 140–D according to CSA A257.2.

E The table is based on backfill density of 1900 kg/m$^3$.

F For positive projecting embankment $K\mu$=0.190, p=0.7, and $r_{sd}$=0.7.

G Conditions other than those indicated shall be calculated from first principles.

H All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev 3

# HEIGHT OF FILL TABLE

REINFORCED CONCRETE PIPE – EMBANKMENT

CLASS 50–D, 65–D, 100–D, and 140–D

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 807.030

| PIPE DIA mm | BEDDING CLASS | POSITIVE PROJECTING EMBANKMENT<br>CLASS 3<br>MAXIMUM HEIGHT OF FILL |
|---|---|---|
| 150 | B | 9.5 |
| | C | 7.8 |
| 200 | B | 7.5 |
| | C | 6.1 |
| 250 | B | 5.5 |
| | C | 4.5 |
| 300 | B | 4.7 |
| | C | 3.7 |
| 375 | B | 4.3 |
| | C | 3.5 |
| 450 | B | 4.2 |
| | C | 3.4 |

NOTES:

A Height of fill is measured from the finished surface to top of pipe.

B For the positive projecting embankment, the variable bedding factor corresponds to Class B and Class C, respectively.

C Minimum height of fill over top of pipe shall be 600mm.

D Class 3 designation according to CSA A257.1.

E The table is based on backfill density of 1900 $kg/m^3$.

F For positive projecting embankment $K\mu=0.190$, $p=0.7$, and $r_{sd}=0.7$.

G Conditions other than those indicated shall be calculated from first principles.

H All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# HEIGHT OF FILL TABLE

NON–REINFORCED CONCRETE PIPE

CLASS 3

Nov 2015 | Rev 2

OPSD 807.040

| PIPE DIA mm | RISE x SPAN mm | BEDDING CLASS | POSITIVE PROJECTING EMBANKMENT | | | | | CONFINED TRENCH | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CLASS HE-A | CLASS HE-I | CLASS HE-II | CLASS HE-III | CLASS HE-IV | CLASS HE-A | CLASS HE-I | CLASS HE-II | CLASS HE-III | CLASS HE-IV |
| | | | MAXIMUM HEIGHT OF FILL | | | | | MAXIMUM HEIGHT OF FILL | | | | |
| 900 | 730 x 1150 | B | 2.0 | 2.8 | 3.5 | 4.7 | 7.2 | 2.2 | 3.0 | 4.1 | 5.9 | 10.0 |
| | | C | 1.6 | 2.2 | 2.8 | 3.8 | 5.9 | 1.7 | 2.4 | 3.0 | 4.0 | 6.5 |
| 1050 | 855 x 1345 | B | 2.1 | 2.8 | 3.6 | 4.7 | 7.3 | 2.3 | 3.1 | 4.2 | 6.0 | 10.0 |
| | | C | 1.7 | 2.3 | 2.9 | 3.8 | 5.9 | 1.8 | 2.5 | 3.1 | 4.0 | 6.6 |
| 1200 | 975 x 1535 | B | 2.2 | 2.9 | 3.6 | 4.8 | 7.4 | 2.4 | 3.2 | 4.3 | 6.1 | 10.0 |
| | | C | 1.8 | 2.4 | 2.9 | 3.8 | 6.0 | 1.8 | 2.6 | 3.2 | 4.1 | 6.9 |
| 1350 | 1095 x 1730 | B | 2.3 | 3.0 | 3.7 | 4.8 | 7.4 | 2.4 | 3.3 | 4.3 | 6.1 | 10.0 |
| | | C | 1.8 | 2.5 | 3.0 | 3.9 | 6.0 | 1.9 | 2.6 | 3.3 | 4.2 | 7.0 |
| 1500 | 1220 x 1920 | B | 2.4 | 3.1 | 3.7 | 4.8 | 7.4 | 2.5 | 3.4 | 4.3 | 6.1 | 10.0 |
| | | C | 1.9 | 2.5 | 3.1 | 3.9 | 6.1 | 2.0 | 2.7 | 3.4 | 4.3 | 7.0 |
| 1650 | 1340 x 2110 | B | 2.4 | 3.1 | 3.8 | 4.9 | 7.5 | 2.5 | 3.4 | 4.4 | 6.1 | 10.0 |
| | | C | 1.9 | 2.6 | 3.2 | 4.0 | 6.1 | 2.0 | 2.8 | 3.4 | 4.4 | 7.1 |
| 1800 | 1465 x 2305 | B | 2.5 | 3.2 | 3.9 | 4.9 | 7.5 | 2.6 | 3.5 | 4.4 | 6.1 | 10.0 |
| | | C | 2.0 | 2.7 | 3.3 | 4.0 | 6.1 | 2.1 | 2.8 | 3.5 | 4.5 | 7.2 |
| 1950 | 1585 x 2495 | B | 2.5 | 3.3 | 4.0 | 4.9 | 7.6 | 2.6 | 3.5 | 4.5 | 6.1 | 10.0 |
| | | C | 2.0 | 2.7 | 3.3 | 4.1 | 6.2 | 2.1 | 2.9 | 3.6 | 4.5 | 7.2 |
| 2100 | 1705 x 2690 | B | 2.6 | 3.3 | 4.0 | 5.0 | 7.6 | 2.6 | 3.5 | 4.5 | 6.1 | 10.0 |
| | | C | 2.1 | 2.8 | 3.4 | 4.2 | 6.2 | 2.1 | 2.9 | 3.6 | 4.6 | 7.2 |
| 2400 | 1950 x 3070 | B | 2.6 | 3.5 | 4.2 | 5.1 | 7.6 | 2.7 | 3.6 | 4.5 | 6.1 | 10.0 |
| | | C | 2.1 | 2.8 | 3.5 | 4.4 | 6.2 | 2.2 | 3.0 | 3.7 | 4.7 | 7.3 |
| 2700 | 2195 x 3455 | B | 2.7 | 3.6 | 4.3 | 5.3 | 7.7 | 2.8 | 3.7 | 4.6 | 6.2 | 10.0 |
| | | C | 2.2 | 2.9 | 3.6 | 4.5 | 6.3 | 2.3 | 3.1 | 3.8 | 4.8 | 7.4 |
| 3000 | 2440 x 3840 | B | 2.8 | 3.6 | 4.4 | 5.5 | 7.8 | 2.8 | 3.7 | 4.6 | 6.2 | 10.0 |
| | | C | 2.1 | 3.0 | 3.7 | 4.6 | 6.5 | 2.3 | 3.1 | 3.9 | 4.9 | 7.5 |

NOTES:

A Height of fill is measured from the finished surface to top of pipe.

B For the positive projecting embankment and confined trench, the load factor used for the calculation of the variable bedding factor is: Class B bedding=1.9 and Class C bedding=1.5.

C Minimum height of fill over top of pipe shall be 600mm.

D The table is based on backfill density of 1900kg/$m^3$.

E For Confined Trench K$\mu$=0.130, p=0.7, and $r_{sd}$ =0.7.

F For positive projecting embankment K$\mu$=0.190, p=0.7, and $r_{sd}$ =0.7.

G Conditions other than those indicated shall be calculated from first principles.

H This OPSD shall be read in conjunction with OPSD 802.050.

I All dimensions are in metres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev 3

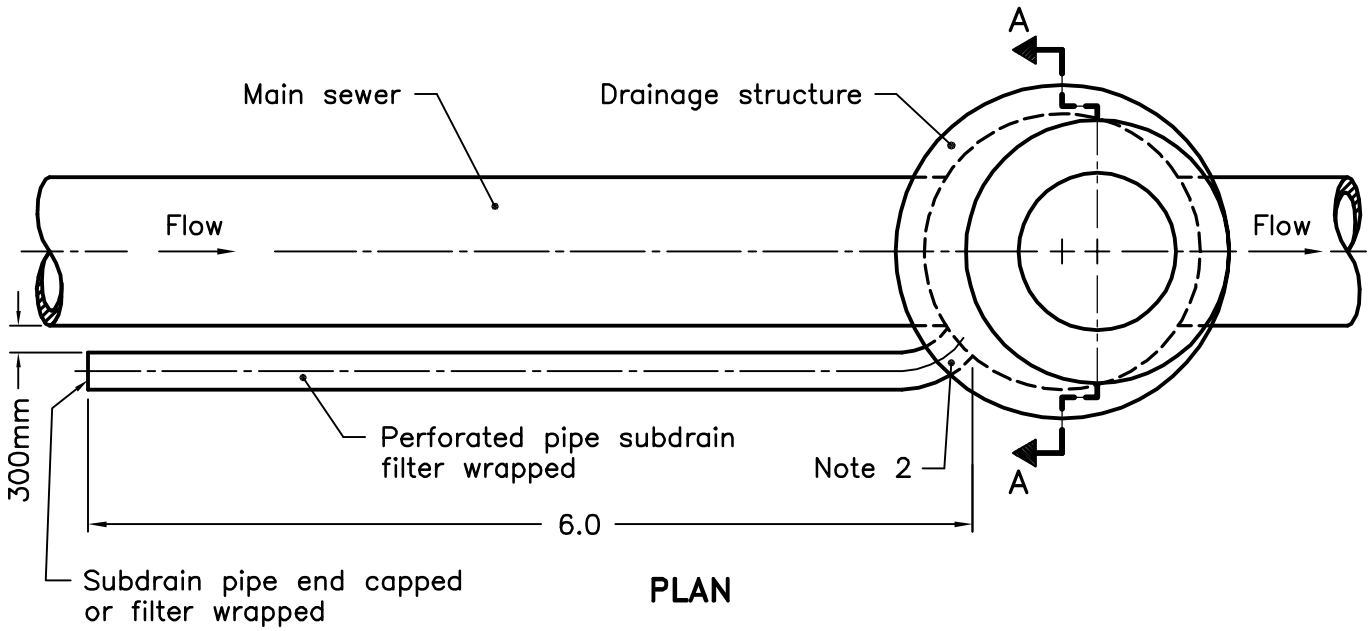
# HEIGHT OF FILL TABLE

## HORIZONTAL ELLIPTICAL CONCRETE PIPE

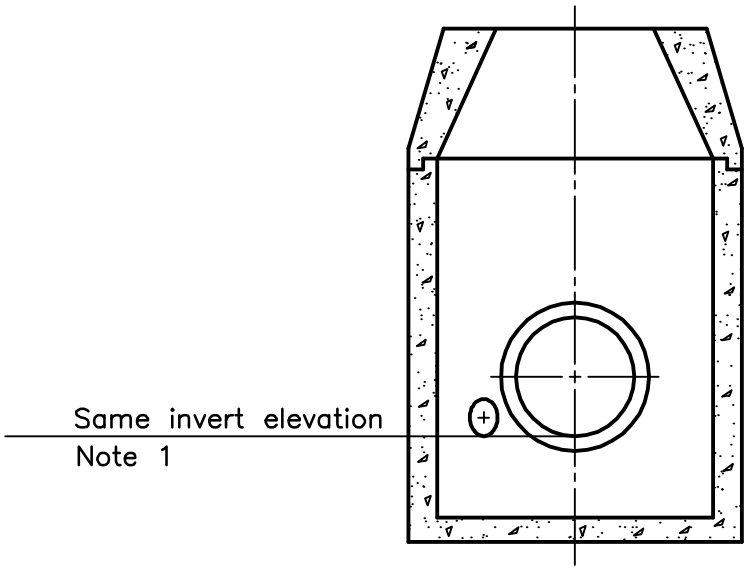
## CLASS HE-A, HE-I, HE-II, HE-III, and HE-IV

ONTARIO STANDARDS · MUNICIPAL - PROVINCIAL · O P S

OPSD 807.050




**PLAN**




**SECTION A–A**

NOTES:

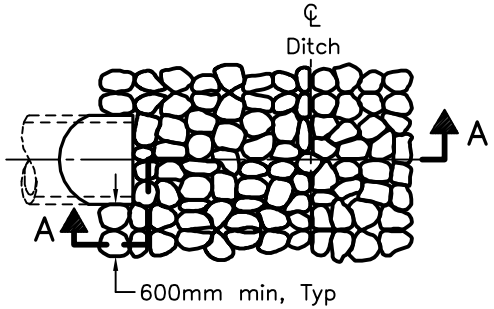
1 Where concrete bedding is used for the main sewer, the pipe subdrain shall be placed 150mm above the top of such bedding.

2 Subdrain pipe shall be cored into maintenance hole.

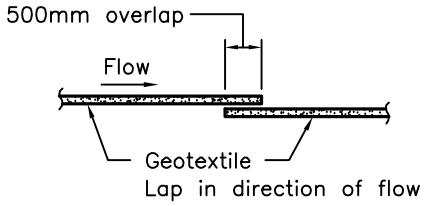
A Maintenance hole benching shall accommodate pipe subdrain, as required.

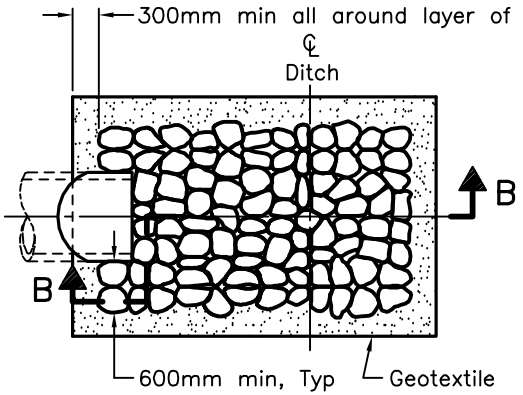
B All dimensions are in metres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| PERFORATED PIPE SUBDRAIN<br>IN GRANULAR TRENCH<br>MAIN STORM SEWER CONNECTION<br>TO DRAINAGE STRUCTURE | | | |
| | OPSD 809.010 | | |

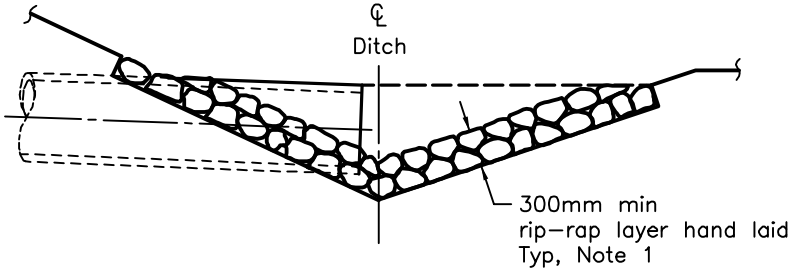



PLAN
CUT OR FILL

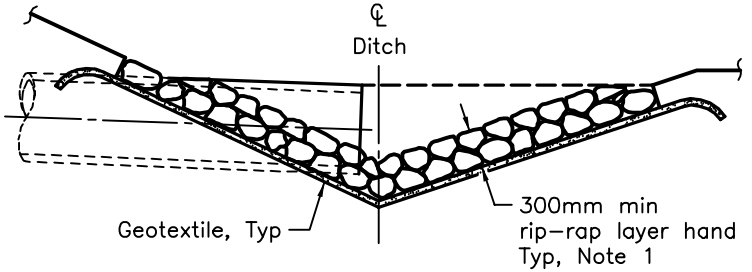


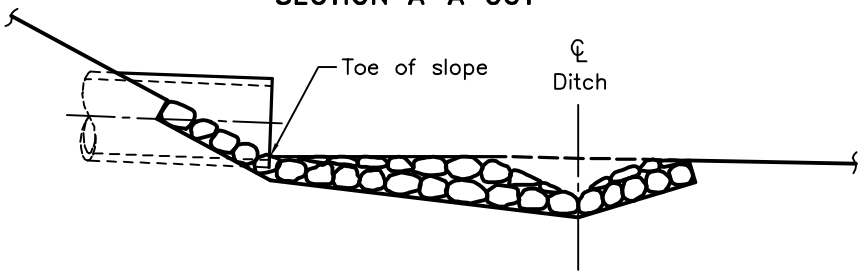

PLAN
CUT OR FILL



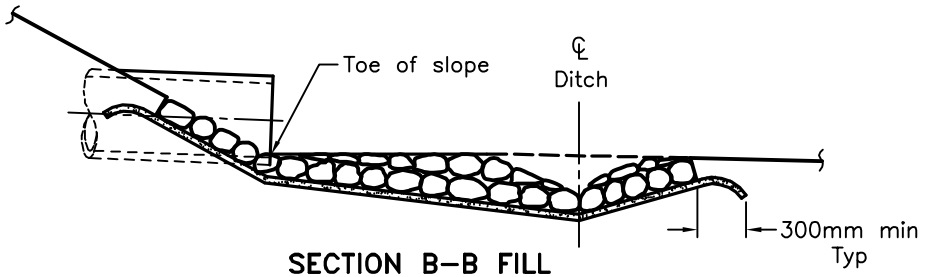

SECTION A–A CUT




SECTION B–B CUT




SECTION A–A FILL




SECTION B–B FILL

## TYPE A – WITHOUT GEOTEXTILE

## TYPE B – WITH GEOTEXTILE

NOTES:

1 The thickness of the rip–rap layer shall be at least 1.5 times the rip–rap mean diameter.

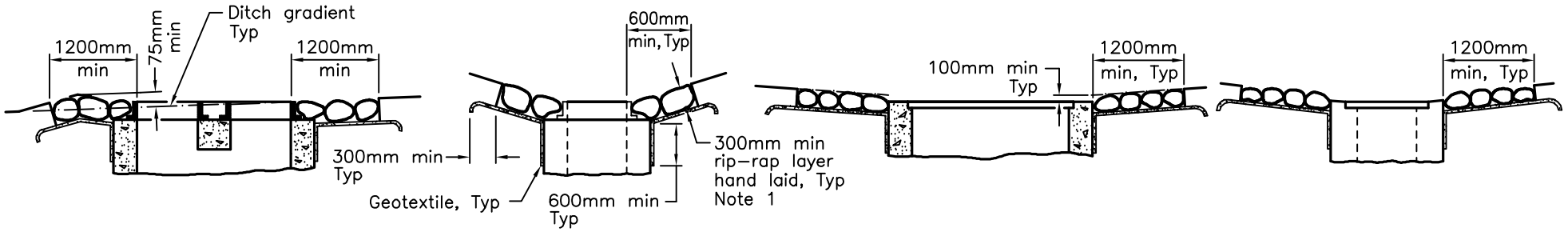
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# GENERAL RIP–RAP LAYOUT FOR SEWER AND CULVERT OUTLETS

Nov 2013 | Rev 2

OPSD 810.010

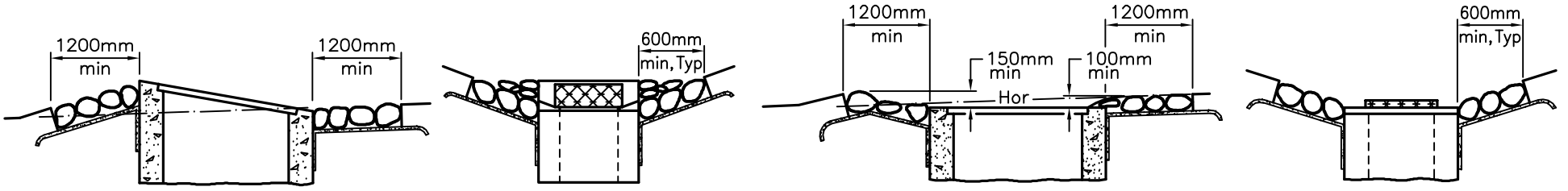



Ditch Longitudinal Section — Ditch Cross–Section

**TWIN INLET–INTERMEDIATE**

Ditch Longitudinal Section — Ditch Cross–Section

**SINGLE INLET–SUMP**

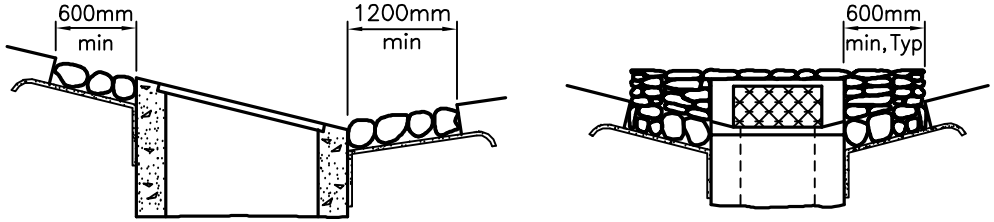



Ditch Longitudinal Section — Ditch Cross–Section

**SINGLE INLET–INTERMEDIATE**

Ditch Longitudinal Section — Ditch Cross–Section

**SINGLE INLET–INTERMEDIATE**




Ditch Longitudinal Section — Ditch Cross–Section

**SINGLE INLET–END OF DITCH**

NOTES:

1 The thickness of the rip–rap layer shall be at least 1.5 times the rip–rap mean diameter.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

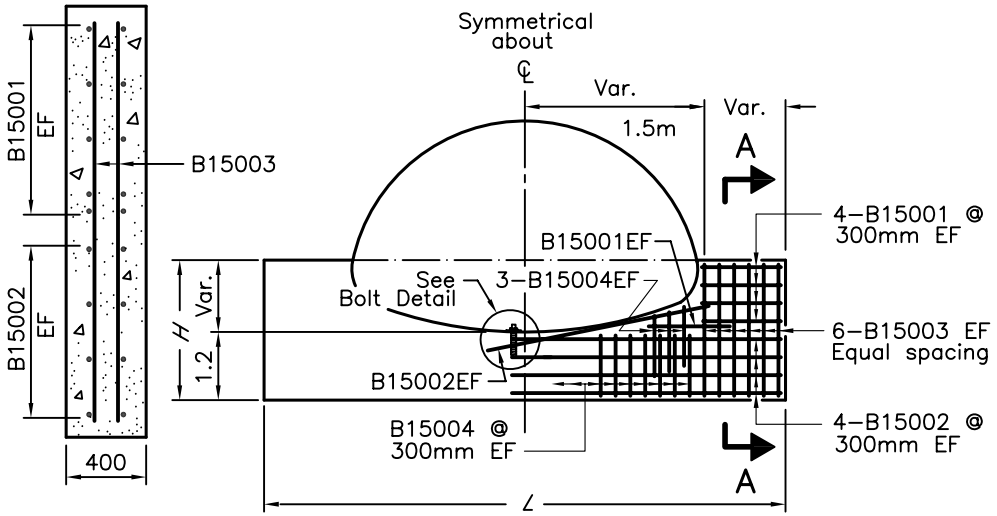
# GENERAL RIP–RAP LAYOUT FOR DITCH INLETS

Nov 2013 | Rev 2

OPSD 810.020

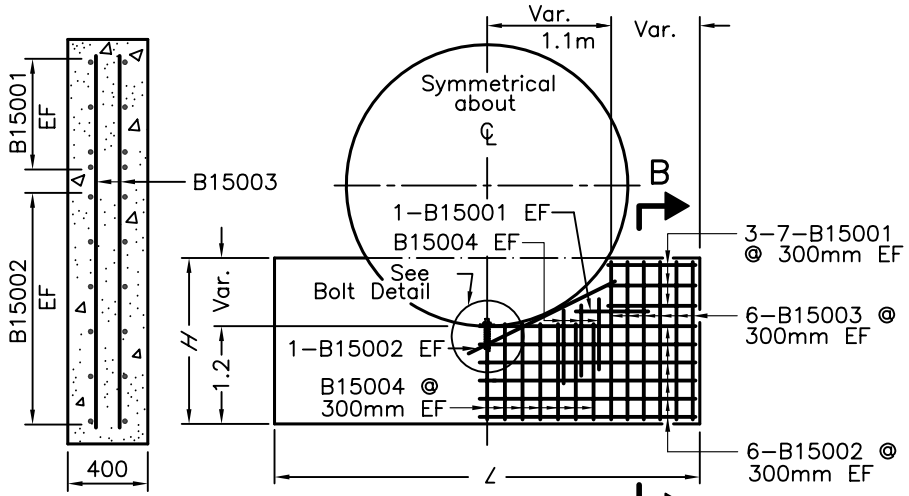
| PIPE | | B15001 | | B15002 | | B15003 | | B15004 | | ℓ | H |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Span | Rise | No | Length m | No | Length m | No | Length m | No | Length m | m | m |
| 3730 | 2290 | 20 | 1.06 | 20 | 3.20 | 24 | 2.13 | 36 | 1.06 | 6.17 | 2.28 |
| 3890 | 2690 | 20 | 1.06 | 20 | 3.27 | 24 | 2.13 | 36 | 1.06 | 6.32 | 2.28 |
| 4370 | 2870 | 20 | 1.37 | 20 | 3.86 | 24 | 2.28 | 40 | 1.06 | 7.46 | 2.43 |
| 4720 | 3070 | 20 | 1.37 | 20 | 4.01 | 24 | 2.28 | 42 | 1.06 | 7.77 | 2.43 |
| 5050 | 3330 | 20 | 1.37 | 20 | 4.19 | 24 | 2.28 | 44 | 1.06 | 8.07 | 2.43 |
| 5490 | 3530 | 20 | 1.37 | 20 | 4.42 | 24 | 2.28 | 46 | 1.06 | 8.53 | 2.43 |
| 5890 | 3710 | 20 | 1.37 | 20 | 4.62 | 24 | 2.28 | 50 | 1.06 | 8.91 | 2.43 |
| 6250 | 3910 | 20 | 1.37 | 20 | 4.80 | 24 | 2.28 | 52 | 1.06 | 9.29 | 2.43 |

| PIPE | B15001 | | B15002 | | B15003 | | B15004 | | ℓ | H |
|---|---|---|---|---|---|---|---|---|---|---|
| Dia | No | Length m | No | Length m | No | Length m | No | Length m | m | m |
| 3000 | 16 | 1.37 | 28 | 3.28 | 24 | 1.98 | 32 | 1.37 | 6.10 | 2.13 |
| 3050 | 16 | 1.37 | 28 | 3.35 | 24 | 1.98 | 34 | 1.37 | 6.25 | 2.13 |
| 3300 | 16 | 1.37 | 28 | 3.43 | 24 | 2.13 | 36 | 1.37 | 6.40 | 2.29 |
| 3360 | 16 | 1.37 | 28 | 3.51 | 24 | 2.13 | 38 | 1.37 | 6.55 | 2.29 |
| 3600 | 20 | 1.37 | 28 | 3.58 | 24 | 2.29 | 40 | 1.37 | 6.71 | 2.44 |
| 3670 | 20 | 1.37 | 28 | 3.73 | 24 | 2.44 | 44 | 1.37 | 7.01 | 2.59 |
| 3990 | 20 | 1.37 | 28 | 3.89 | 24 | 2.59 | 48 | 1.37 | 7.32 | 2.74 |
| 4300 | 20 | 1.37 | 28 | 4.04 | 24 | 2.74 | 52 | 1.37 | 7.62 | 2.90 |
| 4610 | 24 | 1.37 | 28 | 4.19 | 24 | 2.90 | 56 | 1.37 | 7.93 | 3.05 |
| 4920 | 24 | 1.37 | 28 | 4.34 | 24 | 3.05 | 60 | 1.37 | 8.23 | 3.20 |
| 5230 | 28 | 1.37 | 28 | 4.50 | 24 | 3.20 | 64 | 1.37 | 8.53 | 3.35 |



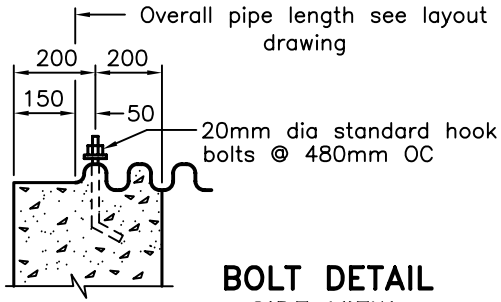

SECTION A–A

ELEVATION
PIPE ARCH




SECTION B–B

ELEVATION
CIRCULAR CSP




BOLT DETAIL
SIDE VIEW

NOTES:

A Class of concrete: 30MPa.
B Cover to reinforcing bars: 100mm.
C EF denotes each face.
D Number of bars shown is for one wall.
E All dimensions are in millimetres unless otherwise shown.

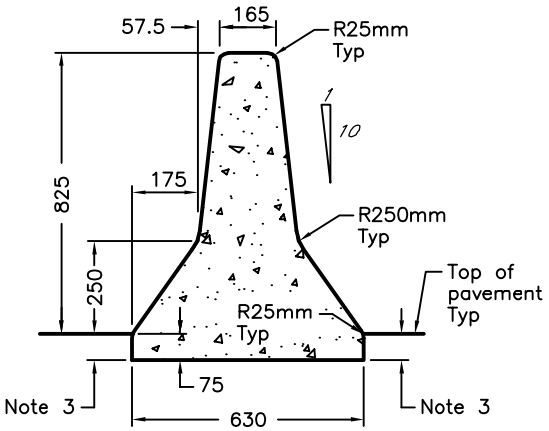
ONTARIO PROVINCIAL STANDARD DRAWING

# CUT OFF WALL FOR STRUCTURAL PLATE PIPE ARCH AND CIRCULAR CSP

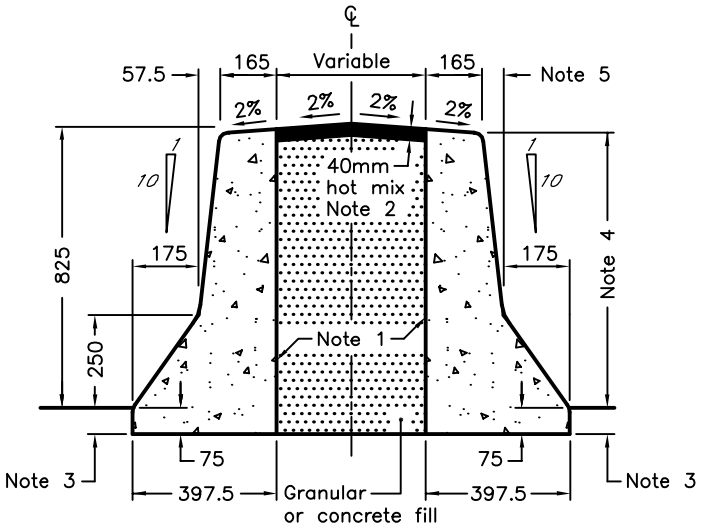
Nov 2006 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

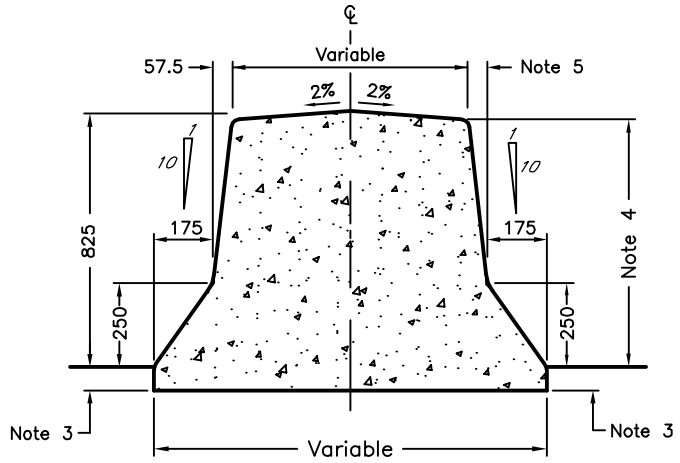
OPSD 812.010



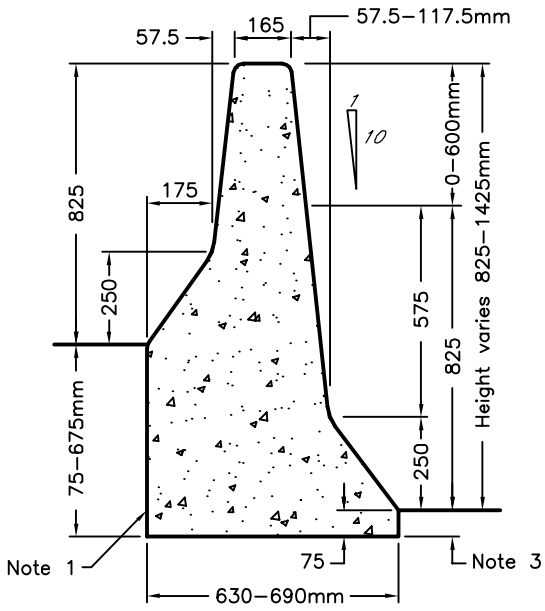

TYPE A




TYPE A–2




TYPE A–3




TYPE A–1
ASYMMETRIC SECTION

NOTES:

1 For slipforming procedure, a 1H:20V batter is acceptable.

2 Hot mix not required when concrete fill is placed to the top of the concrete barriers.

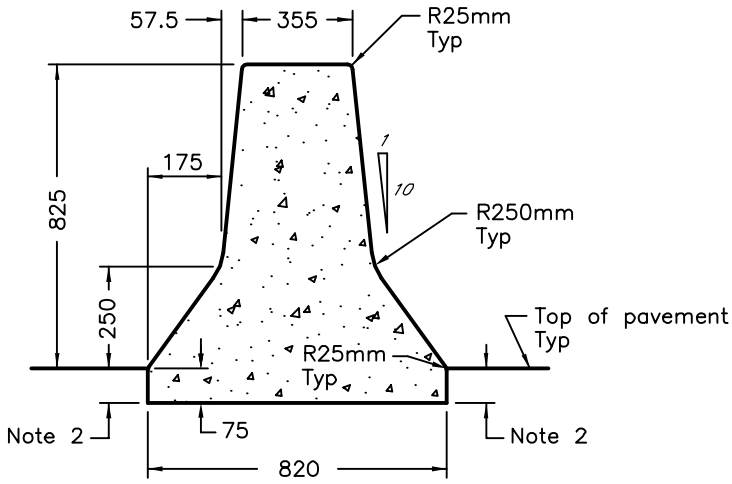
3 Embedment shall be 75mm into adjacent pavement.

4 Height may vary from 825 to 1425mm in an asymmetric cross section.

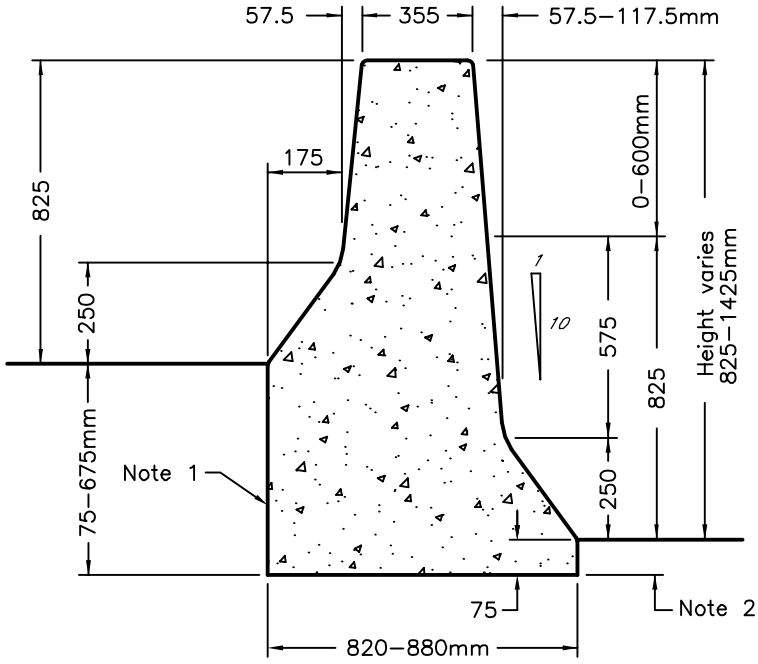
5 Width may vary from 57.5 to 117.5mm in an asymmetric cross section.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER CAST–IN–PLACE, TYPE A INSTALLATION | | | |
| | OPSD 911.130 | | |




**TYPE C**




**TYPE C–1**
**ASYMMETRIC SECTION**

NOTES:

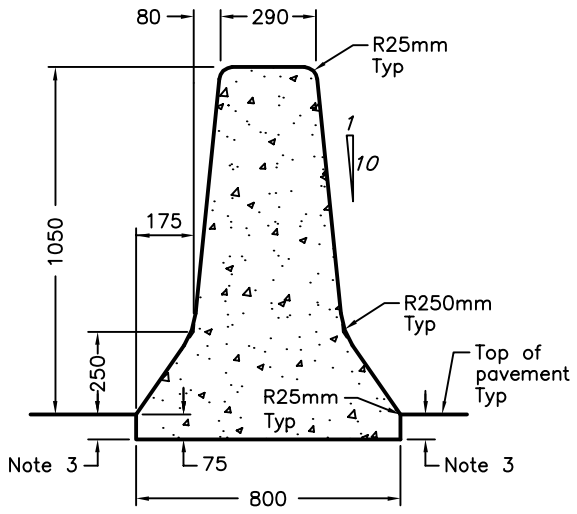
1 For slipforming procedure, a 1H:20V batter is acceptable.

2 Embedment shall be 75mm into adjacent pavement.

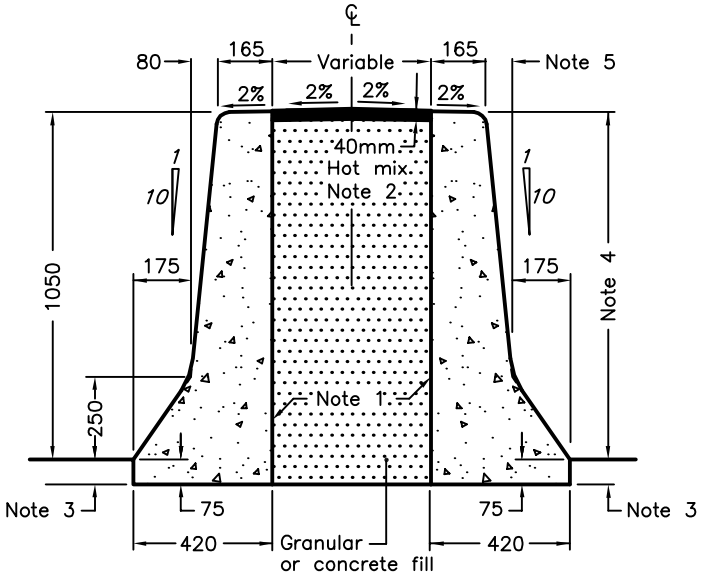
A OPSD 911.130 Type A–2 barrier shall be placed adjacent to bridge piers.

B All dimensions are in millimetres unless otherwise shown.

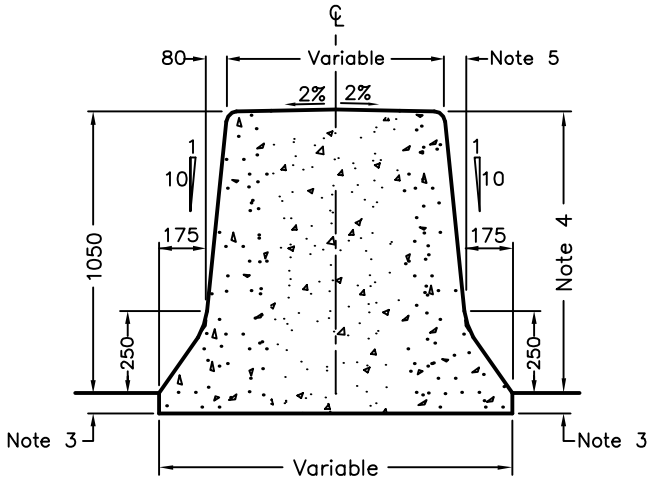
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER<br>CAST–IN–PLACE, TYPE C<br>INSTALLATION | | | |
| | OPSD 911.131 | | |



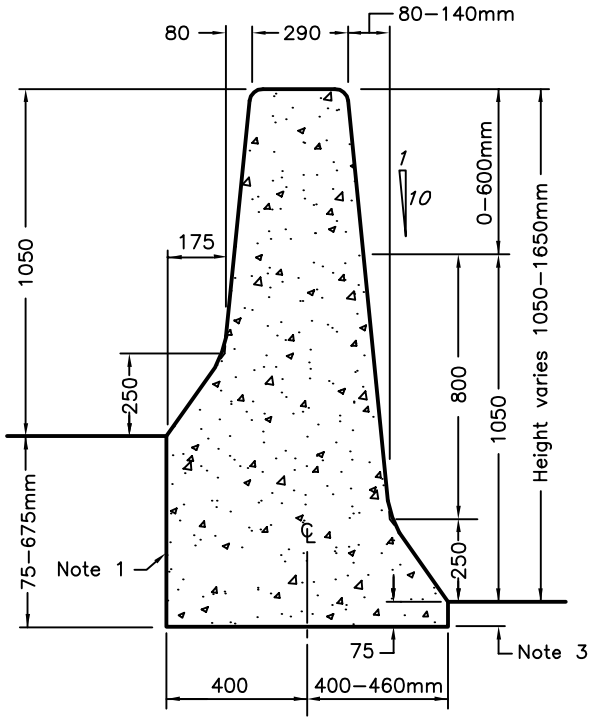

**TYPE TW**




**TYPE TW–2**




**TYPE TW–3**




**TYPE TW–1**
**ASYMMETRIC SECTION**

NOTES:

1 For slipforming procedure, a 1H:20V batter is acceptable.

2 Hot mix not required when concrete fill is placed to the top of the concrete barriers.

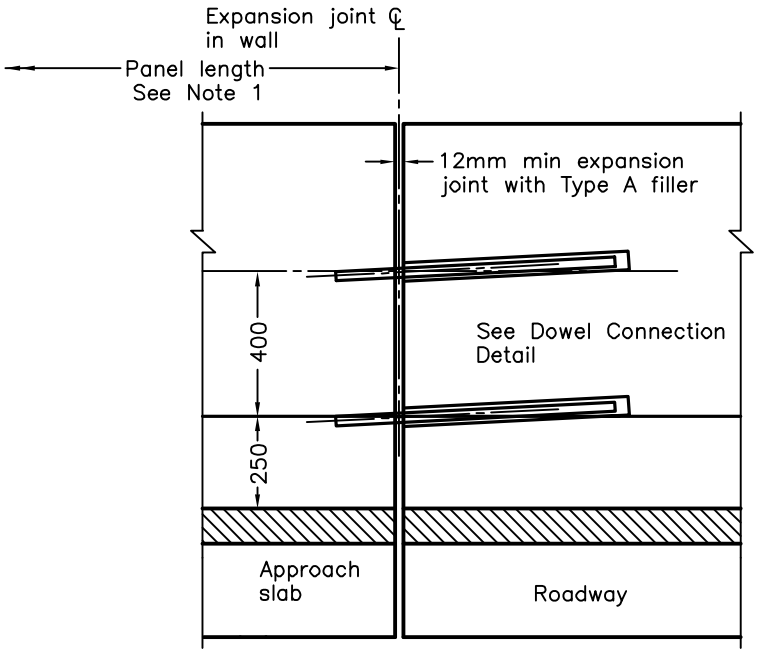
3 Embedment shall be 75mm into adjacent pavement.

4 Height may vary from 1050 to 1650mm in an asymmetric cross section.

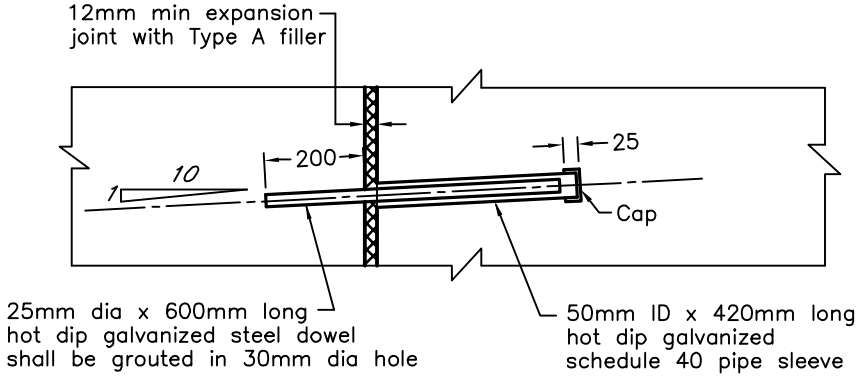
5 Width may vary from 80 to 140mm in an asymmetric cross section.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| **GUIDE RAIL SYSTEM, CONCRETE BARRIER CAST–IN–PLACE, TALL WALL INSTALLATION** | | | |
| | **OPSD 911.132** | | |




**ELEVATION**




**DOWEL CONNECTION DETAIL**

NOTES:

1 Barrier panel length shall not exceed 6m.

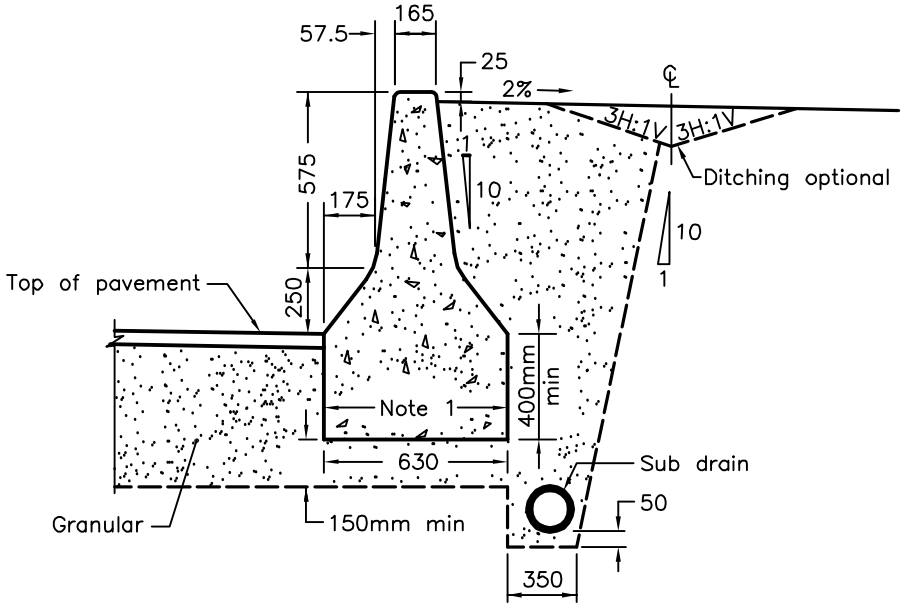
A This OPSD shall be read in conjunction with OPSD 911.130, 911.131, and 911.132.

B All dowels shall be hot dip galvanized according to ASTM A123.

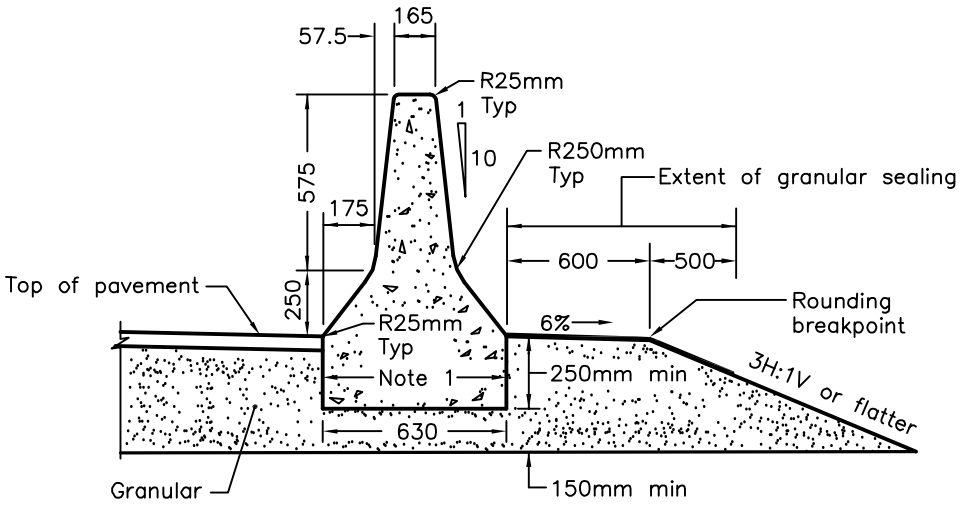
C Cover on reinforcement shall be 70mm ±20mm at all joints.

D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER INSTALLATION – MEDIAN CONCRETE BARRIER TO STRUCTURE | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 911.134 | | |




CUT SECTION



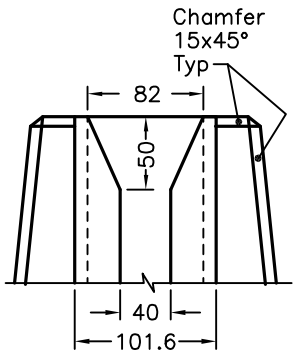

FILL SECTION

NOTES:

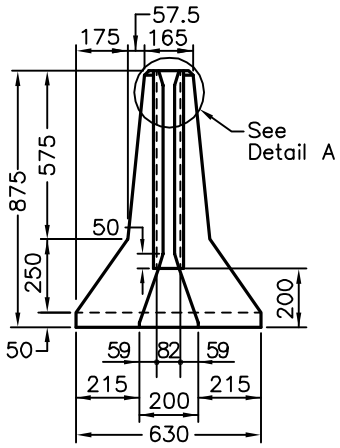
1 For slipforming procedure, a 1H:20V batter is acceptable.

A All dimensions are in millimetres unless otherwise shown.

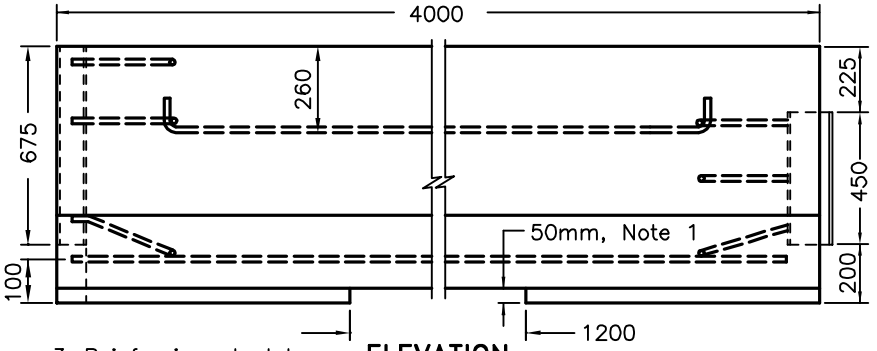
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE ROADSIDE BARRIER CAST–IN–PLACE OR SLIPFORMED INSTALLATION | | | |
| | OPSD 911.135 | | |



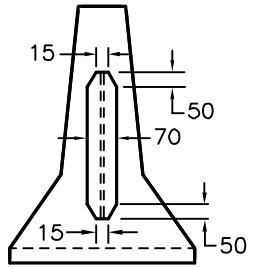

DETAIL A



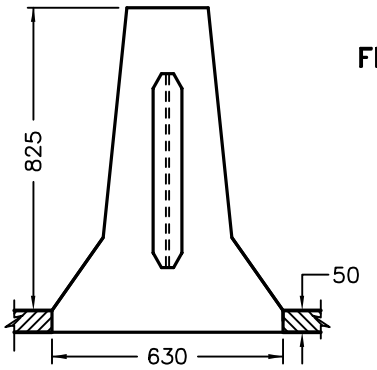

FEMALE END ELEVATION
See Installation
Detail B or C



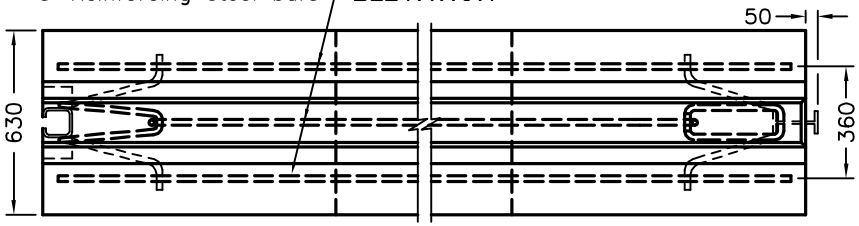

ELEVATION



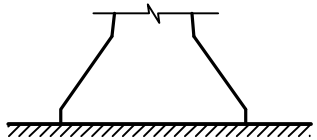

MALE END ELEVATION
See Installation
Detail B or C



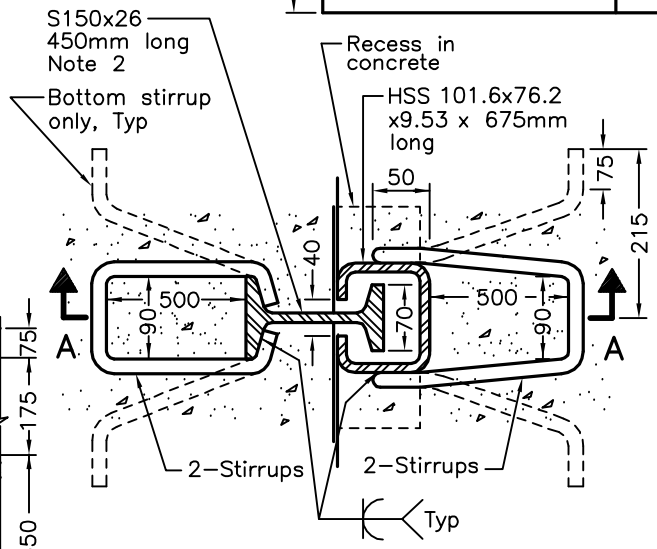

DETAIL B
PERMANENT INSTALLATION



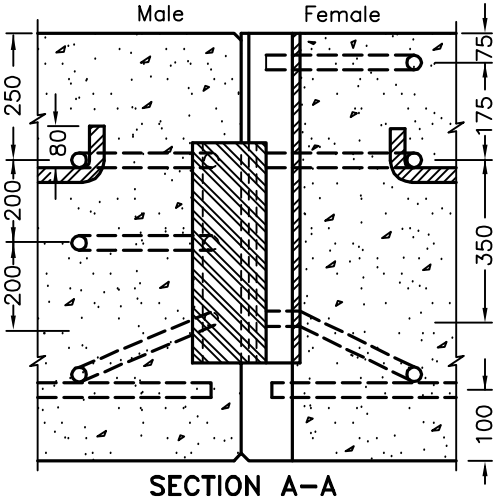

PLAN



DETAIL C
TEMPORARY INSTALLATION




CONNECTION ASSEMBLY DETAIL, Note 3




SECTION A–A

NOTES:

1 When installed as a permanent concrete barrier, the 50mm recess shall be filled with grout or the precast unit produced without the recess.

2 The exposed flange shall be trimmed symmetrically about centreline to a width of 70mm.

3 When installed as a permanent concrete barrier, the connection assembly shall be hot dip galvanized after fabrication according to ASTM A 123.

A Reinforcing and stirrups shall be size 10M, Grade 400W, deformed steel bars. Concrete cover shall be 50mm minimum.

B All concrete edges shall have 15x45° chamfer.

C Welds shall be according to CSA W59 and CSA W186.

D All dimensions are in millimetres unless otherwise shown.

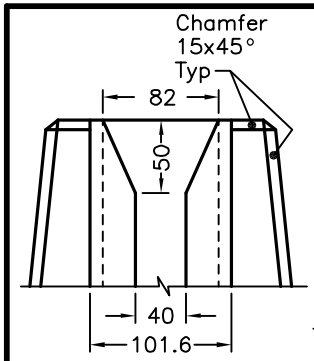
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 1

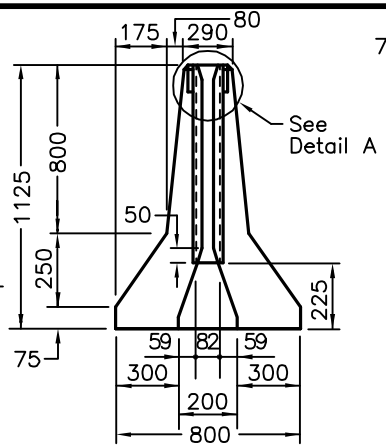
# GUIDE RAIL SYSTEM, CONCRETE BARRIER PRECAST I–LOCK CONNECTION INSTALLATION–TEMPORARY AND PERMANENT

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

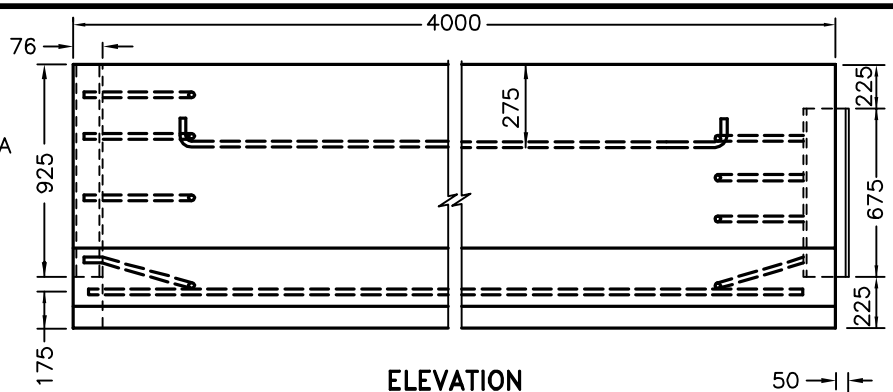
OPSD 911.140



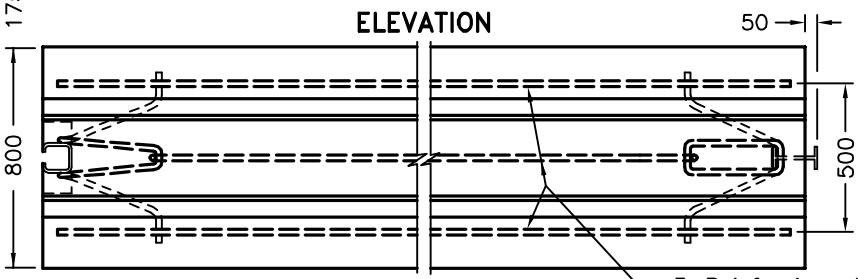

DETAIL A



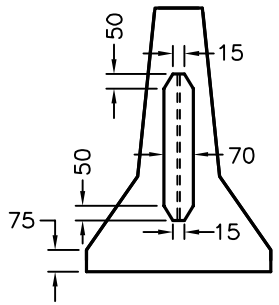

FEMALE END ELEVATION
See Installation Detail B



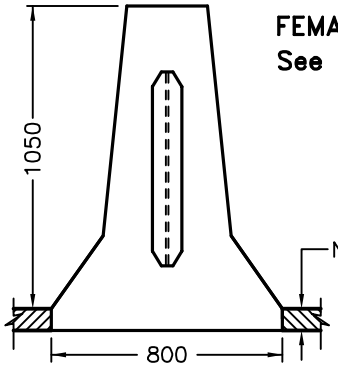

ELEVATION



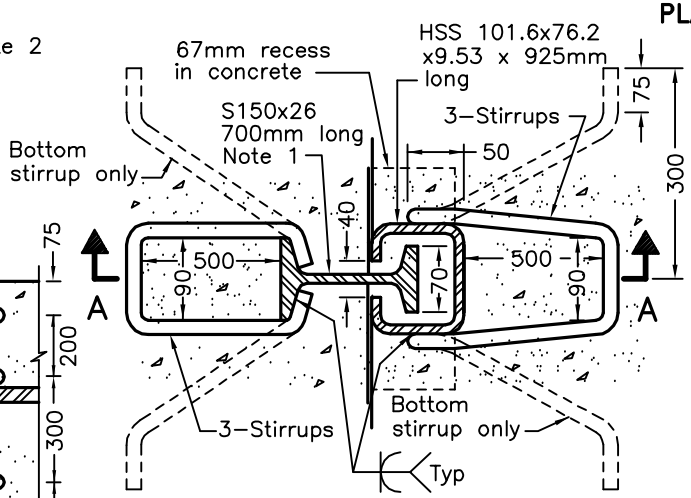

PLAN



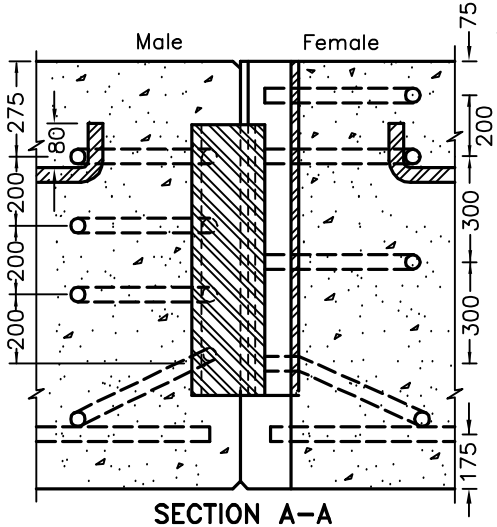

MALE END ELEVATION
See Installation Detail B




DETAIL B




CONNECTION ASSEMBLY DETAIL, Note 3




SECTION A–A

## NOTES:

1 The exposed flange shall be trimmed symmetrically about centreline to a width of 70mm.

2 Embedment shall be 75mm into adjacent pavement, 2.6m minimum width, both sides of barrier.

3 The connection assembly shall be hot dip galvanized after fabrication according to ASTM A 123.

A Reinforcing and stirrups shall be 10M, Grade 400W, deformed steel bars. Concrete cover shall be 50mm minimum.

B All concrete edges shall have 15x45° chamfer.

C Welds shall be according to CSA W59 and CSA W186.

D All dimensions are in millimetres unless otherwise shown.

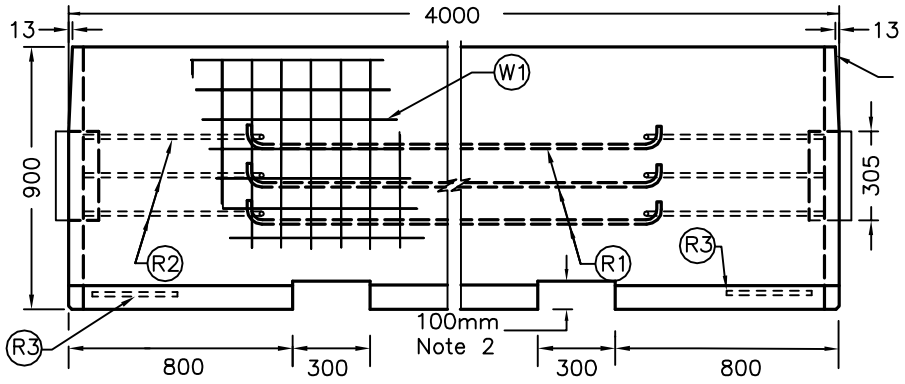
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 1

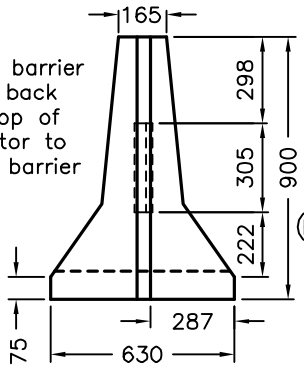
# GUIDE RAIL SYSTEM, CONCRETE BARRIER PRECAST I–LOCK CONNECTION, TYPE TW INSTALLATION – PERMANENT

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

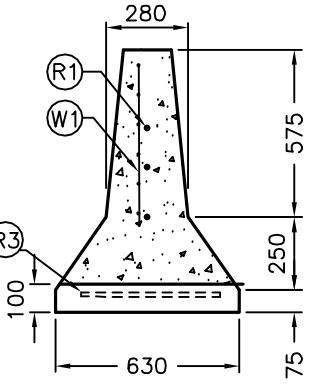
OPSD 911.143



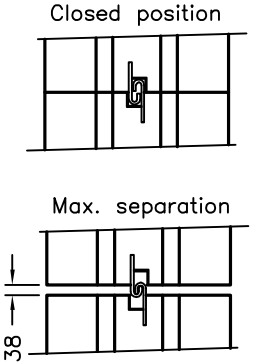

ELEVATION

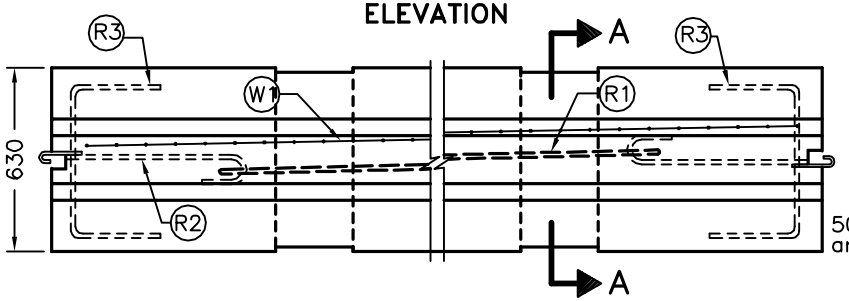



END ELEVATION

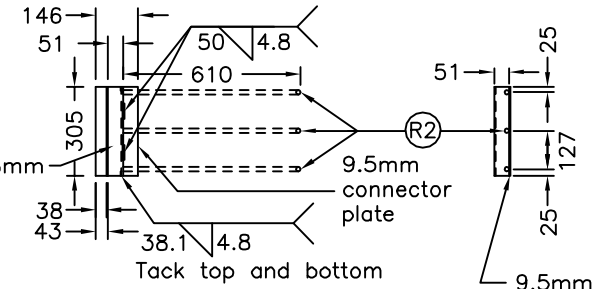


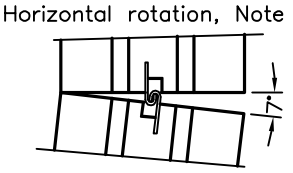

SECTION A–A



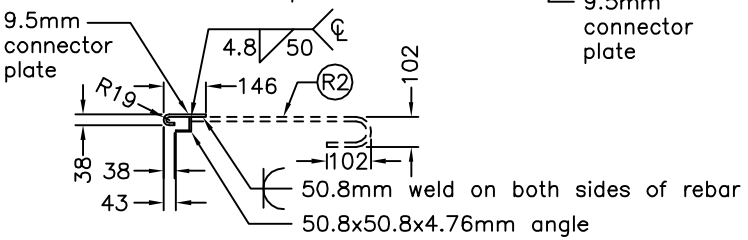




PLAN




BARRIER TO BARRIER CONNECTION




Type J Connection DETAIL, Note 3

| REINFORCING STEEL BARS | | | | | | |
|---|---|---|---|---|---|---|
| BAR | SIZE | GRADE | TYPE | LENGTH | SHAPE | NO. REQ'D |
| R1 | 15M | 400W | Deformed | 3200 | 3000 / 100 | 3 |
| R2 | 15M | 400W | Deformed | 814 | 610 / 102 / 102 | 6 |
| R3 | 10M | 400W | Deformed | 1080 | 480 / 300 | 2 |
| W1 | 152X152 MW18.7XMW18.7 (456X3810) | | | | | |

NOTES:

1 Minimum horizontal radius shall be 31m.

2 Drainage openings. Temporary concrete barriers manufactured prior to September 2009 with one 600mm long x 100mm high drainage opening are acceptable.

3 JJ Hook Connection is proprietary to Easi–Set Industries Inc.

A System configuration meets NCHRP Report 350 TL–3.

B Concrete cover 50mm minimum.

C All concrete edges shall have 15x45° chamfers.

D Welds shall be according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

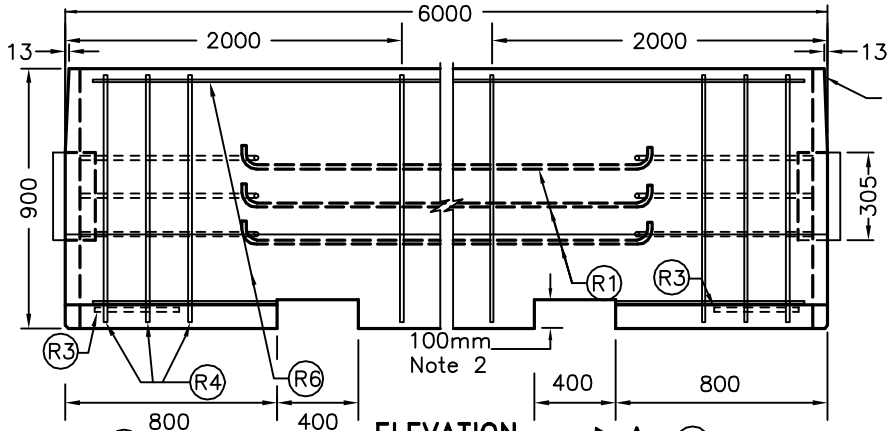
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE J CONNECTION, 4m LENGTH INSTALLATION–TEMPORARY

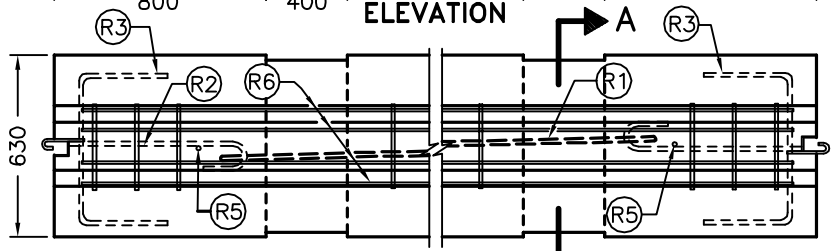
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

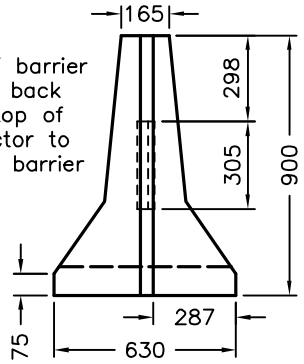
OPSD 911.150



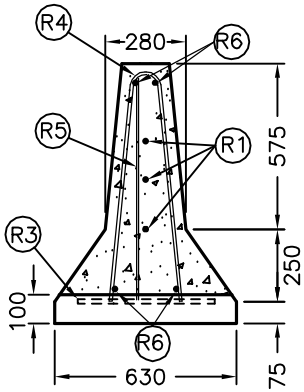

ELEVATION



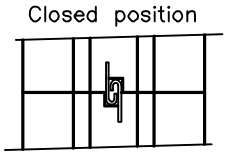

PLAN

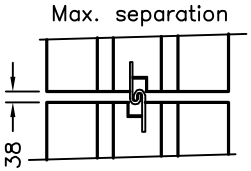


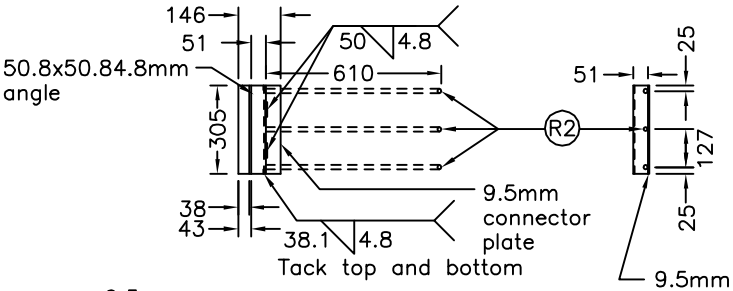

END ELEVATION

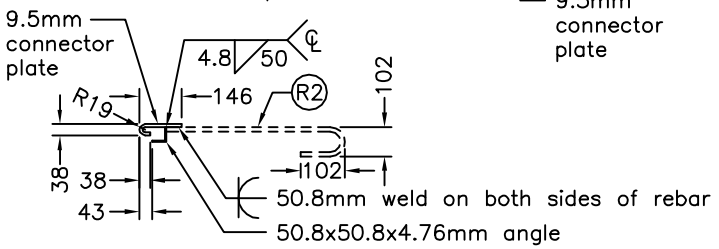



SECTION A–A

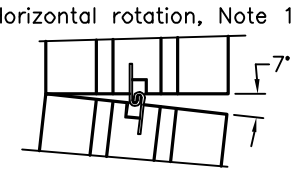



Type J Connection DETAIL, Note 3




BARRIER TO BARRIER CONNECTION

| REINFORCING STEEL BARS | | | | | | |
|---|---|---|---|---|---|---|
| BAR | SIZE | GRADE | TYPE | LENGTH | SHAPE | NO. REQ'D |
| R1 | 15M | 400W | Deformed | 5045 | 4845, 100 | 3 |
| R2 | 15M | 400W | Deformed | 814 | 610, 102, 102 | 6 |
| R3 | 10M | 400W | Deformed | 1080 | 480, 300 | 2 |
| R4 | 10M | 400W | Deformed | 1650 | 786, 253, R42 | 8 |
| R5 | 10M | 400W | Deformed | 750 | 750 | 2 |
| R6 | 20M | 400W | Deformed | 5825 | 5825 | 4 |

NOTES:

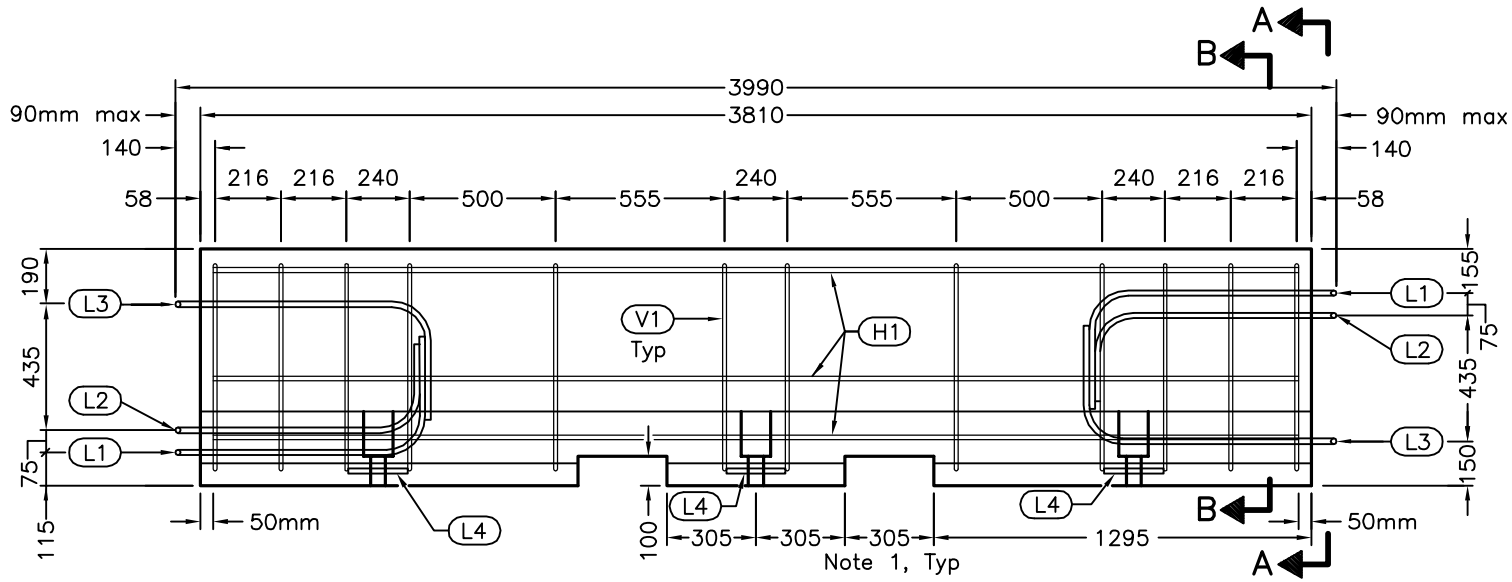
1 Minimum horizontal radius shall be 47m.
2 Drainage openings.
3 JJ Hook Connection is proprietary to Easi–Set Industries Inc.
A System configuration meets NCHRP Report 350 TL–3.
B Concrete cover 50mm minimum.
C All concrete edges shall have 15x45° chamfers.
D Welds shall be according to CSA W59.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

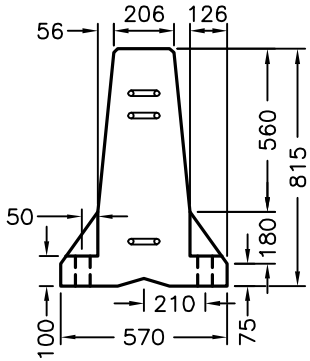
# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE J CONNECTION, 6m LENGTH INSTALLATION–TEMPORARY

Nov 2013 | Rev 0

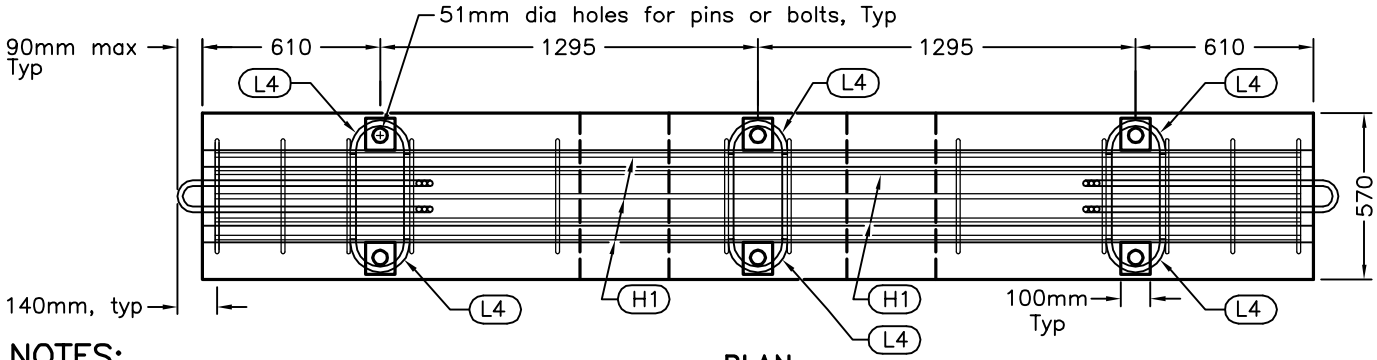
OPSD 911.151



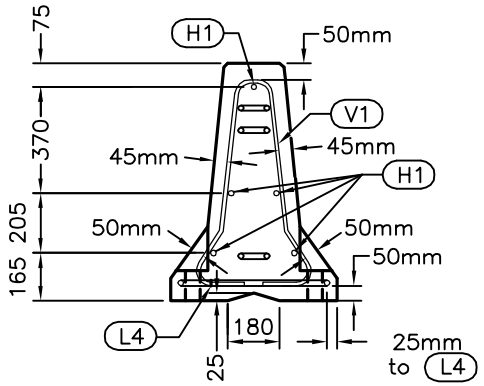

ELEVATION




SECTION A–A




PLAN




SECTION B–B

NOTES:

1 Drainage opening.

A This OPSD shall be read in conjunction with OPSD 911.161.

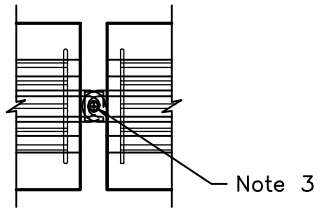
B System configuration meets NCHRP Report 350 TL–3.

C Welding of reinforcement bars shall be according to CSA W186.

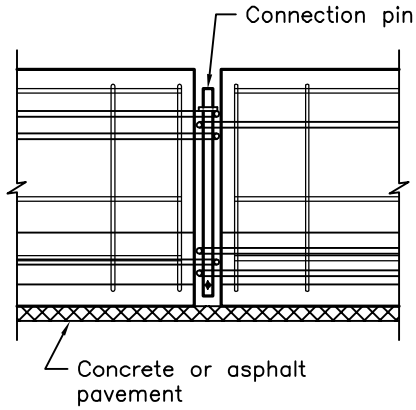
D All concrete edges shall have 15x45° chamfers.

E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER<br>TYPE M CONNECTION<br>INSTALLATION–TEMPORARY 1 | | | |
| | OPSD 911.160 | | |

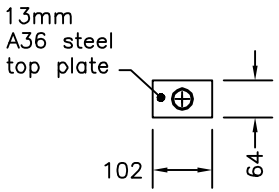



PLAN

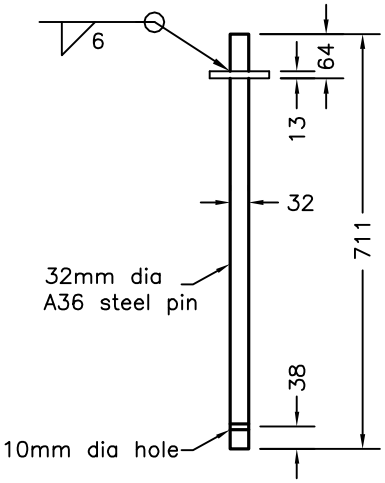



ELEVATION

CONNECTION DETAIL

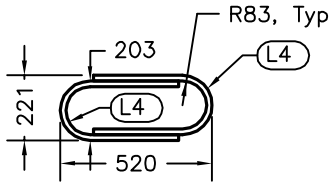



PLAN



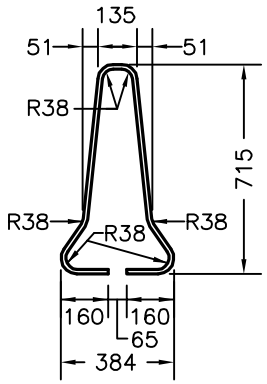

ELEVATION

CONNECTION PIN



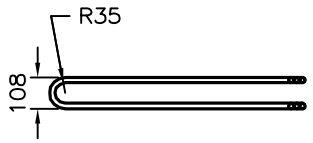

PLAN

HOOP BAR ASSEMBLY

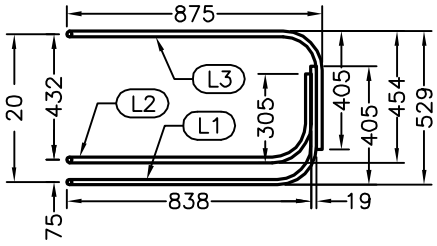



ELEVATION

STIRRUPS




PLAN




ELEVATION

LOOP BAR ASSEMBLY

| REINFORCING STEEL BARS | | | | | | |
|---|---|---|---|---|---|---|
| BAR | SIZE | GRADE | TYPE | LENGTH | SHAPE | NO. REQ'D |
| H1 | 15M | 400W | Deformed | 3708 | 3708 | 5 |
| L1, Note 1 and 2 | 20M | 400W Note 1 | Deformed | 2570 | 405 857 | 2 |
| L2, Note 1 and 2 | 20M | 400W Note 1 | Deformed | 2310 | 305 838 | 2 |
| L3, Note 1 and 2 | 20M | 400W Note 1 | Deformed | 2600 | 405 875 | 2 |
| L4 | 20M | 400W | Deformed | 889 | 203 406 | 6 |
| V1 | 15M | 400W | Deformed | 1791 | | 12 |

NOTES:

1 Minimum tensile elongation of test specimen shall be greater than 14%.
2 Imperial size 3/4 inch diameter Grade 60 ASTM A706 smooth reinforcing steel bars are acceptable.
3 Slack shall be removed from joint after pin installation. Minimum horizontal radius shall be 26m.

A Welding of connection pin and plate shall be according to CSA W59.
B All dimensions are in millimetres unless otherwise shown.

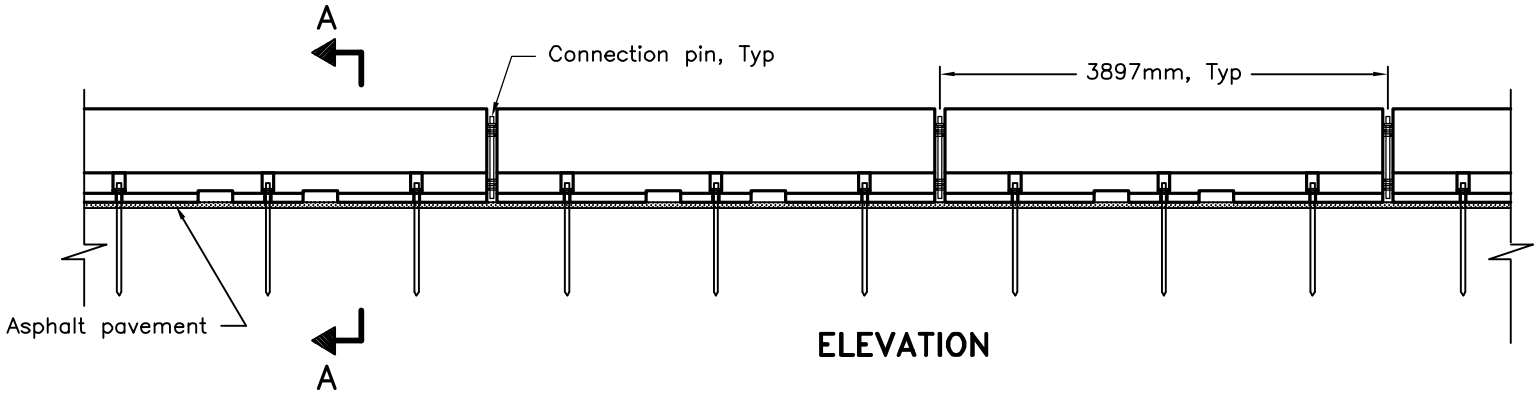
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION INSTALLATION–TEMPORARY 2

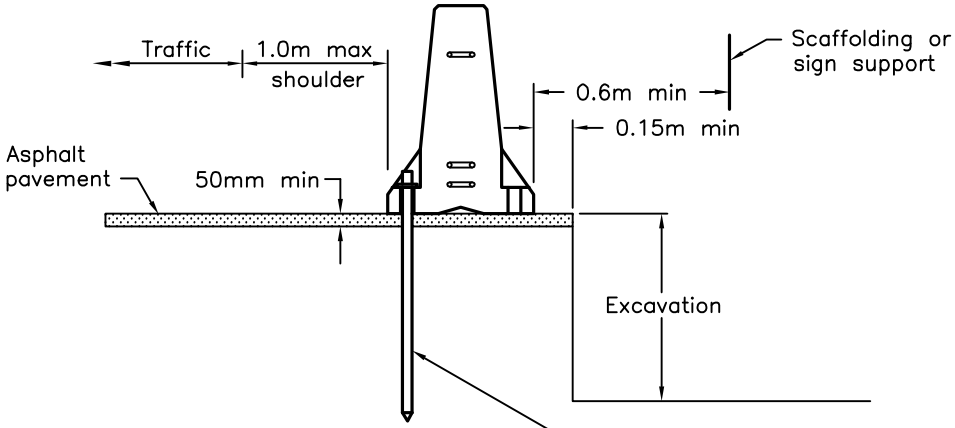
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · STS

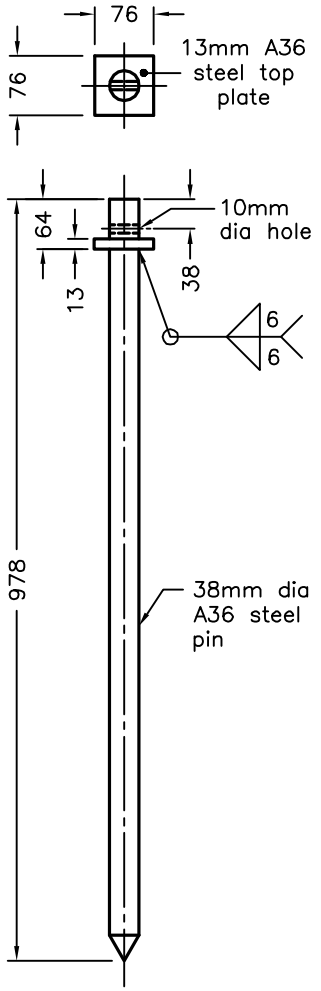
OPSD 911.161




ELEVATION




SECTION A–A




STEEL PIN ASSEMBLY
FOR ASPHALT PAVEMENT

NOTES:

1 Maximum 38mm diameter holes may be drilled through asphalt pavement for pins. Holes shall be drilled after barriers positioned.

A This OPSD shall be read in conjunction with OPSD 911.160 and 911.170.

B System configuration meets NCHRP Report 350 TL–3.

C Welds shall be according to CSA W59.

D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

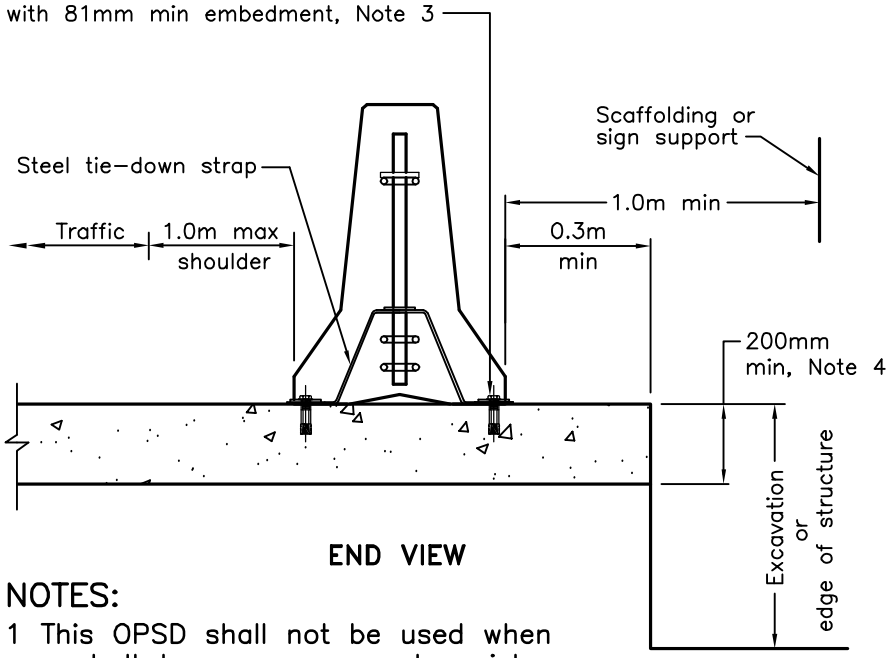
# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION

## INSTALLATION – TEMPORARY RESTRAINED SYSTEM PINNED TO ASPHALT PAVEMENT

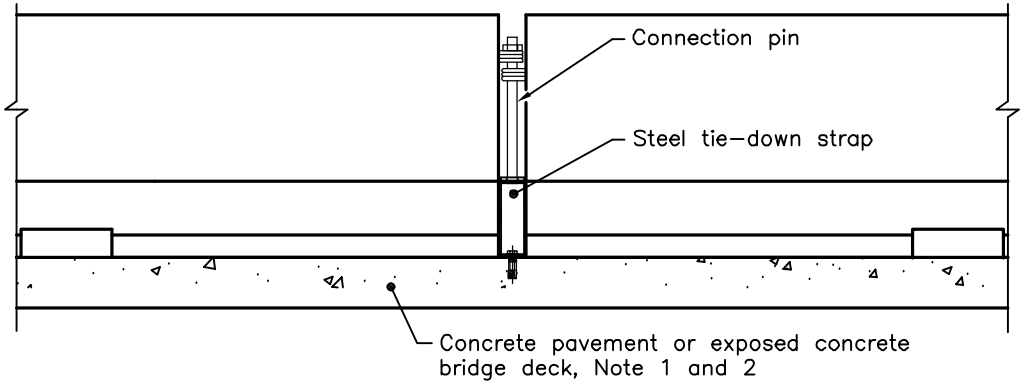
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

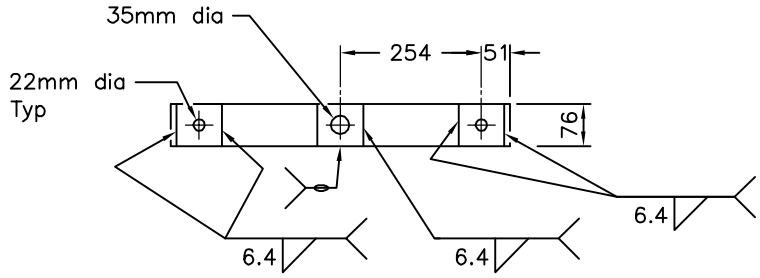
OPSD 911.162



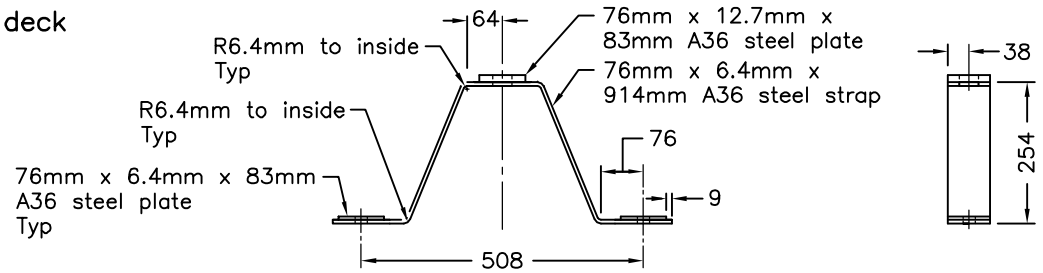

END VIEW




ELEVATION




PLAN




STEEL TIE–DOWN STRAP

## NOTES:

1 This OPSD shall not be used when asphalt layer over concrete exists.

2 This OPSD shall not be used on bridge superstructures that contain post tensioned tendons within the concrete deck or bridge superstructures with longitudinally prestressed, transversally post tensioned, solid or voided concrete slab units.

3 Anchors shall be installed according to manufacturer's specifications by an installer trained by the manufacturer's direct representative.

4 Minimum concrete strength shall be 27MPa.

A This OPSD shall be read in conjunction with OPSD 911.160 and 911.171.

B System configuration meets NCHRP Report 350 TL–3.

C Welds shall be according to CSA W59.

D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

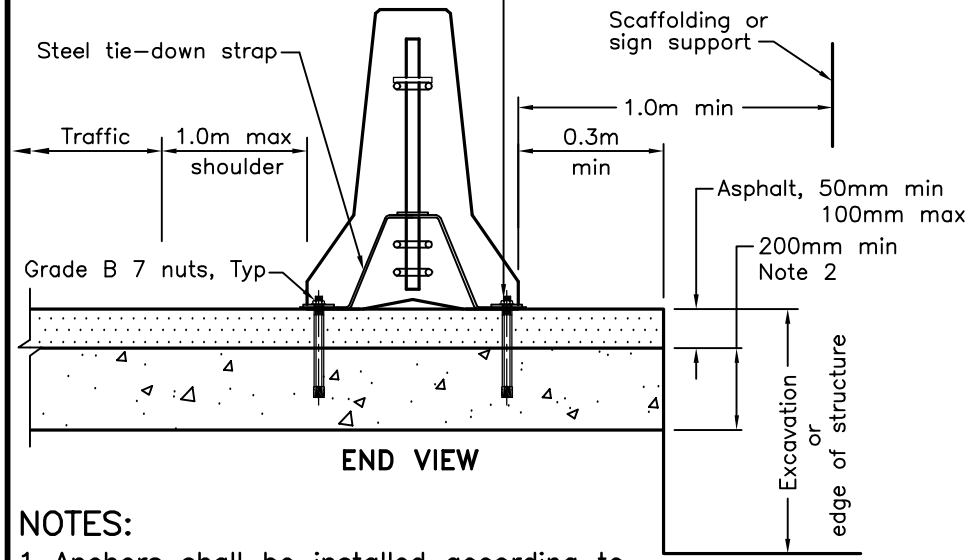
# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION INSTALLATION – TEMPORARY RESTRAINT SYSTEM STRAPPED TO CONCRETE

Nov 2013 | Rev 0

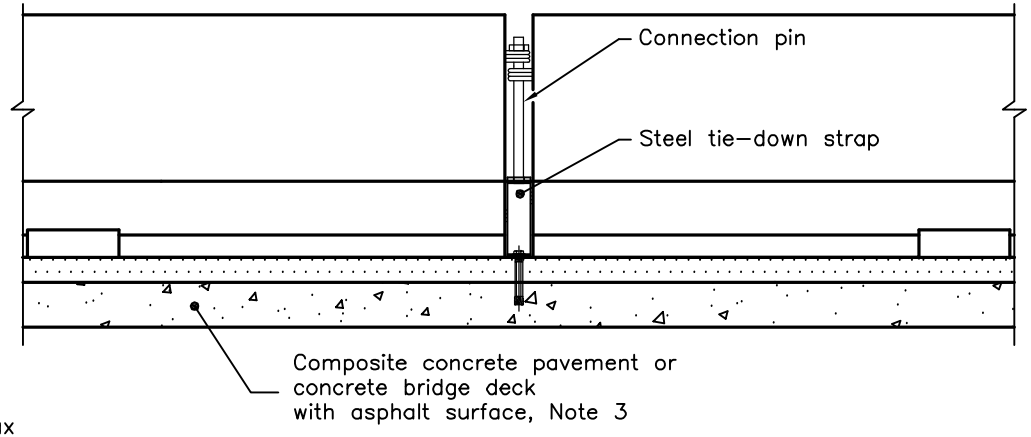
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 911.163

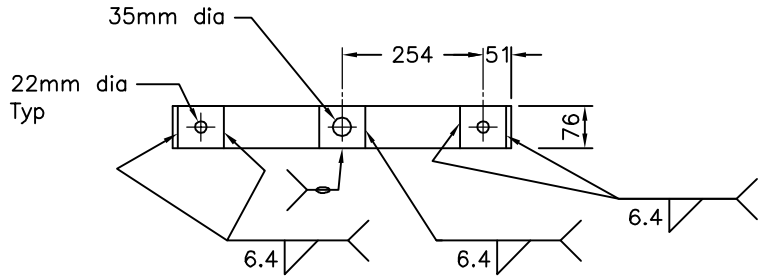
Two 3/4" dia x 4" Hilti HAS Super Rods fully threaded into Hilti 3/4" x 8-1/4" HIS-N inserts and HIT-RE 500 epoxy anchoring system with minimum 120mm embedment into concrete. Top of inserts and epoxy flush with top of pavement. Nuts shall not be torqued until epoxy is cured. Note 1



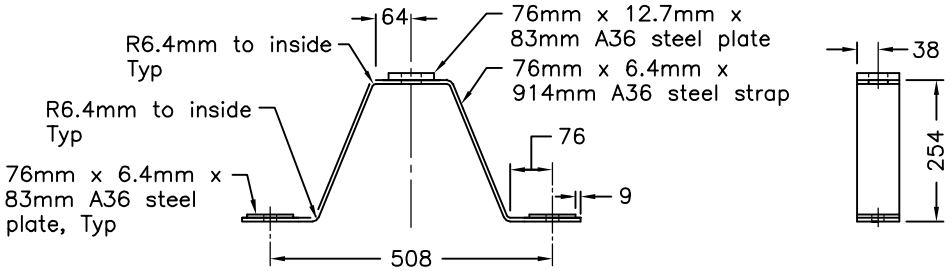

END VIEW




ELEVATION




PLAN




STEEL TIE-DOWN STRAP

## NOTES:

1 Anchors shall be installed according to manufacturer's specifications by an installer certified by the manufacturer's direct representative. The 1-1/4" diameter holes for anchors shall be diamond core drilled.

2 Minimum concrete strength shall be 27MPa.

3 This OPSD shall not be used on bridge superstructures that contain post tensioned tendons within the concrete deck or bridge superstructures with longitudinally prestressed, transversally post tensioned, solid or voided concrete slab units.

A This OPSD shall be read in conjunction with OPSD 911.160 and 911.171.

B System configuration is equivalent to OPSD 911.163, which meets NCHRP Report 350 TL-3.

C Barriers shall be pulled tight during installation to remove slack.

D Welds shall be according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

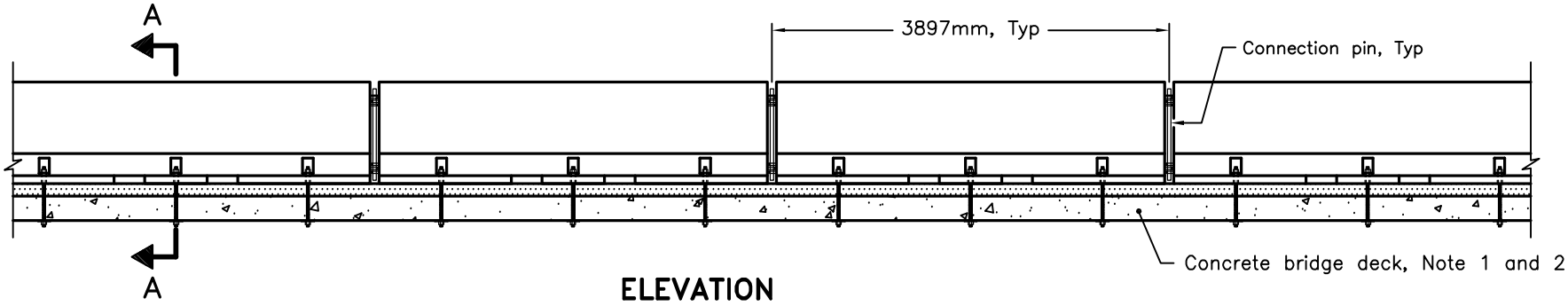
# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION

## INSTALLATION – TEMPORARY RESTRAINT SYSTEM STRAPPED TO CONCRETE WITH ASPHALT SURFACE

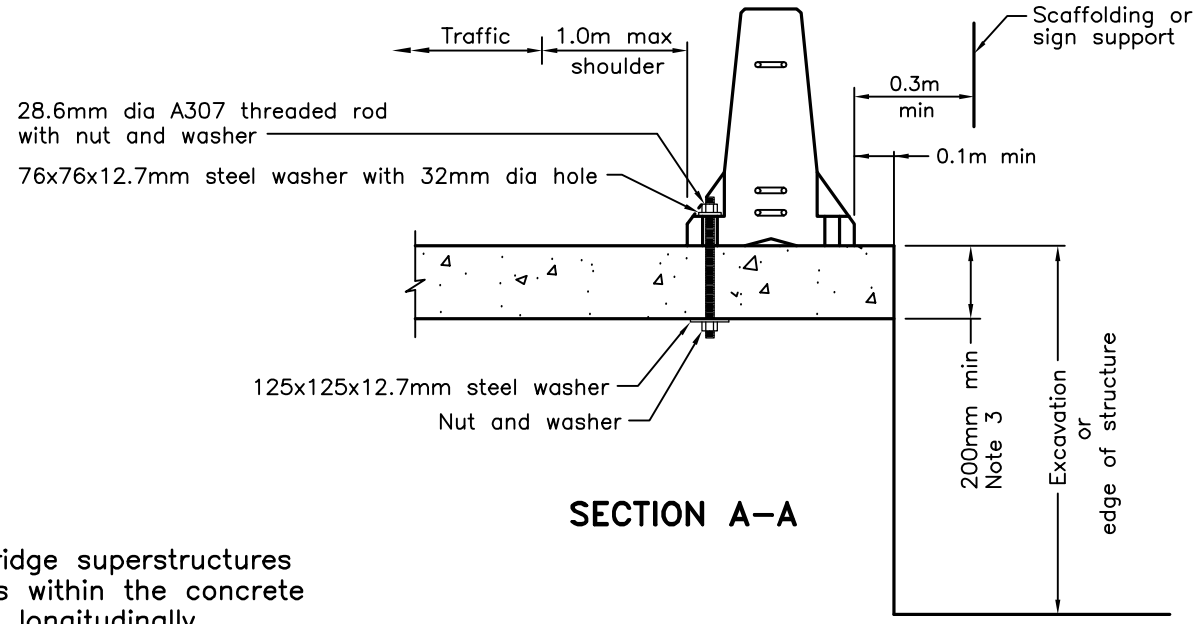
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 911.164




ELEVATION




SECTION A–A

NOTES:

1 This OPSD shall not be used when asphalt layer over concrete exists.

2 This OPSD shall not be used on bridge superstructures that contain post tensioned tendons within the concrete deck or bridge superstructures with longitudinally prestressed, transversally post tensioned, solid or voided concrete slab units.

3 Minimum concrete strength shall be 27MPa.

A This OPSD shall be read in conjuction with OPSD 911.160 and 911.172.

B System configuration meets NCHRP Report 350 TL–3.

C All dimensions are in millimetres unless otherwise shown.

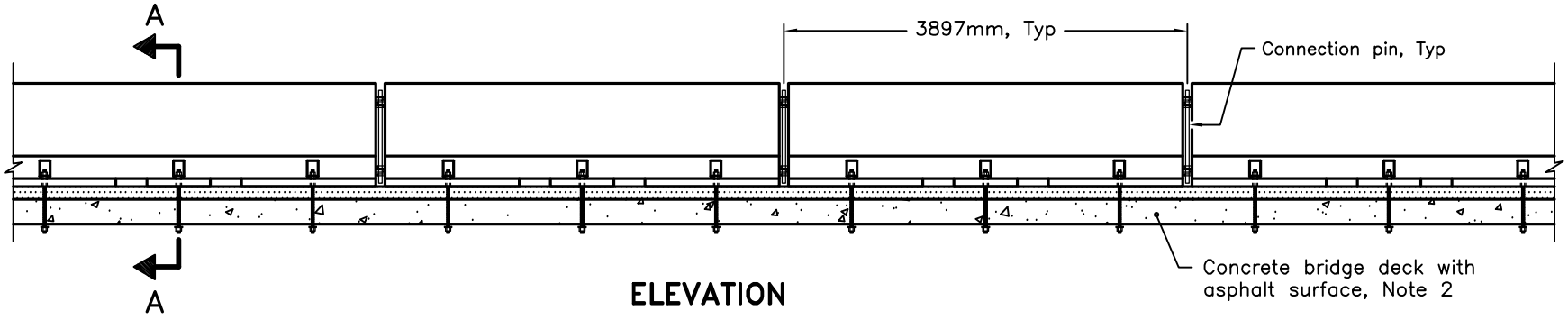
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION
## INSTALLATION – TEMPORARY RESTRAINT SYSTEM BOLTED THROUGH CONCRETE

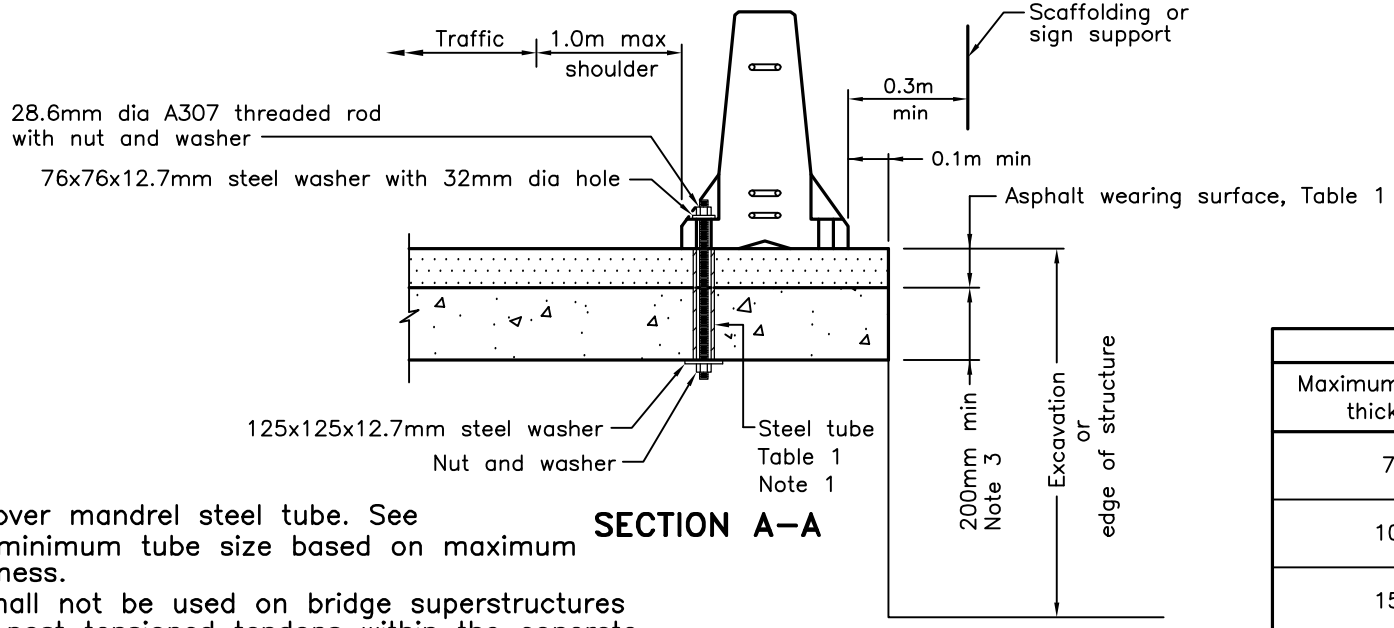
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 911.167




ELEVATION




SECTION A–A

| Table 1 | |
|---|---|
| Maximum asphalt thickness | Steel tube diameter |
| 76 | 73 OD<br>41 ID |
| 100 | 83 OD<br>51 ID |
| 150 | 95 OD<br>64 ID |

NOTES:

1 Cold drawn over mandrel steel tube. See Table 1 for minimum tube size based on maximum asphalt thickness.
2 This OPSD shall not be used on bridge superstructures that contain post tensioned tendons within the concrete deck or bridge superstructures with longitudinally prestressed, transversally post tensioned, solid or voided concrete slab units.
3 Minimum concrete strength shall be 27MPa.

A This OPSD shall be read in conjunction with OPSD 911.160 and 911.172.
B System configuration is equivalent to OPSD 911.167, which meets NCHRP Report 350 TL–3.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

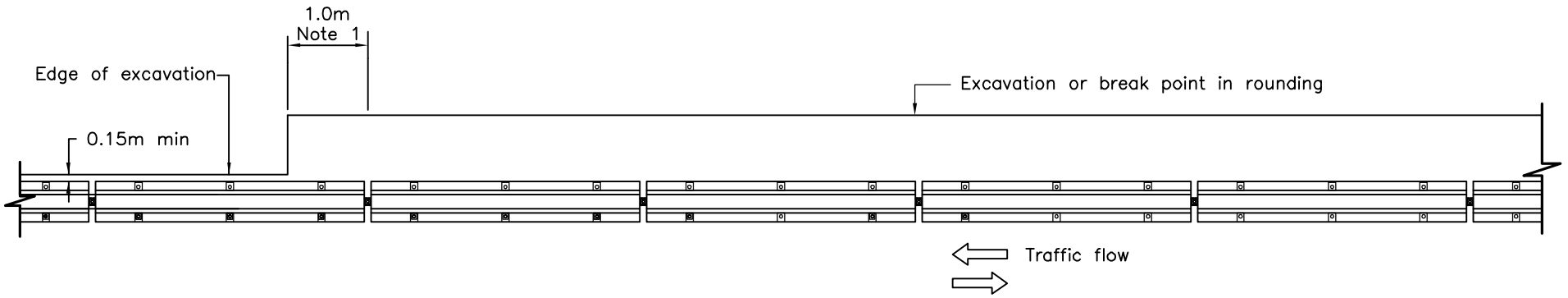
# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION

## INSTALLATION – TEMPORARY RESTRAINT SYSTEM BOLTED THROUGH CONCRETE WITH ASPHALT SURFACE

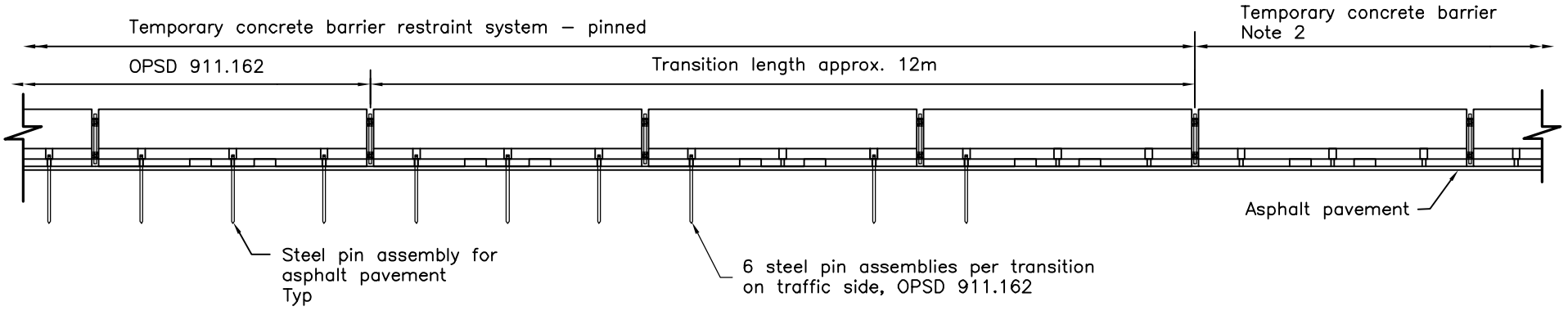
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 911.168




**PLAN**




**ELEVATION**

NOTES:

1 Decreased offset to excavation located minimum 1.0m beyond transition.

2 Type M temporary concrete barrier shown. Transition to another connection type shall be completed according to OPSD 911.340.

A This OPSD shall be read in conjunction with OPSD 911.160 and 911.162.

B System configuration meets NCHRP Report 350 TL–3.

C All dimensions are in millimetres unless otherwise shown.

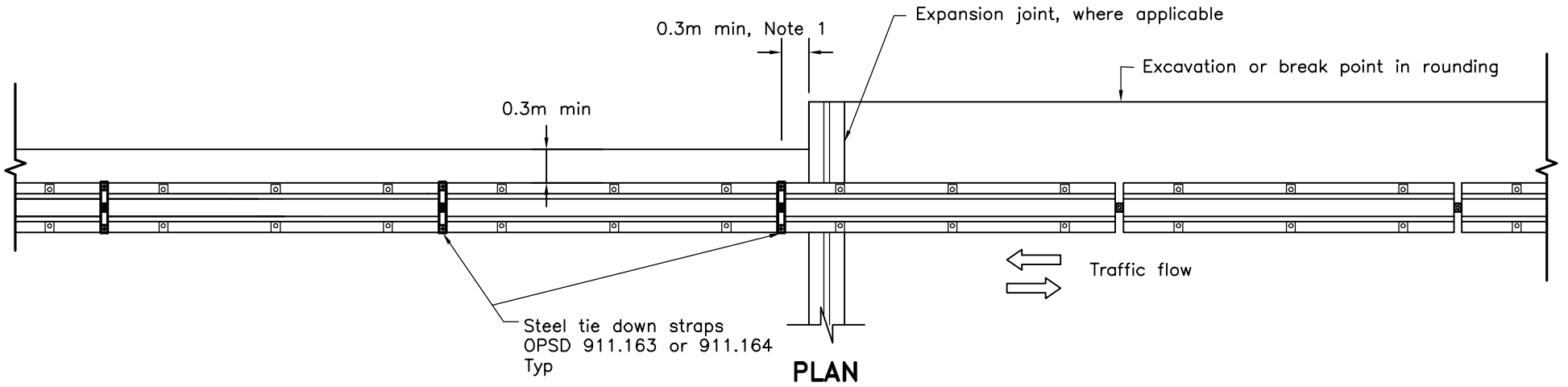
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION
## INSTALLATION – TEMPORARY RESTRAINT SYSTEM TRANSITION TO PINNED TCB

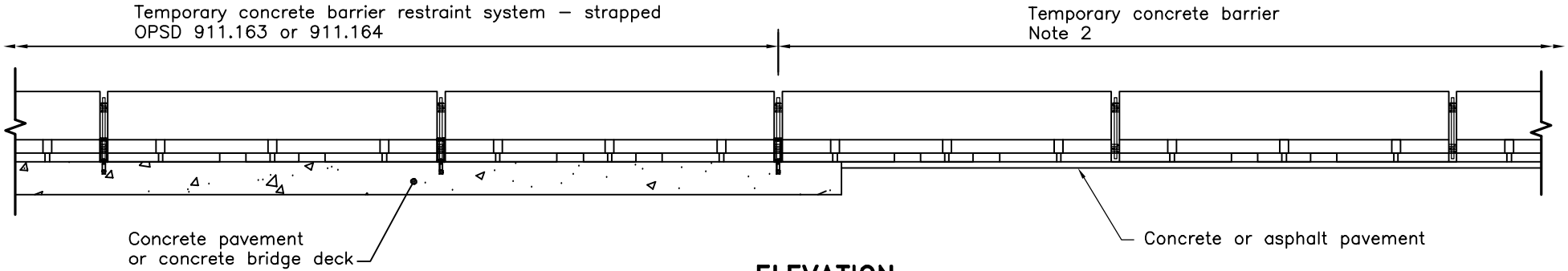
Nov 2014 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 911.170




**PLAN**




**ELEVATION**

NOTES:

1 Bridge deck expansion joint shall be located beyond tie–down strap.

2 Type M temporary concrete barrier shown. Transition to another connection type shall be completed according to OPSD 911.340.

A This OPSD shall be read in conjunction with OPSD 911.160, 911.163, and 911.164.

B System configuration meets NCHRP Report 350 TL–3.

C All dimensions are in millimetres unless otherwise shown.

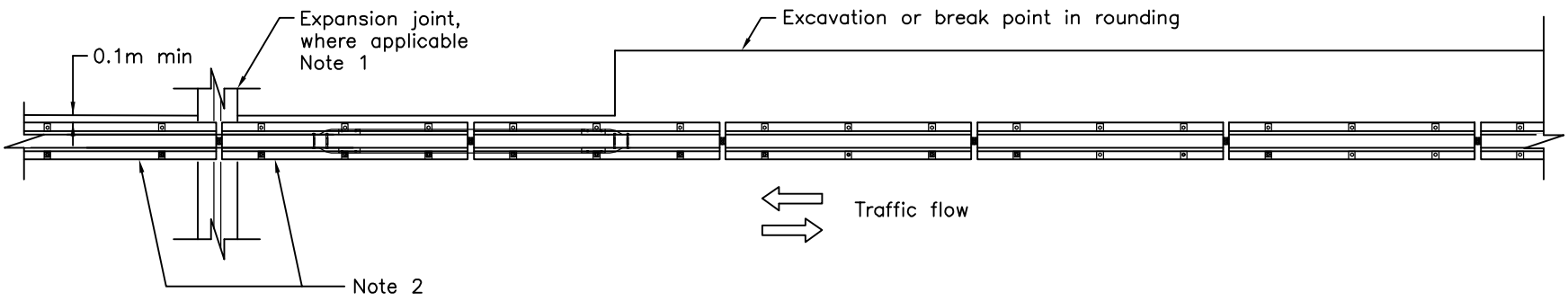
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION
## INSTALLATION – TEMPORARY RESTRAINT SYSTEM TRANSITION TO STRAPPED TCB

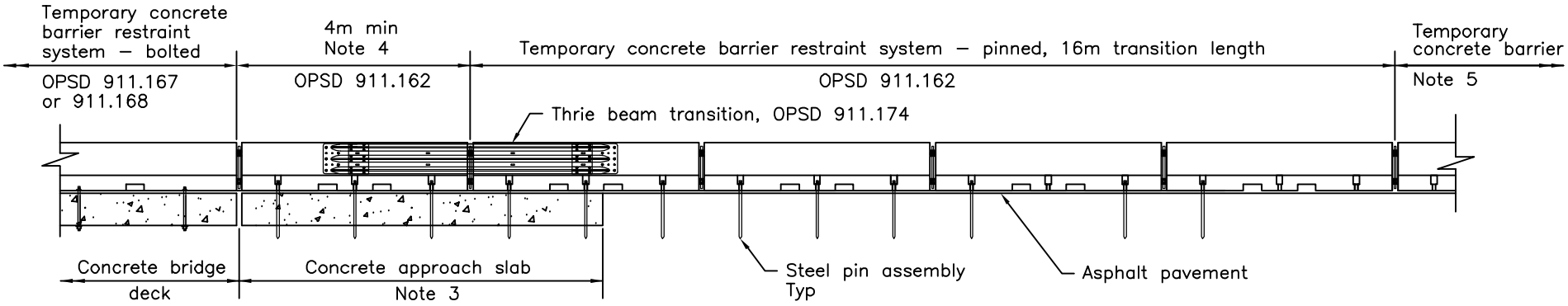
Nov 2014 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 911.171




**PLAN**




**ELEVATION**

NOTES:

1 It is acceptable to omit one anchor bolt within a single barrier if a conflict exists between an anchor location and an expansion joint or deck drain.
2 When the connection of adjacent barrier units does not line up with the expansion joint, a barrier unit crossing the expansion joint shall be anchored with a combination of bolts on the bridge deck and pins on the the approach slab.
3 When the steel pin assembly is to be installed within the limits of the approach slab, drill maximum 45mm diameter holes through the asphalt and concrete approach slab. Holes shall be drilled after the barriers are positioned.
4 Distance measured from end of bridge deck to mid span of thrie beam rail.
5 Type M temporary concrete barrier shown. Transition to another connection type shall be completed according to OPSD 911.340.

A This OPSD shall be read in conjunction with OPSD 911.160, 911.162, 911.167, 911.168, and 911.174.
B System configuration meets NCHRP Report 350, TL–3.
C All dimensions are in millimetres unless otherwise shown.

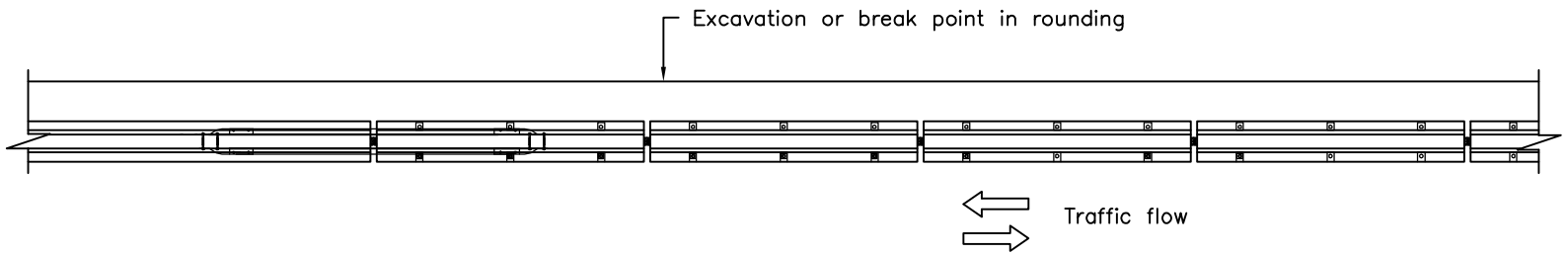
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION
## INSTALLATION – TEMPORARY RESTRAINT SYSTEM TRANSITION TO BOLTED TCB

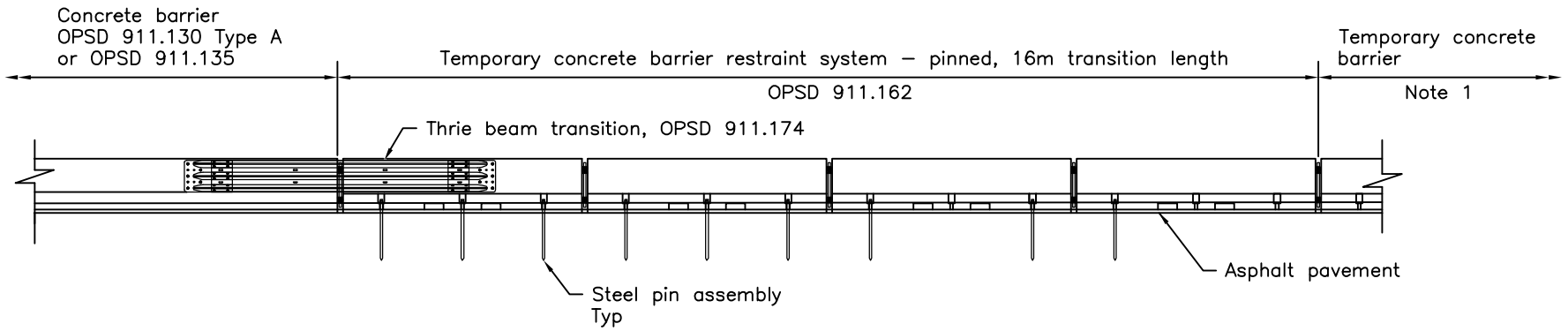
Nov 2014 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · STANDARD

OPSD 911.172




PLAN




ELEVATION

NOTES:

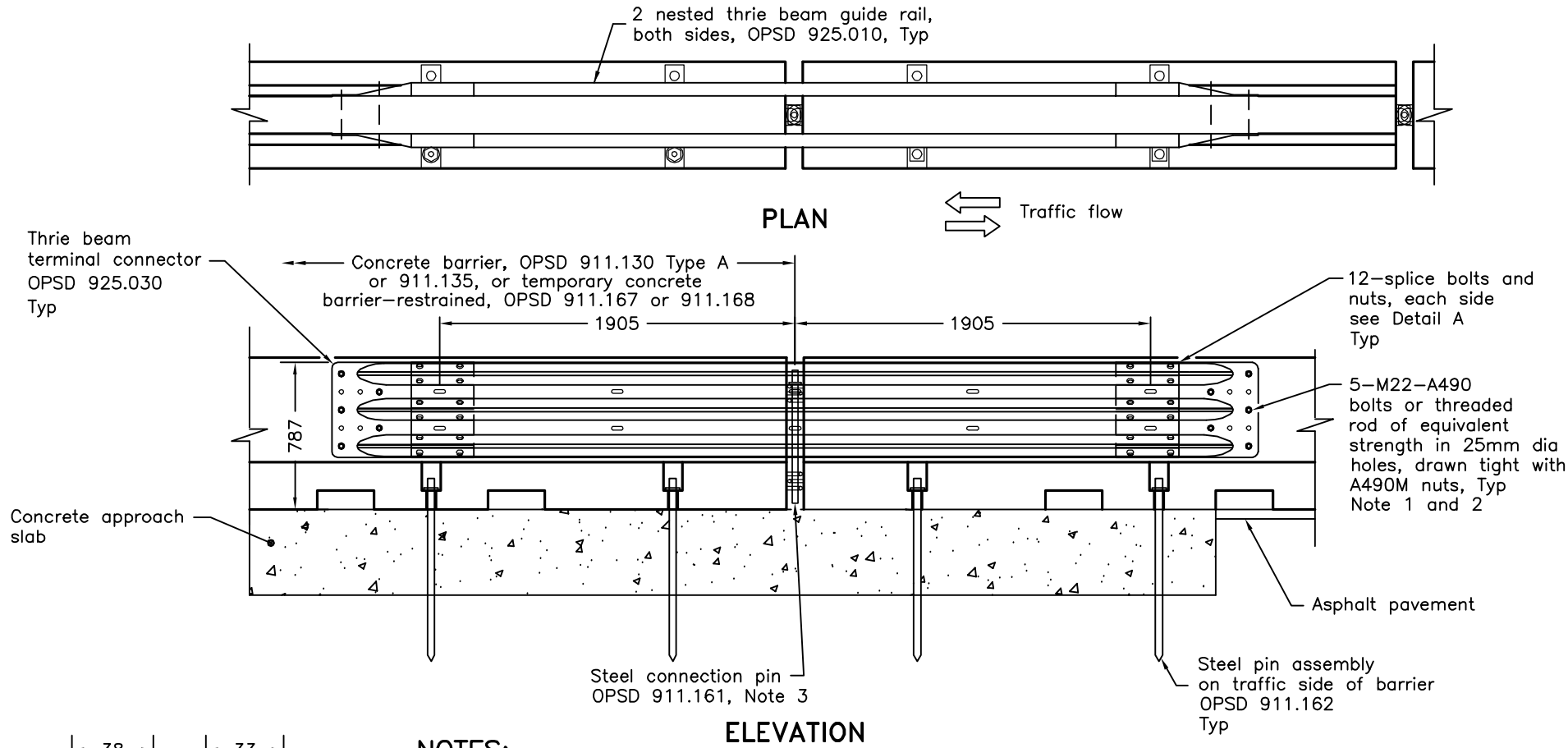
1 Type M temporary concrete barrier shown. Transition to another connection type shall be completed according to OPSD 911.340.

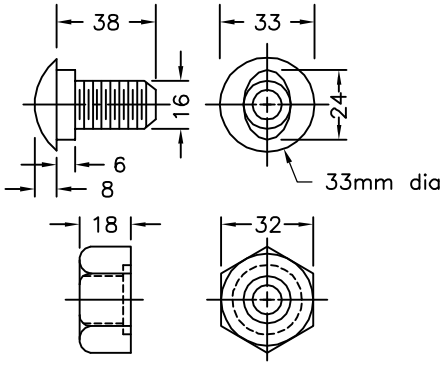
A This OPSD shall be read in conjunction with OPSD 911.160 and 911.162.

B System configuration meets NCHRP Report 350 TL–3.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION INSTALLATION – TEMPORARY RESTRAINT SYSTEM TRANSITION TO PERMANENT CONCRETE BARRIER | | | |
| | OPSD 911.173 | | |



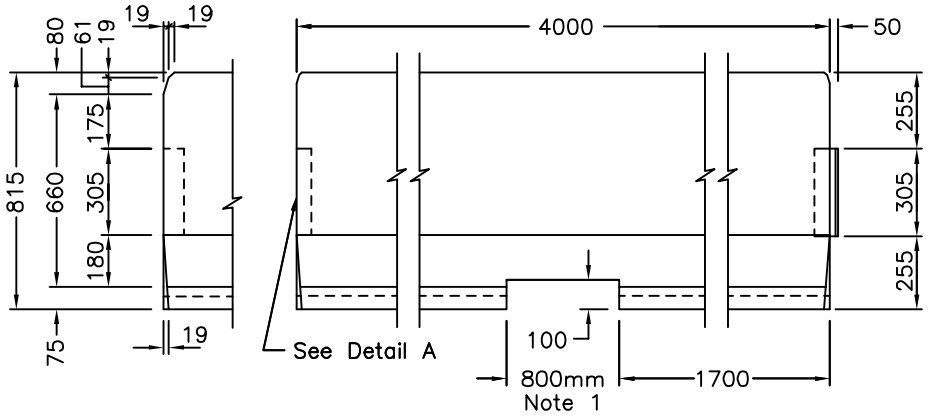




SPLICE BOLT AND NUT
DETAIL A

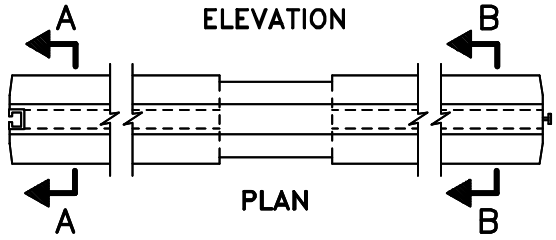
NOTES:

1 Alternative Hilti HIT HY200 with 22mm diameter HAS–E rods or equivalent, 95mm minimum embedment.
2 Exposed bolt or threaded rod end saw–cut flush with face of nut.
3 Steel connection pin not required with OPSD 911.130 or 911.135.
A This OPSD shall be read in conjunction with OPSD 911.160.
B System configuration meets NCHRP Report 350 TL–3.
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE M CONNECTION COMPONENT–THRIE BEAM TRANSITION | | | |
| | | | OPSD 911.174 |

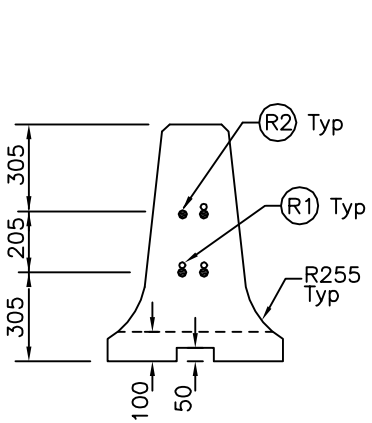



DETAIL A

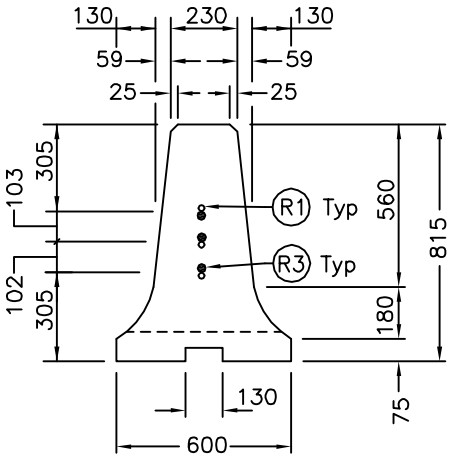



ELEVATION

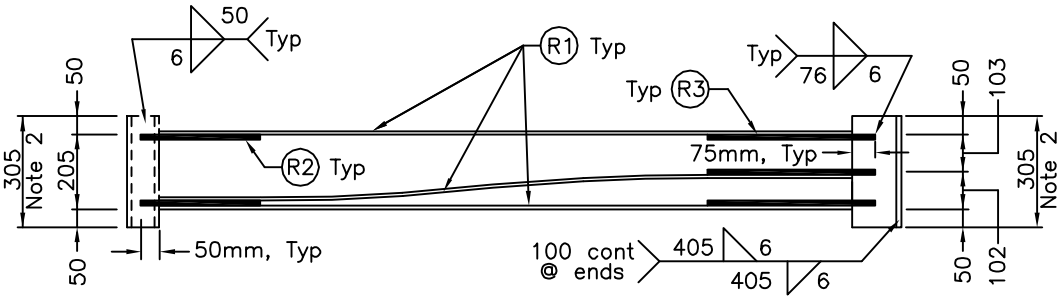
PLAN



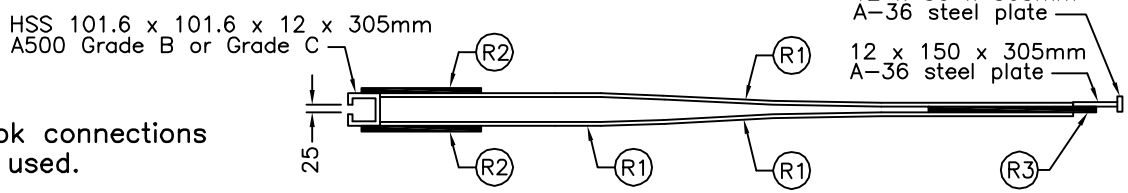

SECTION A–A




SECTION B–B




ELEVATION




PLAN

STEEL DETAILS

| REINFORCING STEEL BARS | | | | | |
|---|---|---|---|---|---|
| BAR | SIZE | GRADE | TYPE | LENGTH | NO. REQ'D |
| R1 | 15M | 400W | Deformed | 3898 | 3 |
| R2 | 20M | 400W | Deformed | 610 | 4 |
| R3 | 20M | 400W | Deformed | 915 | 3 |

NOTES:

1 Drainage opening.

2 Type T connections with 610mm long T–Lok connections manufactured before March 2010 may be used.

A Minimum horizontal radius shall be 26m.

B T–Lok connection is proprietary to Rockingham Precast.

C System configuration meets NCHRP Report 350 TL–3 and AASHTO MASH TL–3.

D Concrete cover 50mm minimum.

E All concrete edges shall have 15x45° chamfers.

F Welds shall be according to CSA W59.

G All dimensions are in millimetres unless otherwise shown.

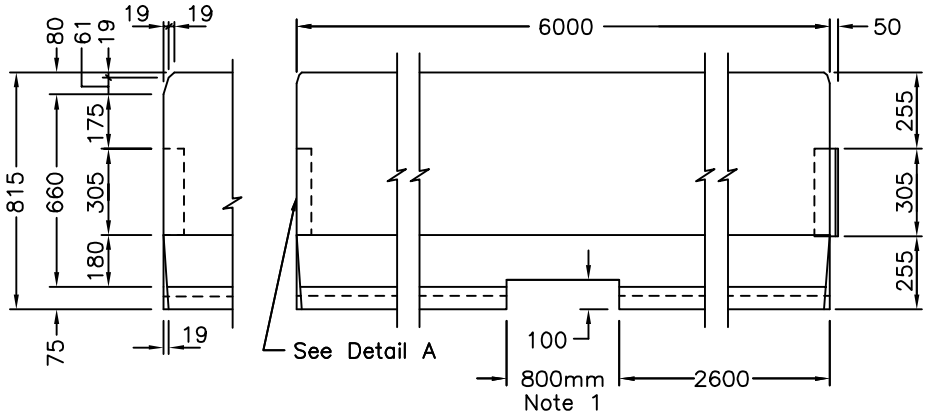
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE T CONNECTION, 4.0m LENGTH INSTALLATION–TEMPORARY

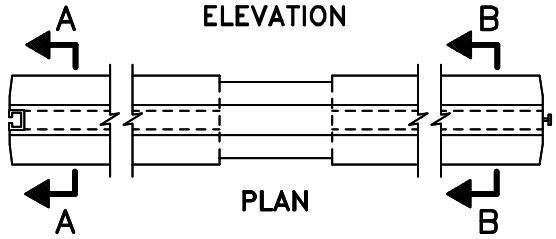
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · STANDARD

OPSD 911.180

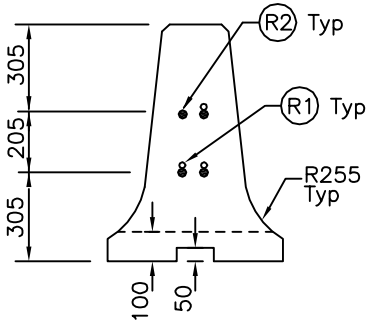



DETAIL A

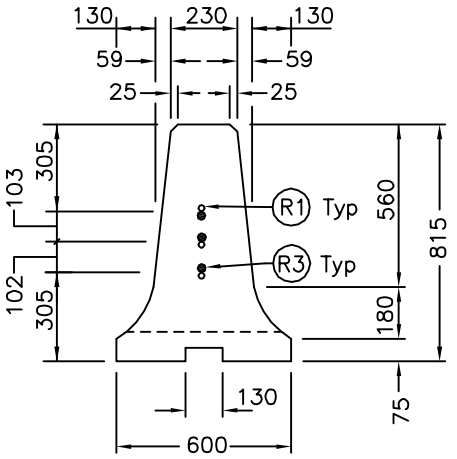



ELEVATION

PLAN

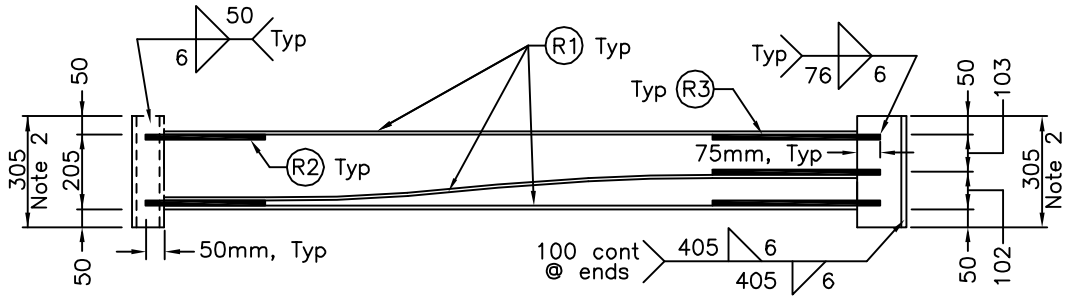



SECTION A–A

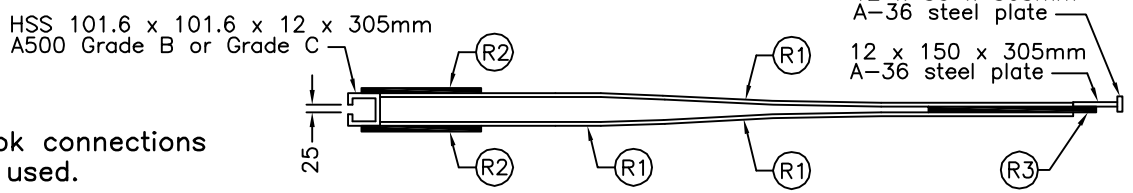



SECTION B–B

| REINFORCING STEEL BARS | | | | | |
|---|---|---|---|---|---|
| BAR | SIZE | GRADE | TYPE | LENGTH | NO. REQ'D |
| R1 | 15M | 400W | Deformed | 5898 | 3 |
| R2 | 20M | 400W | Deformed | 610 | 4 |
| R3 | 20M | 400W | Deformed | 915 | 3 |




ELEVATION




PLAN

STEEL DETAILS

NOTES:

1 Drainage opening.
2 Type T connections with 610mm long T–Lok connections manufactured before March 2010 may be used.
A Minimum horizontal radius shall be 39m.
B T–Lok connection is proprietary to Rockingham Precast.
C System configuration meets NCHRP Report 350 TL–3 and AASHTO MASH TL–3.
D Concrete cover 50mm minimum.
E All concrete edges shall have 15x45° chamfers.
F Welds shall be according to CSA W59.
G All dimensions are in millimetres unless otherwise shown.

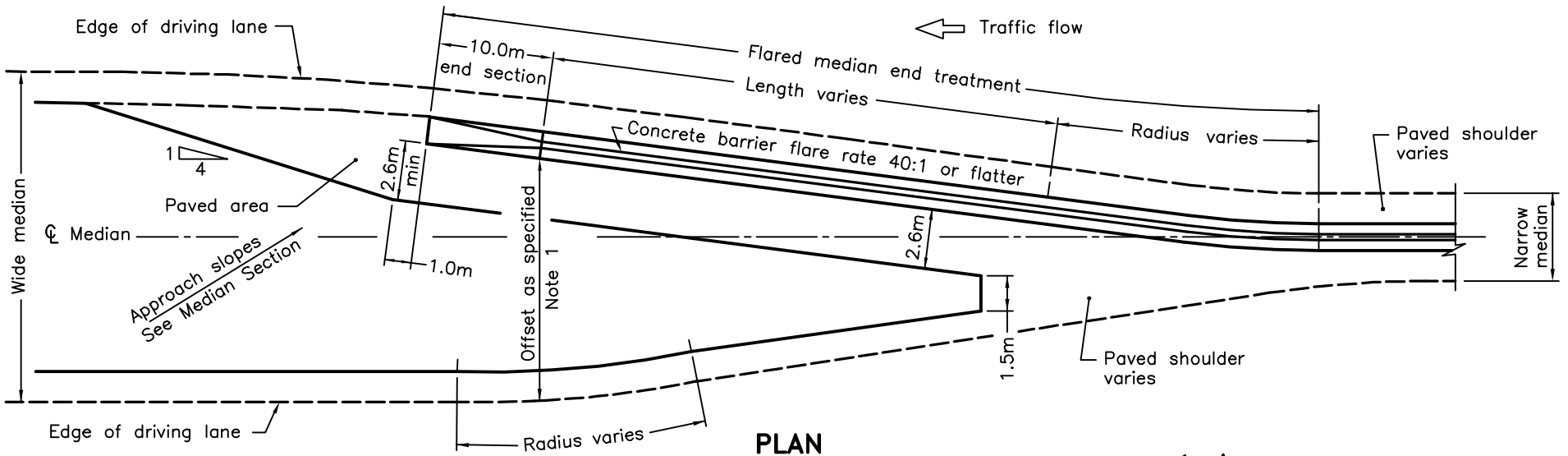
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TYPE T CONNECTION, 6.0m LENGTH INSTALLATION–TEMPORARY

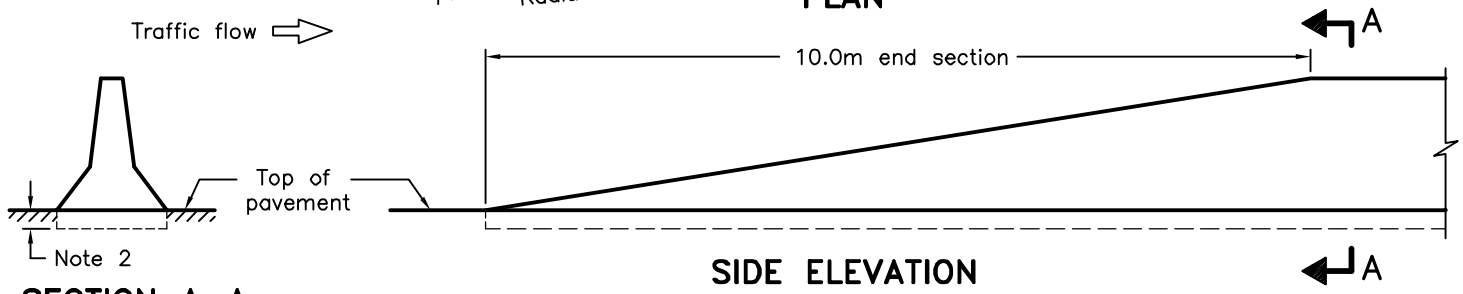
Nov 2013 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 911.181

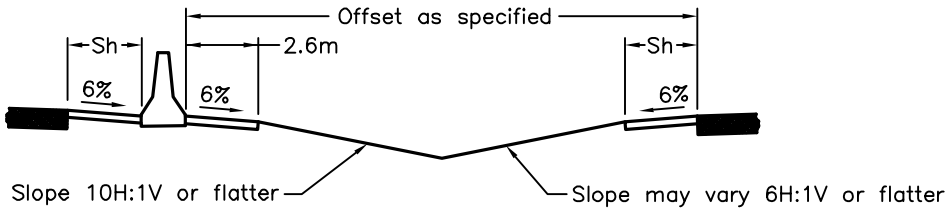



**PLAN**




**SECTION A–A**

**SIDE ELEVATION**




**MEDIAN SECTION**

NOTES:

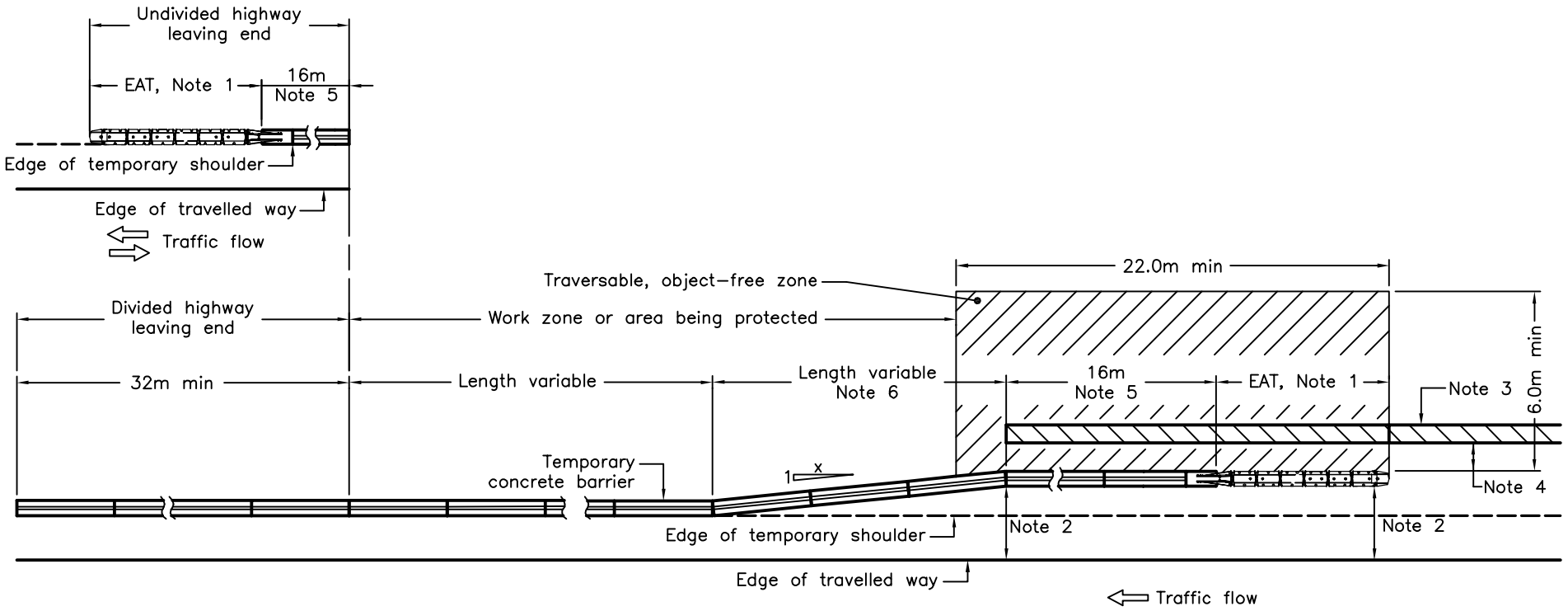
1 Where minimum clearance cannot be obtained, an approved end treatment or energy attenuator shall be installed.

2 Embedment shall be 75mm into adjacent pavement.

A This OPSD shall be read in conjunction with OPSD 911.130, 911.131, and 911.132.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| **GUIDE RAIL SYSTEM, CONCRETE BARRIER MEDIAN END TREATMENT INSTALLATION** | | | |
| | | | **OPSD 911.230** |




**PLAN**

NOTES:

1 EAT–RE or EAT–NA shall be used. EAT–RE shown. Energy attenuator shall be placed on an appropriate surface according to the manufacturer's recommendations and Contract Documents.

2 Offset to energy attenuator from edge of travelled way shall not be less than 2.0m for EAT–RE or 0.5m for EAT–NA.

3 At locations where existing concrete barrier or steel beam guide rail is present, the existing barrier shall extend a minimum of 16m beyond the energy attenuator.

4 When EAT–RE is placed adjacent to existing barrier, clearance shall be ≤0.3m or ≥3.0m; otherwise, a traversable object–free zone shall be provided.

5 First 16m shall be placed parallel to energy attenuator.

6 Length of transition governed by flare rate.

A Roadside installation shown. For median application, use a mirror image.

B All dimensions are in millimetres unless otherwise shown.

| Flare Rate | |
|---|---|
| Posted Speed km/h | X:1 |
| ≥ 70 | 10 |
| < 70 | 6 |

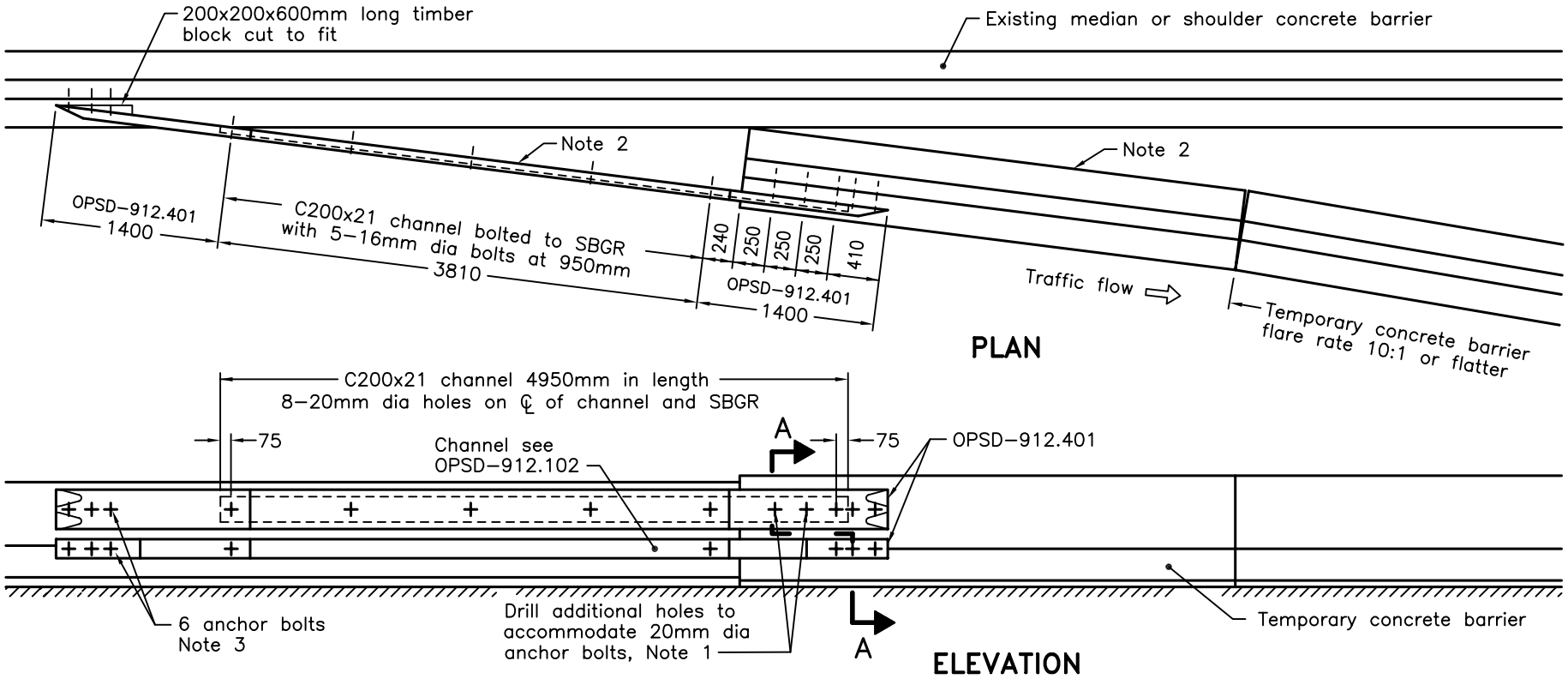
ONTARIO PROVINCIAL STANDARD DRAWING

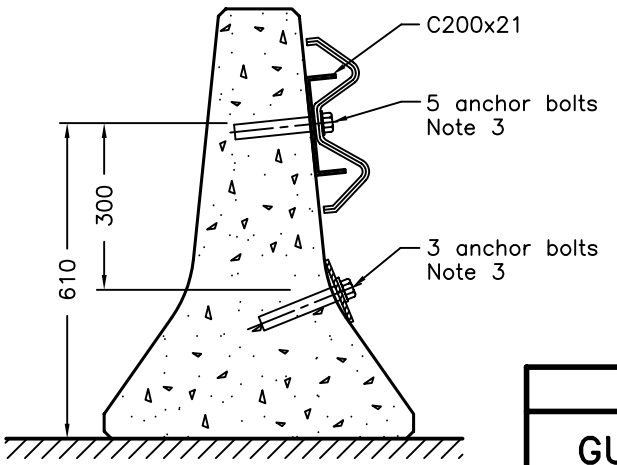
# GUIDE RAIL SYSTEM, CONCRETE BARRIER ENERGY ATTENUATOR INSTALLATION – TEMPORARY

Nov 2014 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 911.232




NOTES:

1 OPSD–912.401 rail connections shall consist of double SBGR panels. Additional holes may be field drilled.

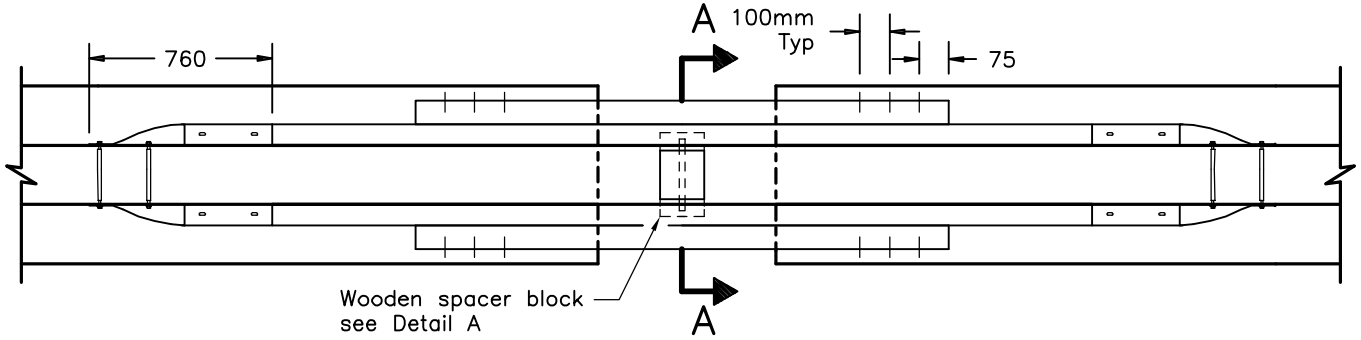
2 Flare rate of temporary transition rail and first temporary concrete barrier unit shall be 12:1 or flatter.

3 20mm dia removable anchor bolts each with an ultimate pullout value of 100kN in 30MPa concrete.

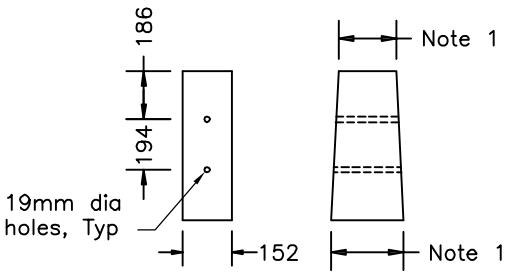
A When transitioning from a curb section onto a lower surface the temporary concrete barrier shall be supported to attain a grade of 10% or flatter.

B All dimensions are in millimetres unless otherwise shown.

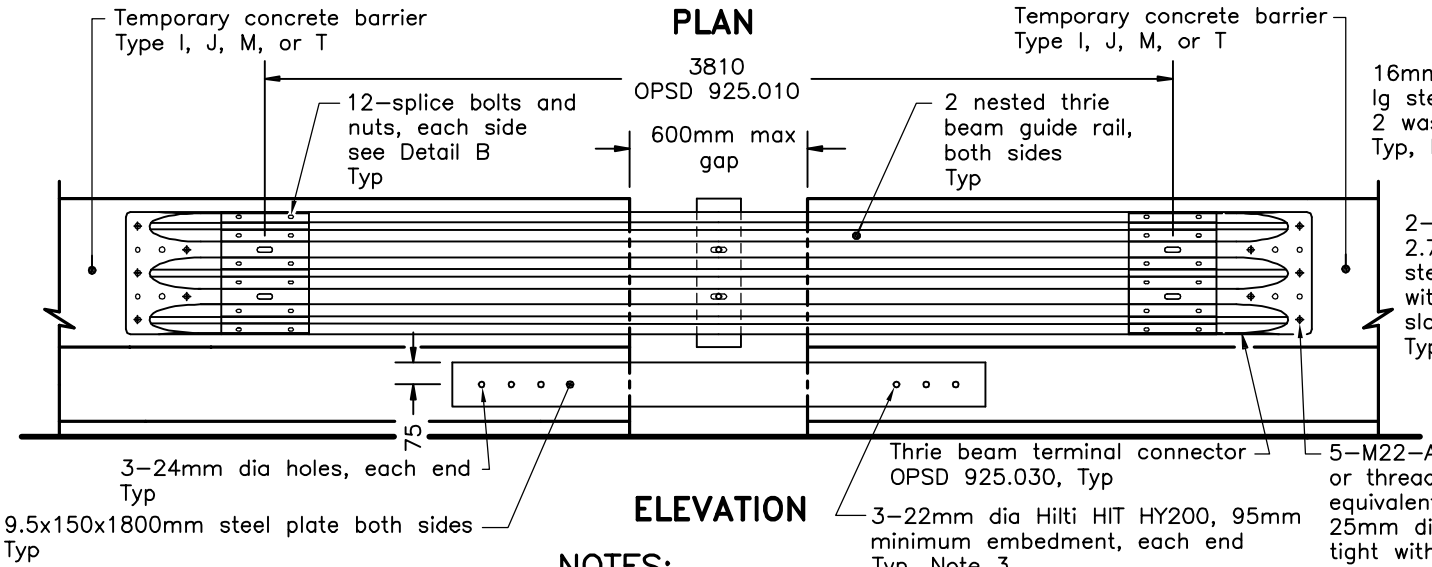
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2001 | Rev | 0 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER TEMPORARY TRANSITION INSTALLATION–RAIL METHOD CONCRETE BARRIER TO TEMPORARY CONCRETE BARRIER | | | |
| | OPSD – 911.330 | | |



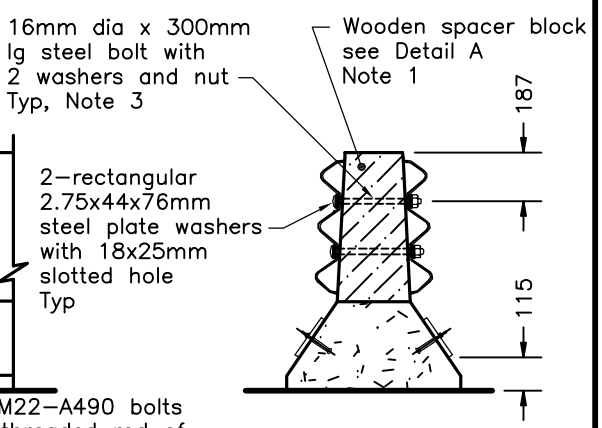

PLAN




WOODEN SPACER BLOCK
DETAIL A



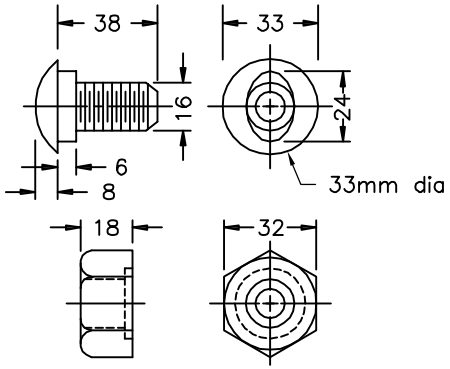

ELEVATION




SECTION A–A

NOTES:

1 Top and bottom of wooden spacer block cut shall match profile of adjacent temporary concrete barriers.
2 Alternative Hilti HIT HY200 with 22mm diameter HAS–E rods or equivalent, 95mm minimum embedment.
3 Exposed bolt or threaded rod end saw–cut flush with face of nut. Flame cutting is not permitted.
A Minimum length of 32m of temporary concrete barrier on both sides of transition.
B All dimensions are in millimetres unless otherwise shown.



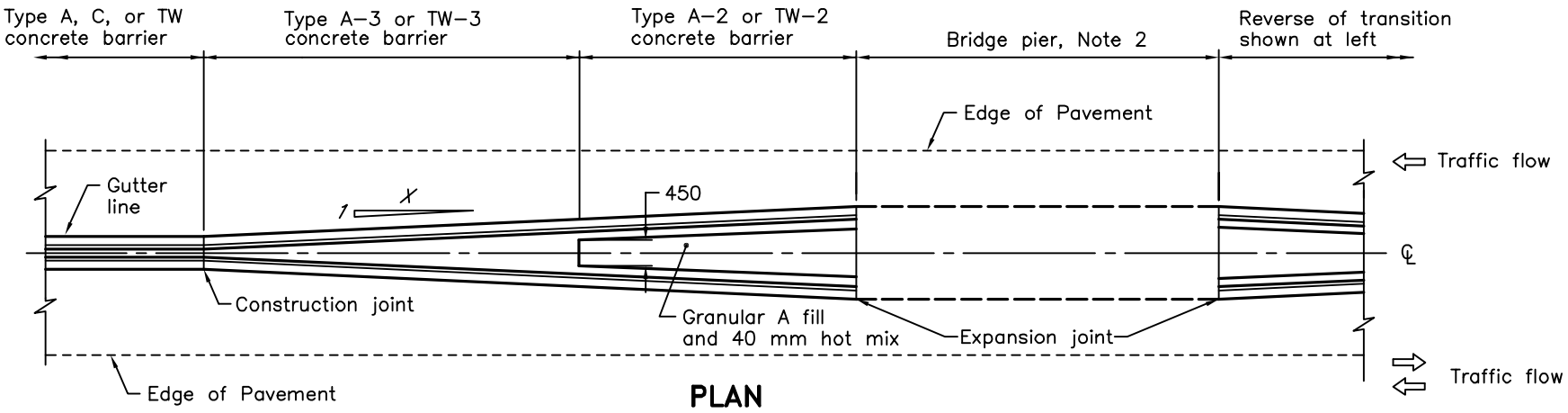

SPLICE BOLT AND NUT
DETAIL B

ONTARIO PROVINCIAL STANDARD DRAWING

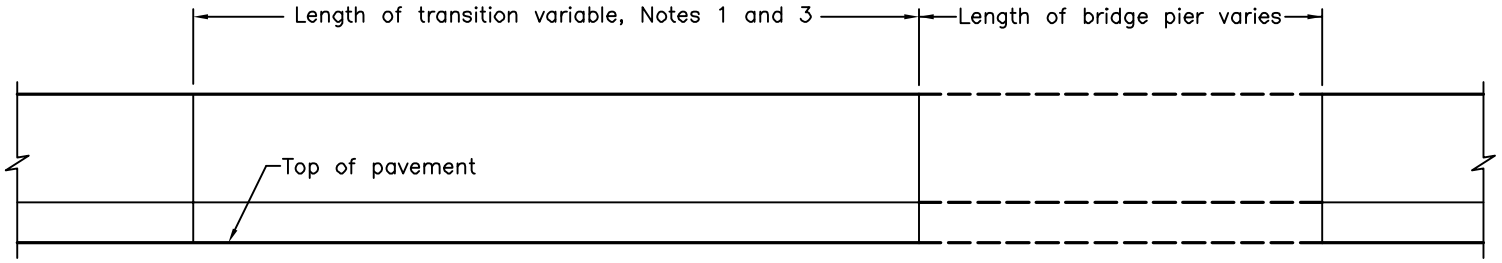
Nov 2013 | Rev 0

GUIDE RAIL SYSTEM, CONCRETE BARRIER
TEMPORARY CONCRETE BARRIER TRANSITION
INSTALLATION – TEMPORARY

OPSD 911.340




**PLAN**




**ELEVATION**

| TABLE 1 | |
|---|---|
| Flare | |
| POSTED SPEED km/h | X |
| 100 | 32 |
| 90 | 30 |
| 80 | 26 |
| 70 | 24 |
| 60 | 21 |
| 50 | 18 |

NOTES:

1 Transition length governed by flare rate and width of barrier at bridge pier according to Table 1 or as specified.

2 Length governed by bridge pier configuration. Concrete barrier and expansion joint details as specified.

3 Transition shall be one piece construction. No portion of the transition shall be slipformed.

A This OPSD shall be read in conjunction with OPSD 911.130, 911.131, and 911.132.

B All dimensions are in millimetres unless otherwise shown.

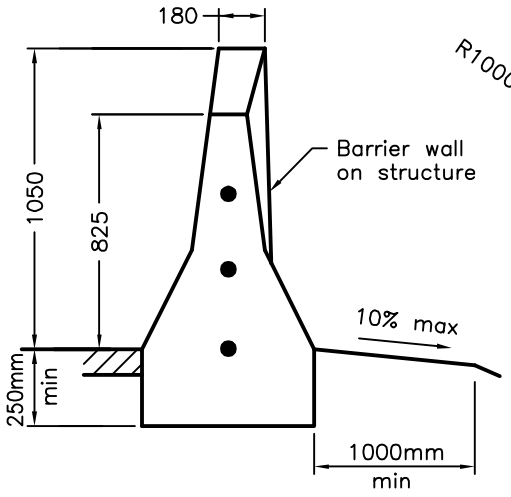
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER PERMANENT TRANSITION INSTALLATION AT BRIDGE PIERS

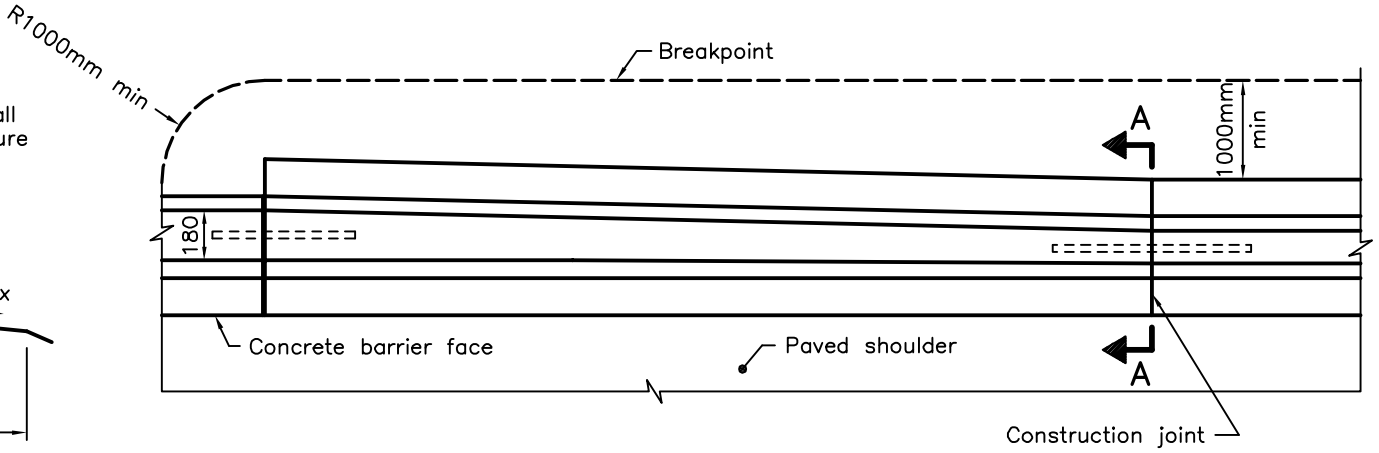
Nov 2015 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

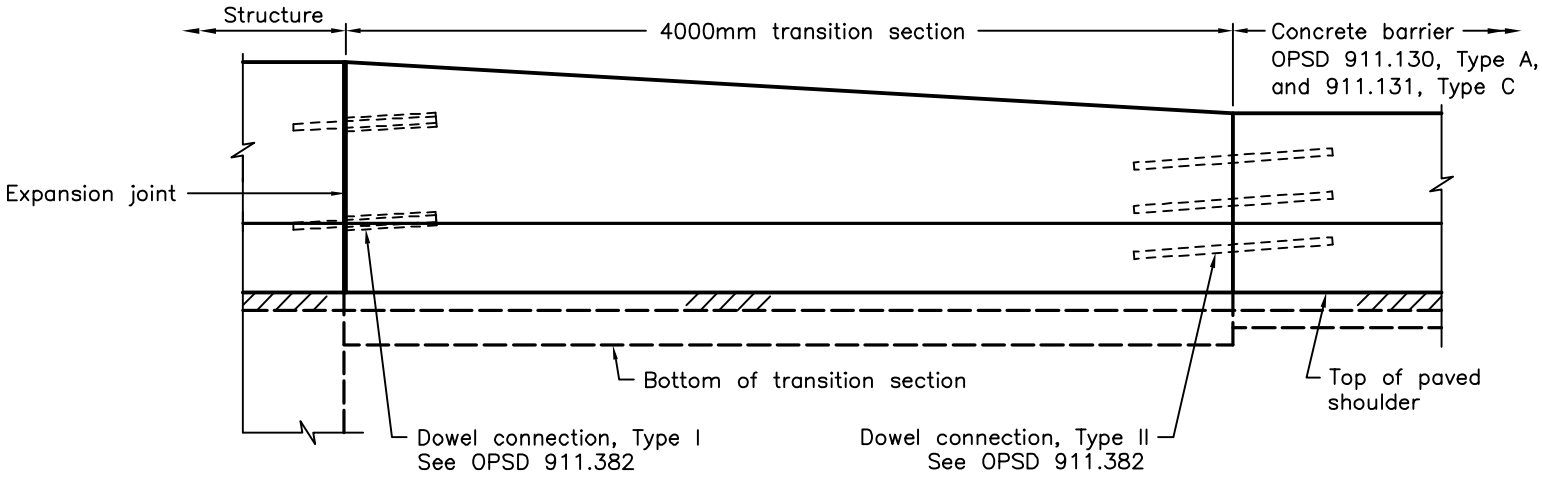
OPSD 911.380




SECTION A–A




PLAN




ELEVATION

NOTES:

A All dimensions are in millimetres unless otherwise shown.

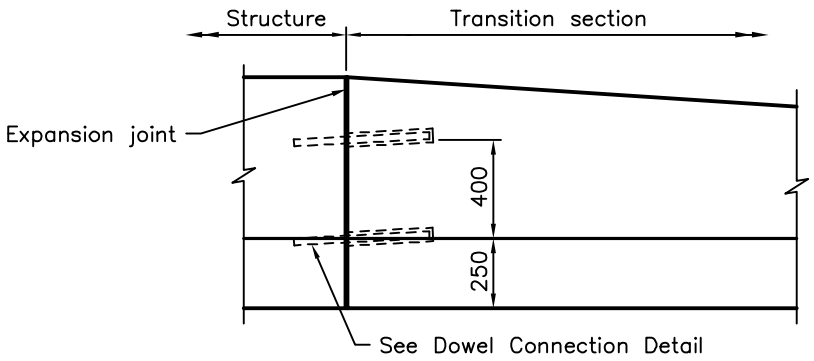
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER PERMANENT TRANSITION INSTALLATION ROADSIDE CONCRETE BARRIER TO STRUCTURE

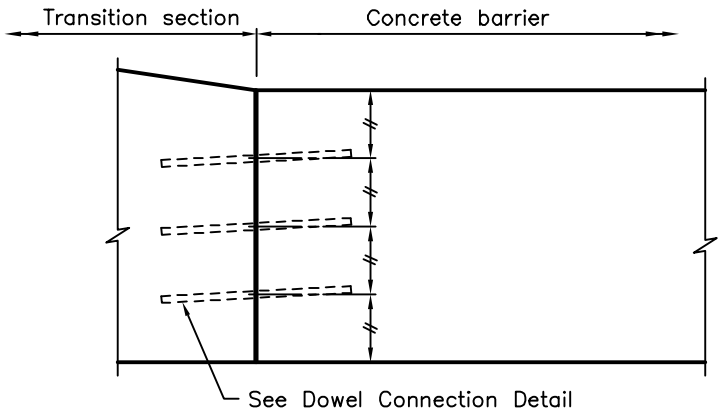
Nov 2015 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

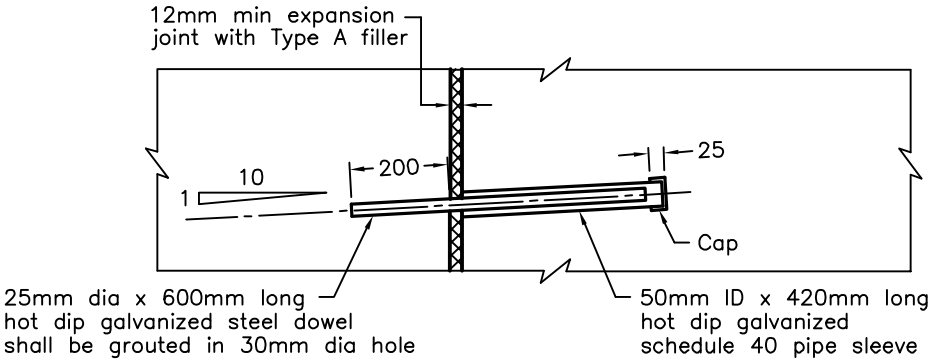
OPSD 911.381



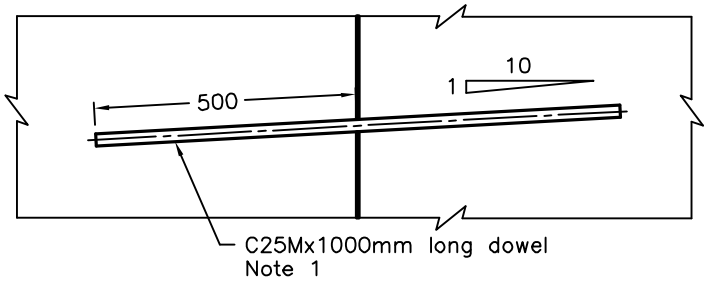

## DOWEL CONNECTION WITH EXPANSION JOINT
## TYPE I




## DOWEL CONNECTION WITHOUT EXPANSION JOINT
## TYPE II




## DOWEL CONNECTION DETAIL
## TYPE I




## DOWEL CONNECTION DETAIL
## TYPE II

NOTES:

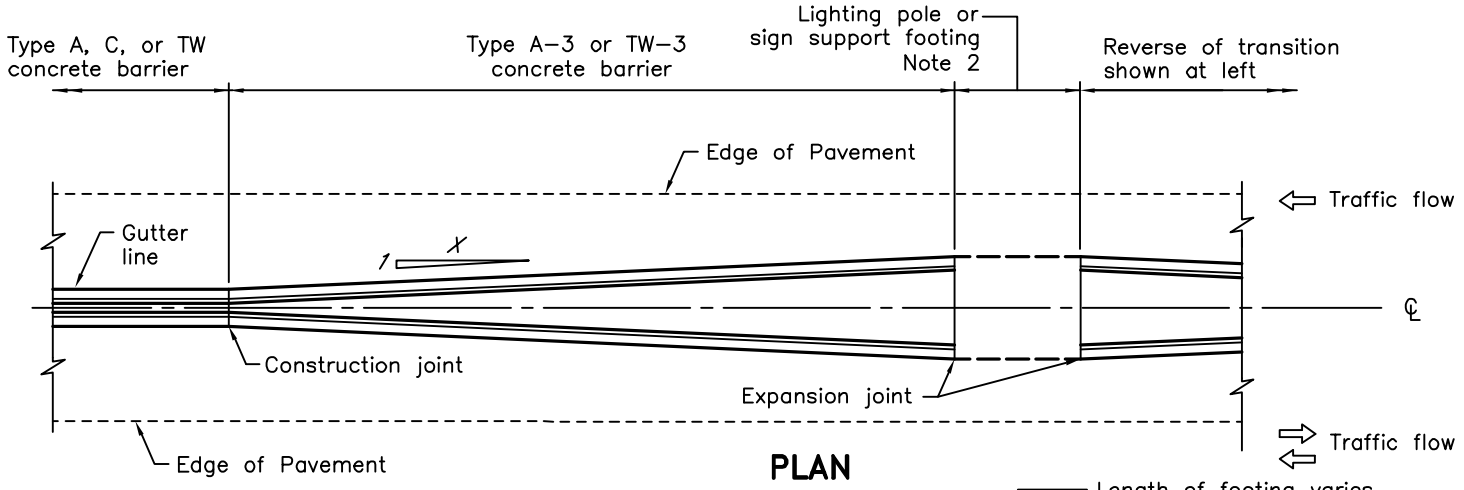
1 Dowel shall be placed along centreline of transition section.

A This OPSD shall be read in conjunction with OPSD 911.381.

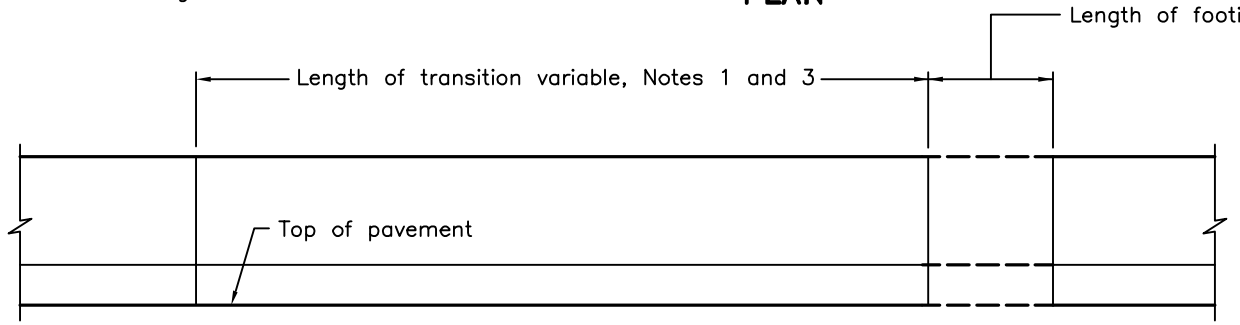
B All dowels shall be hot dip galvanized according to ASTM A123.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CONCRETE BARRIER<br>DOWEL CONNECTION DETAIL | | | |
| | OPSD 911.382 | | |




**PLAN**




**ELEVATION**

| TABLE 1 | |
|---|---|
| Flare | |
| POSTED SPEED km/h | X |
| 100 | 32 |
| 90 | 30 |
| 80 | 26 |
| 70 | 24 |
| 60 | 21 |
| 50 | 18 |

NOTES:

1 Transition length governed by flare rate and width of footing according to Table 1 or as specified.

2 Length governed by lighting pole or sign support footing. Concrete barrier and expansion joint details as specified.

3 Transition shall be one piece construction. No portion of the transition shall be slipformed.

A This OPSD shall be read in conjunction with OPSD 911.130, 911.131, and 911.132.

B All dimensions are in millimetres unless otherwise shown.

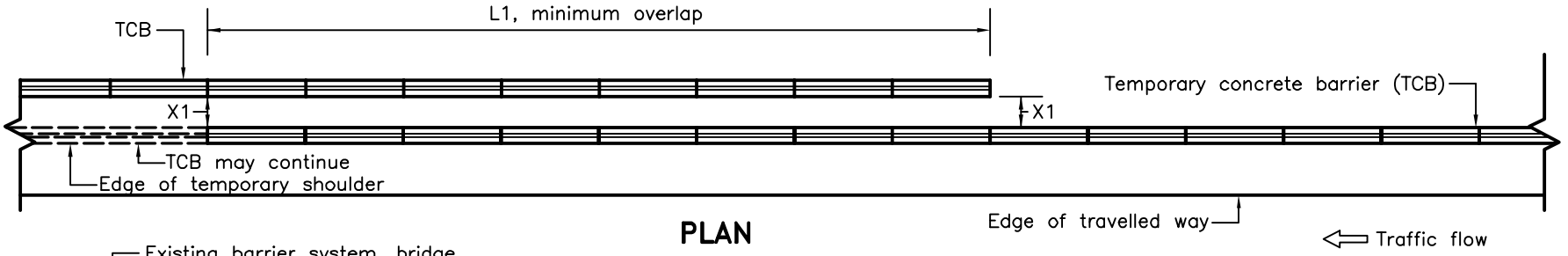
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER PERMANENT TRANSITION INSTALLATION AT LIGHTING POLE AND SIGN SUPPORT FOOTINGS

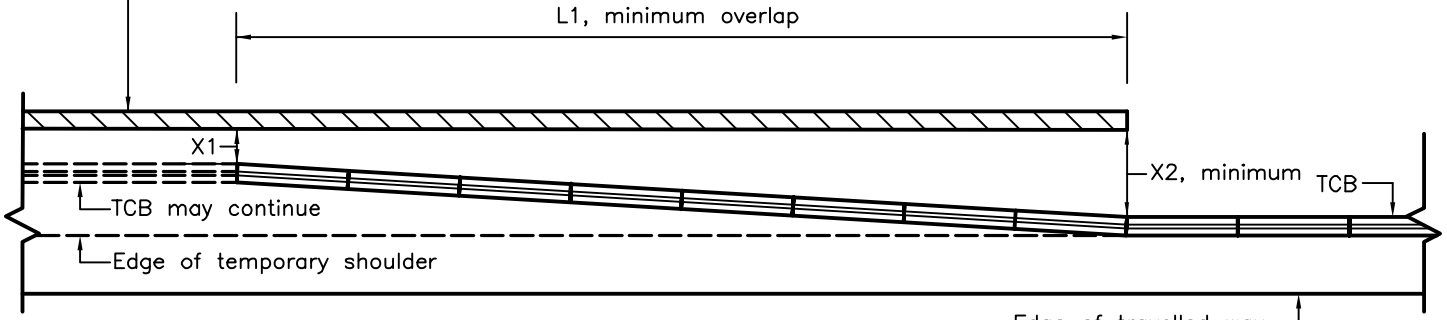
Nov 2015 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 911.383

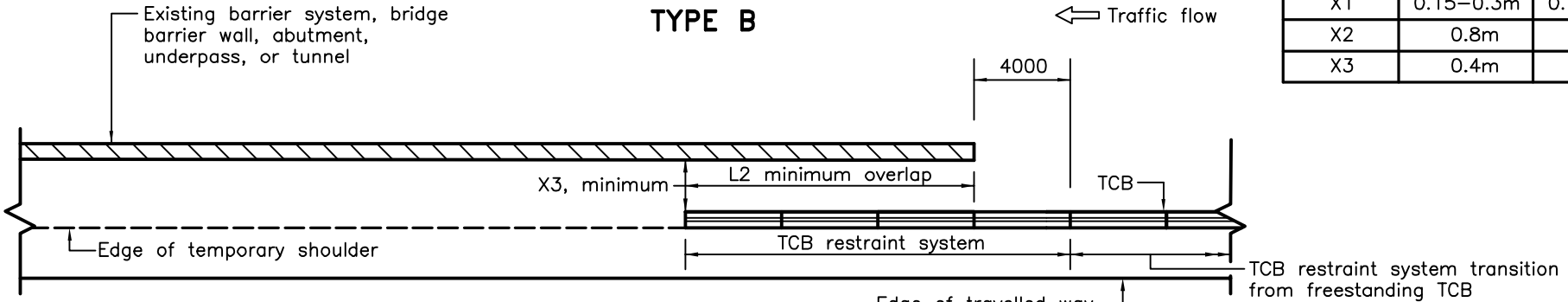



**PLAN**
**TYPE A**




**PLAN**
**TYPE B**

| Dimension | Posted Speed (km/h) | |
|---|---|---|
| | < 70 | ≥ 70 |
| L1 | 20m | 32m |
| L2 | 12m | 16m |
| X1 | 0.15–0.3m | 0.15–0.3m |
| X2 | 0.8m | 1.5m |
| X3 | 0.4m | 0.6m |




**PLAN**
**TYPE C**

NOTES:

A Roadside installation shown. For median application, use a mirror image.

B All dimensions are in millimetres unless otherwise shown.

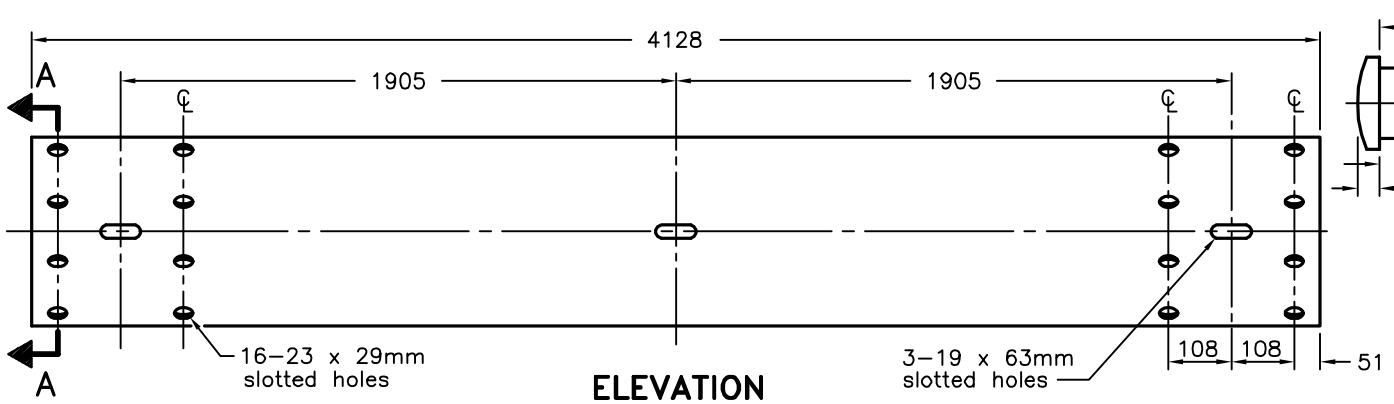
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, CONCRETE BARRIER TEMPORARY – LEAVING END TREATMENT INSTALLATION – DIVIDED HIGHWAY

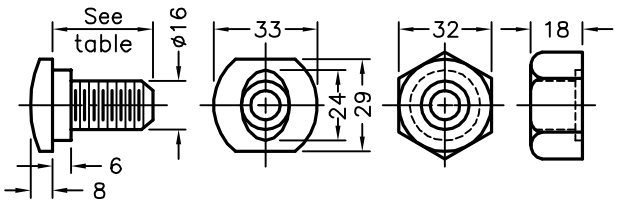
Nov 2015 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

**OPSD 911.430**

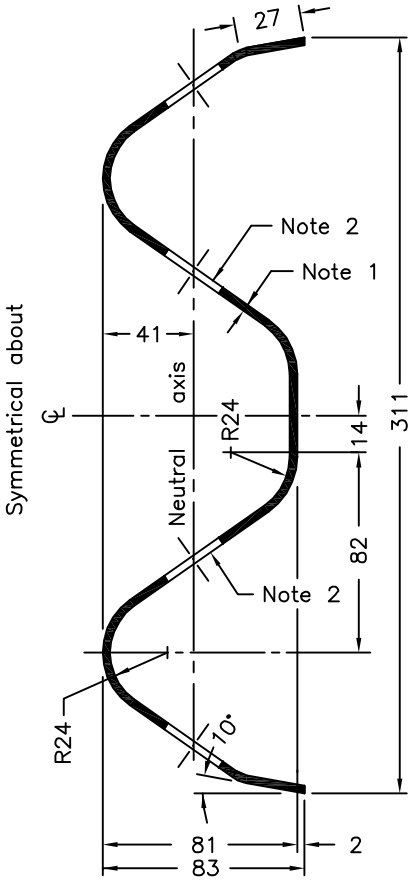



ELEVATION

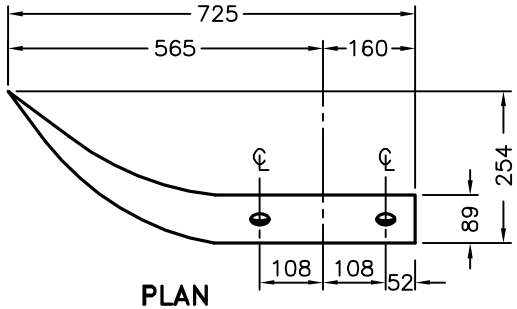



SPLICE BOLT AND NUT

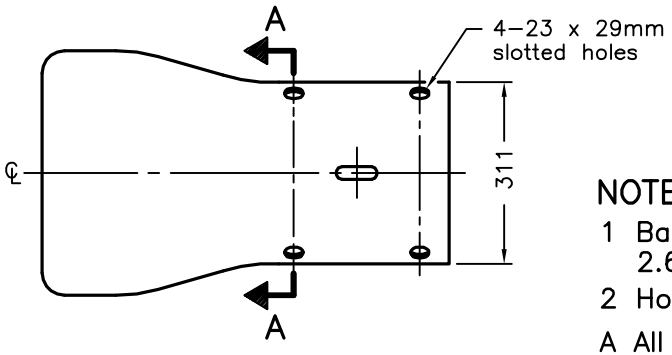
| SPLICE BOLT LENGTH | |
|---|---|
| LOCATION | LENGTH |
| At posts | 32 |
| At structure anchor | 38 |



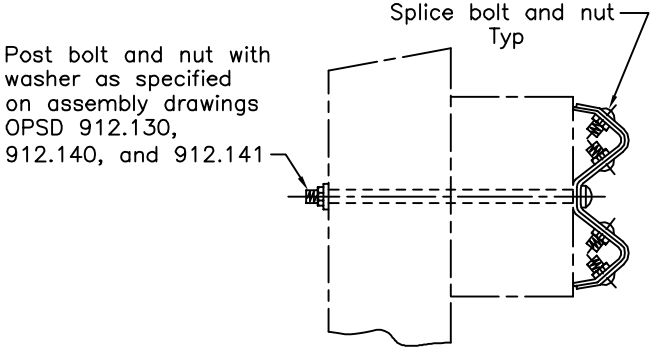

ENLARGED SECTION A–A




PLAN




ELEVATION
TERMINAL SECTION




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.

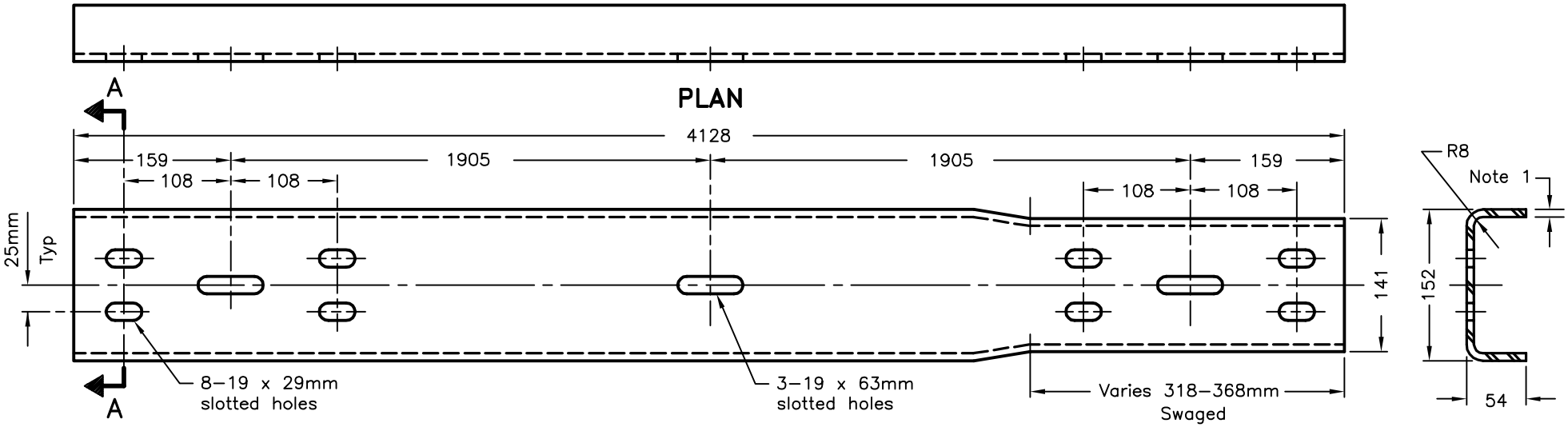
B All dimensions are in millimetres unless otherwise shown.

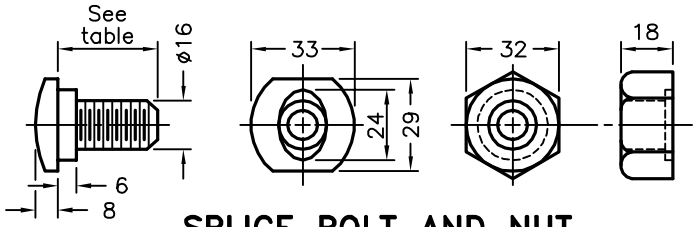
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 | Rev 2

# GUIDE RAIL SYSTEM, STEEL BEAM
# RAIL
# COMPONENT

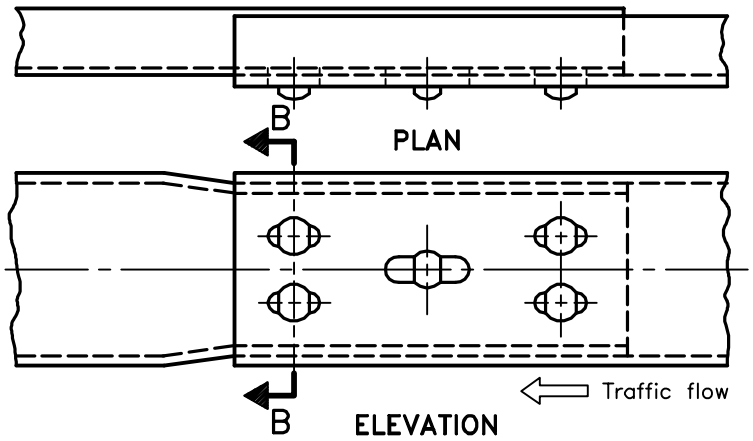
OPSD 912.101



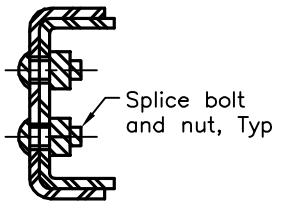




SPLICE BOLT AND NUT

| SPLICE BOLT LENGTH | |
|---|---|
| LOCATION | LENGTH |
| At posts | 32 |
| At structures | 64 |




OVERLAP DETAIL




SECTION B–B

NOTES:

1 Base metal thickness of channel shall be 4.0mm nominal and 3.8mm minimum.

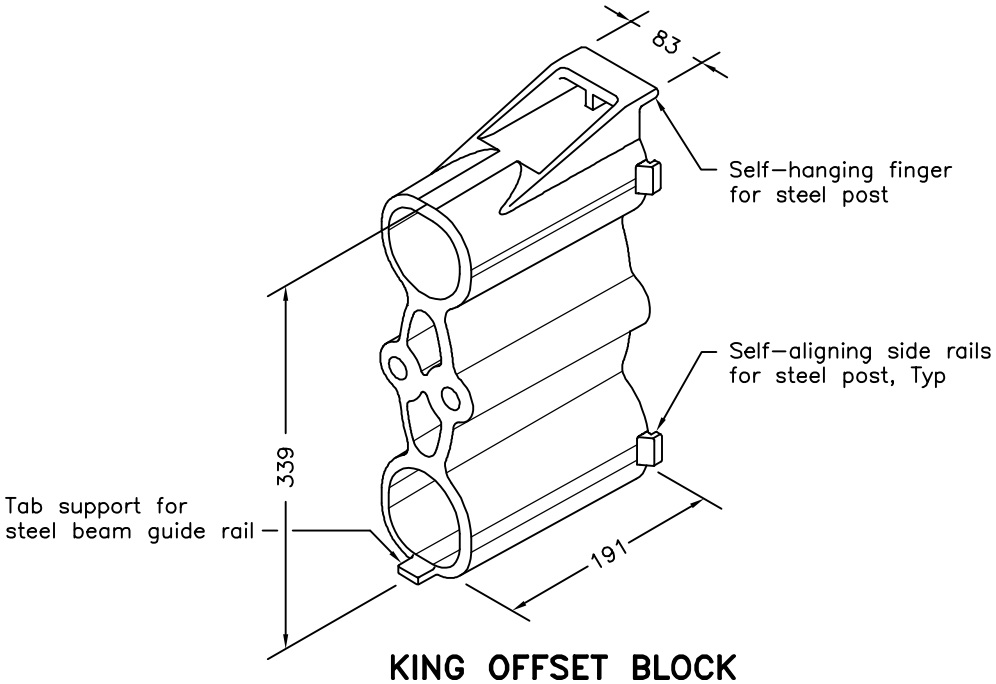
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

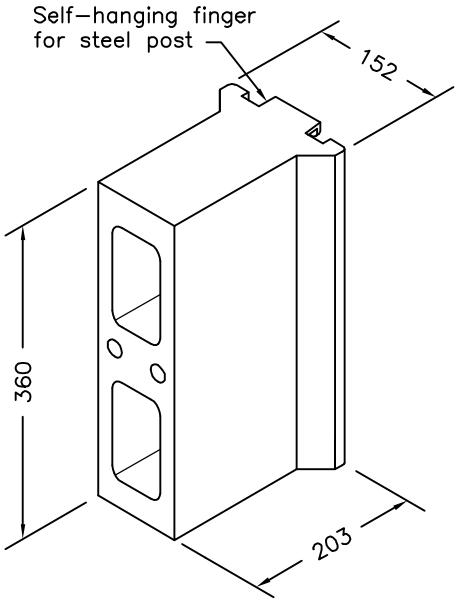
# GUIDE RAIL SYSTEM, STEEL BEAM CHANNEL COMPONENT

Nov 2010 | Rev 1

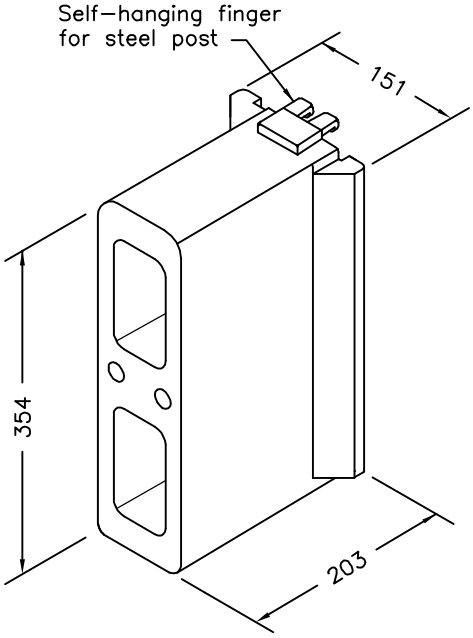
OPSD 912.102




**KING OFFSET BLOCK**
**NOTE 1**




**MONDO OFFSET BLOCK**
**NOTE 2**




**P–BLOCK**
**NOTE 3**

NOTES:

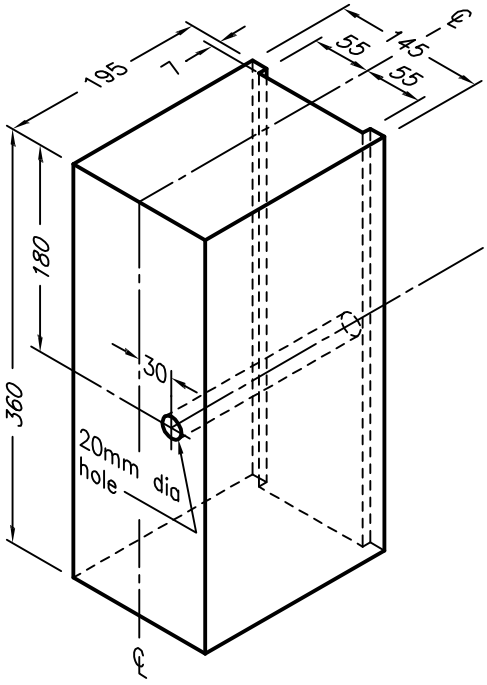
1 The component depicted is proprietary to Trinity Industries, Inc.

2 The component depicted is proprietary to Mondo Polymer Technologies.

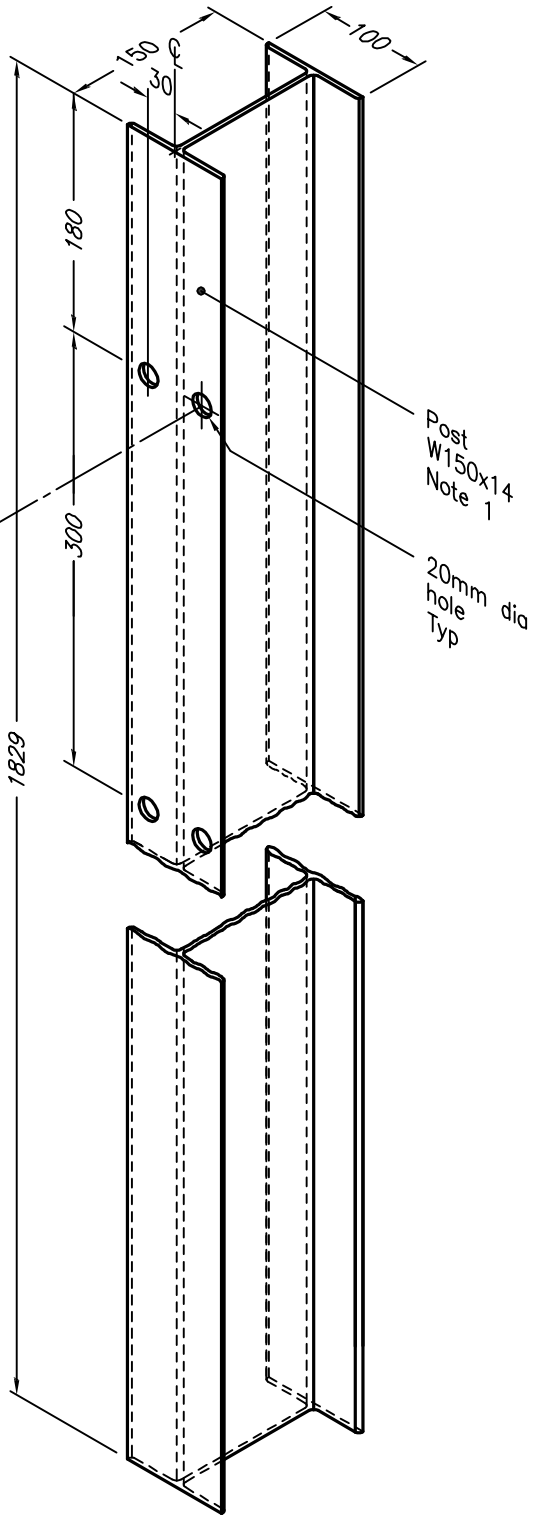
3 The component depicted is proprietary to R.G. Steel Corp.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM<br>PLASTIC OFFSET BLOCKS<br>COMPONENT | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 912.103 | | |




ROUTED WOODEN OFFSET BLOCK



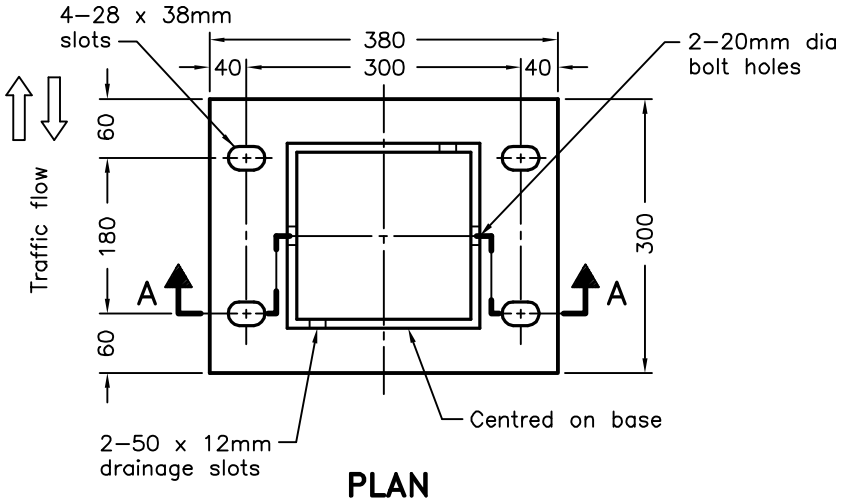

POST DETAIL

NOTES:

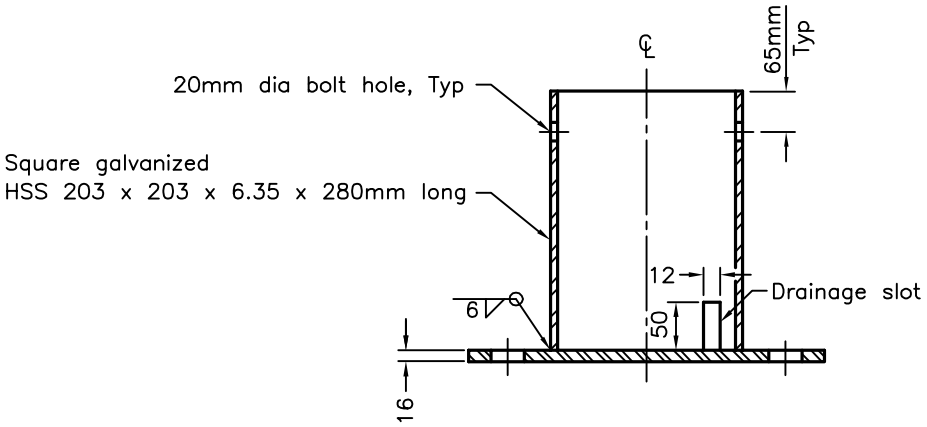
1 Imperial size steel sections W6x9 and W6x8.5 are acceptable.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM<br>STEEL POST WITH WOODEN OFFSET BLOCK<br>COMPONENT | | | |
| | OPSD 912.104 | | |




PLAN



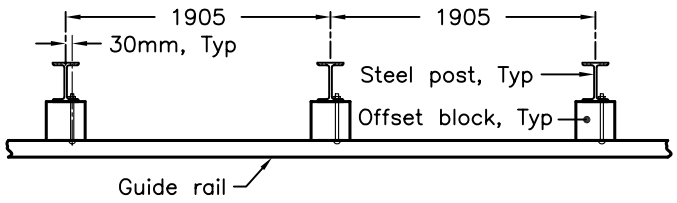

SECTION A–A

FOR SQUARE WOODEN POST FOR STEEL BEAM GUIDE RAIL

NOTES:

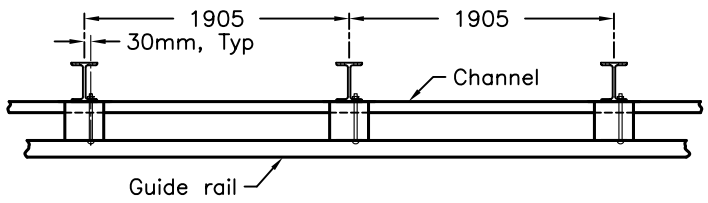
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM<br>BASE PLATE<br>COMPONENT | | | |
| | OPSD 912.105 | | |

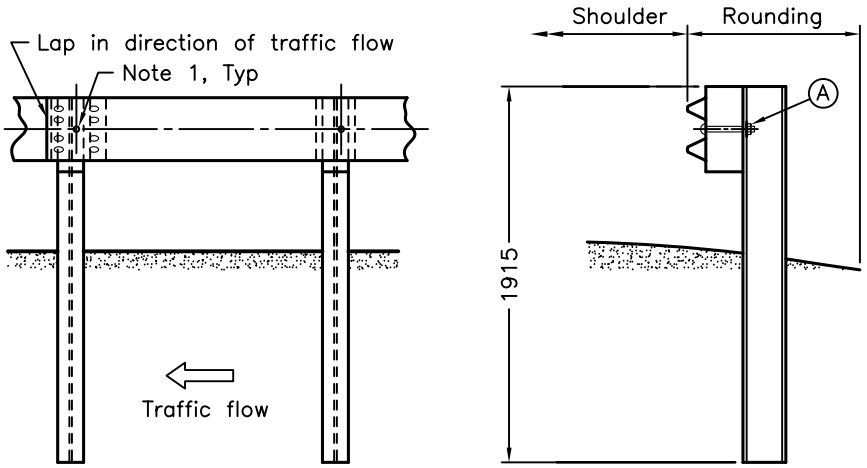



PLAN

| | POST BOLT | |
|---|---|---|
| | Post Bolt Size and Type | Washer @ Nut |
| (A) | 16x250 BH | Plate |
| (B) | 16x100 CaB | Plate |

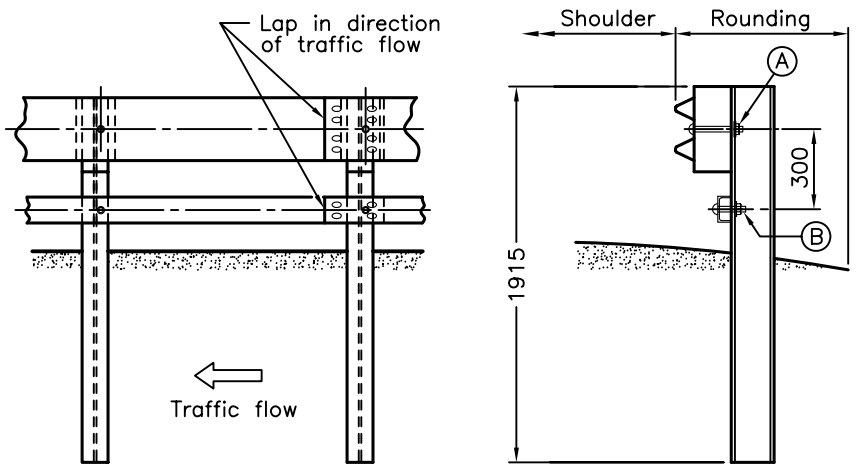



PLAN




ELEVATION SIDE VIEW

SINGLE RAIL




ELEVATION SIDE VIEW

SINGLE RAIL WITH CHANNEL

NOTES:

1 Washer shall not be installed at front face of rail. One bolt located at centre of steel beam guide rail.

A This OPSD to be read in conjunction with OPSD 912.101, 912.102, 912.103, and 912.104.

B Steel beam guide rail mounting heights shall be as specified.

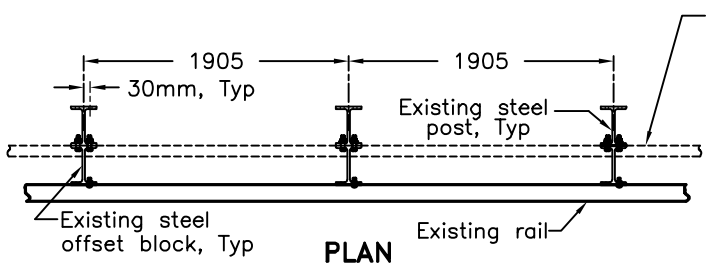
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

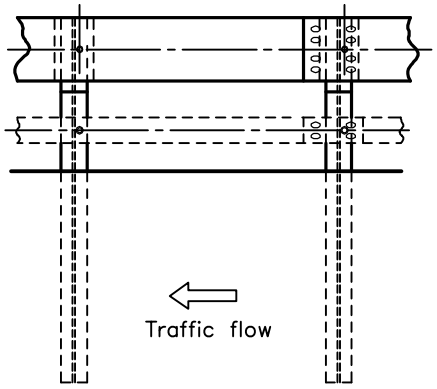
# GUIDE RAIL SYSTEM, STEEL BEAM STEEL POST WITH OFFSET BLOCK ASSEMBLY INSTALLATION – SINGLE RAIL

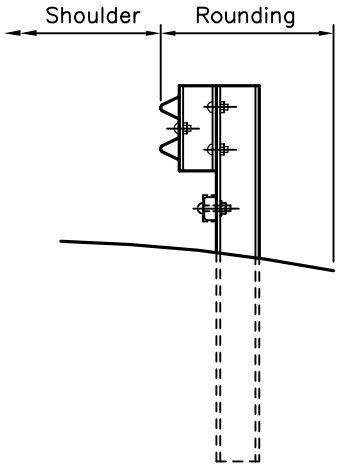
Nov 2008 | Rev 2

OPSD 912.130

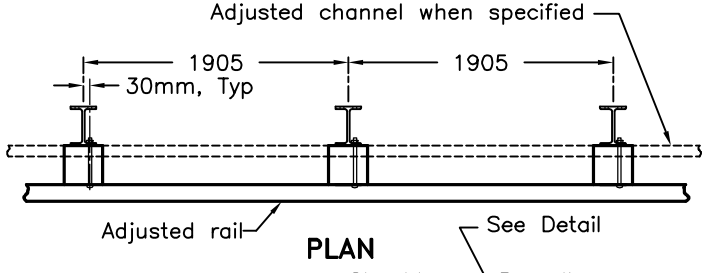


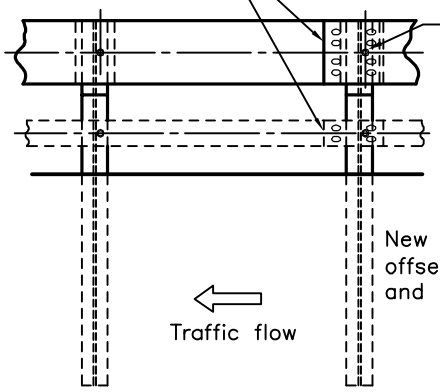

| NEW POST BOLTS | | |
|---|---|---|
| | Post Bolt Size and Type | Washer @ Nut |
| Ⓐ | 16x250 BH | Plate |
| Ⓑ | 16x100 CaB | Plate |

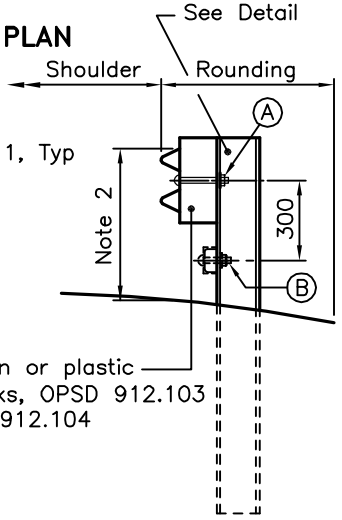


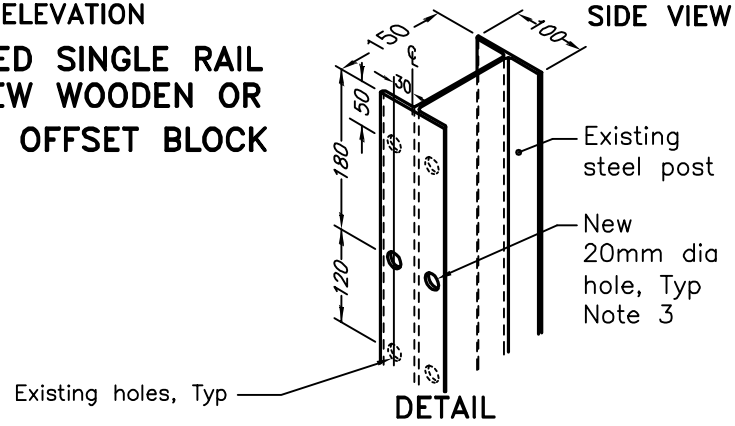

## EXISTING SINGLE RAIL WITH STEEL OFFSET BLOCK




## ADJUSTED SINGLE RAIL WITH NEW WOODEN OR PLASTIC OFFSET BLOCK




## NOTES:

1 Washer shall not be installed at front face of rail. Type Ⓐ bolt located at centre of steel beam guide rail.

2 Steel beam guide rail mounting heights shall be as specified.

3 One new hole shall be punched as required to attach new offset block. Punching of second new hole is acceptable. New holes shall be treated according to ASTM A780. New holes shall not be flame cut.

A This OPSD shall be read in conjunction with OPSD 912.103 and 912.104.

B All dimensions are in millimetres unless otherwise shown.

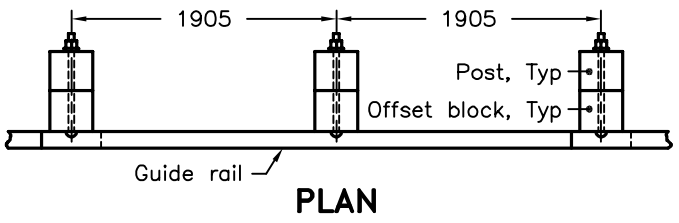
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, STEEL BEAM STEEL POST WITH STEEL OFFSET BLOCK ASSEMBLY ADJUSTMENT – SINGLE RAIL

| Nov 2013 | Rev | 0 |
|---|---|---|

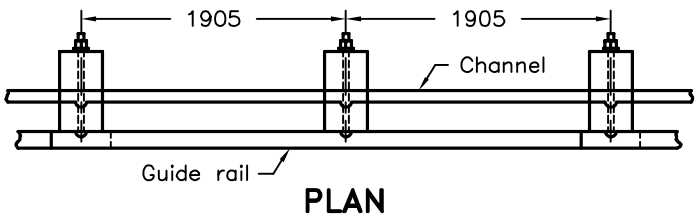
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 912.135

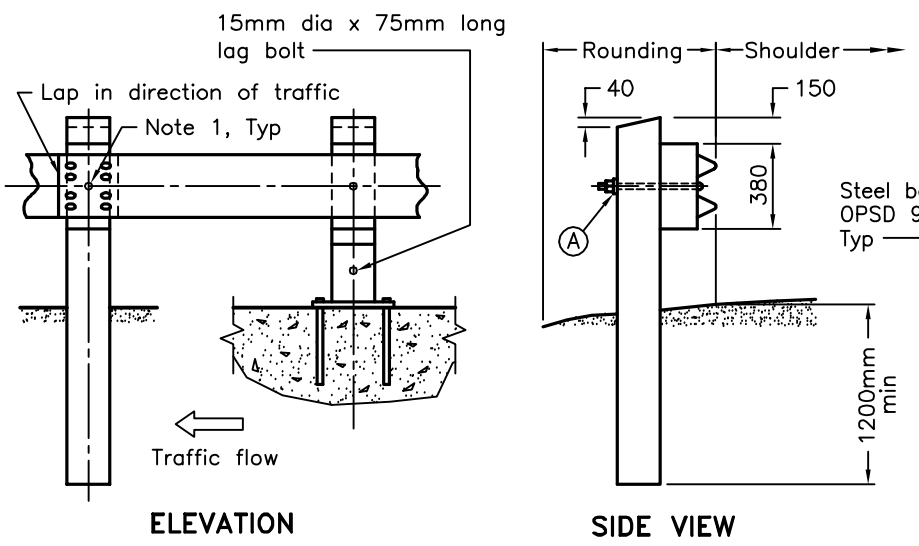



PLAN

| | POST BOLT AND HOLE | |
|---|---|---|
| | Hole Dia | Post Bolt Size and Type |
| (A) | 18 | 16x460 BH |
| (B) | 18 | 16x310 CaB |

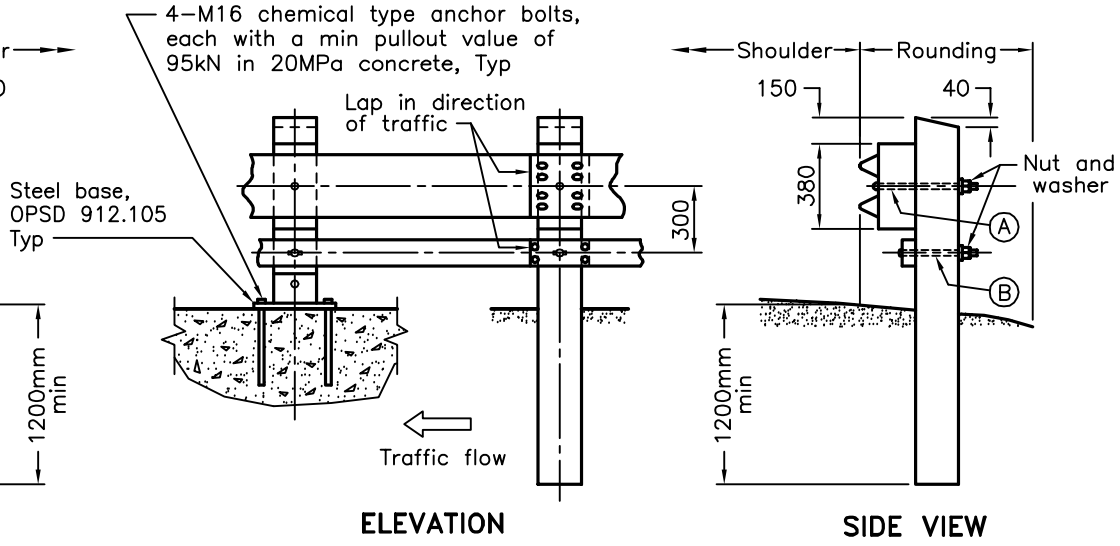



PLAN




ELEVATION SIDE VIEW

SINGLE RAIL




ELEVATION SIDE VIEW

SINGLE RAIL WITH CHANNEL

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.

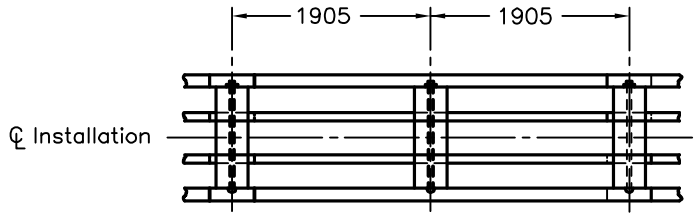
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY INSTALLATION – SINGLE RAIL

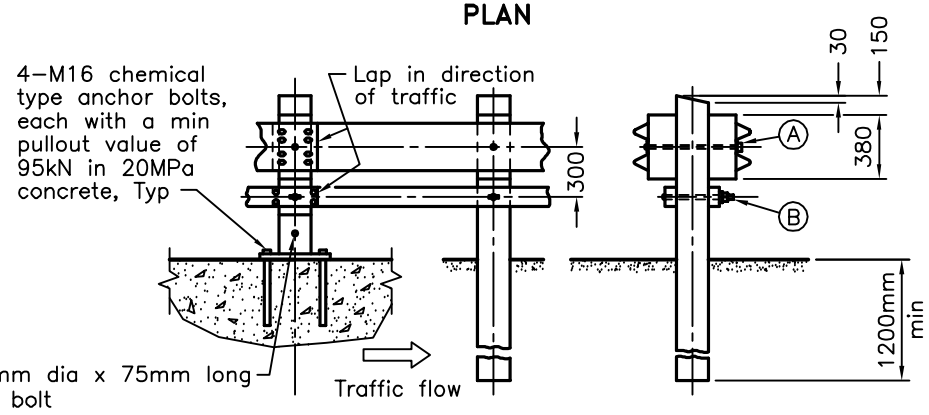
Nov 2010 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 912.140

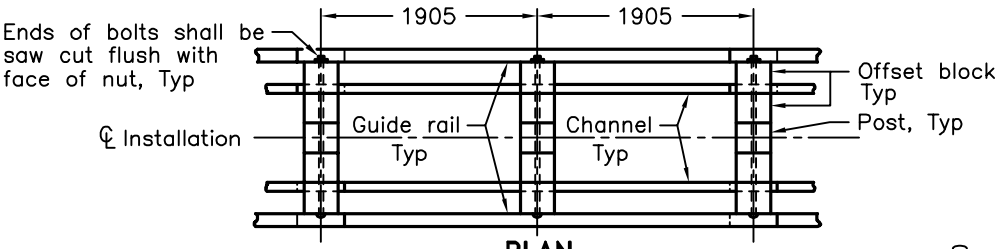



PLAN

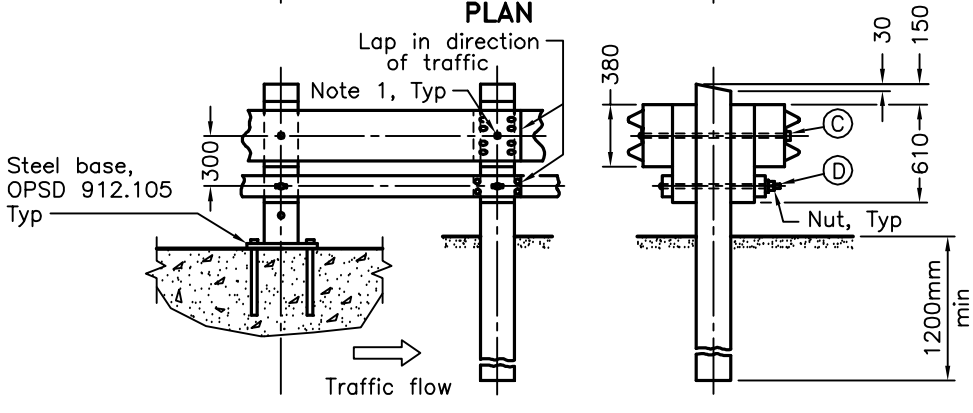



ELEVATION SIDE VIEW

## DOUBLE RAIL WITH CHANNEL

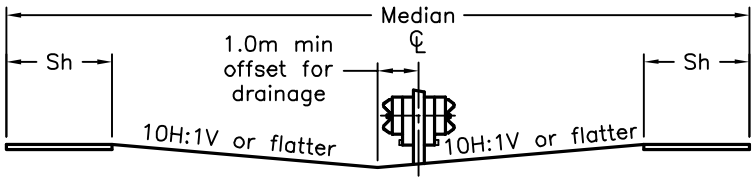



PLAN

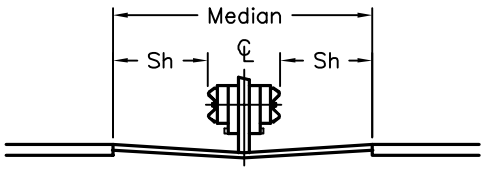



ELEVATION SIDE VIEW

## DOUBLE OFFSET RAIL WITH CHANNEL




## WIDE MEDIAN




## NARROW MEDIAN

| POST BOLT AND HOLE | | |
|---|---|---|
| | Hole Dia | Post Bolt Size and Type |
| Ⓐ | 18 | 16x660 BH |
| Ⓑ | 18 | 16x355 CaB |
| Ⓒ | 18 | 16x860 BH |
| Ⓓ | 18 | 16x660 CaB |

## 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.

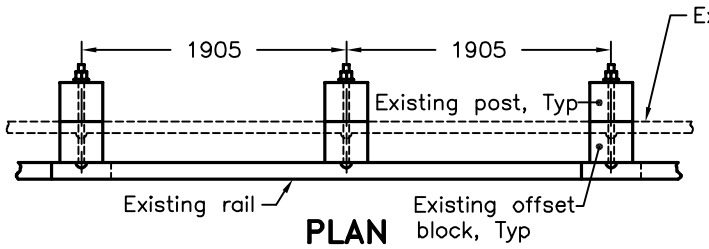
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY INSTALLATION – DOUBLE RAIL

Nov 2010 | Rev 2

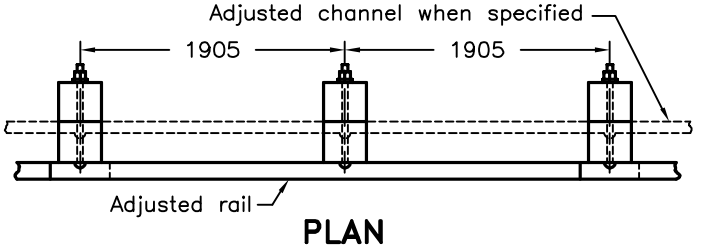
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

# OPSD 912.141

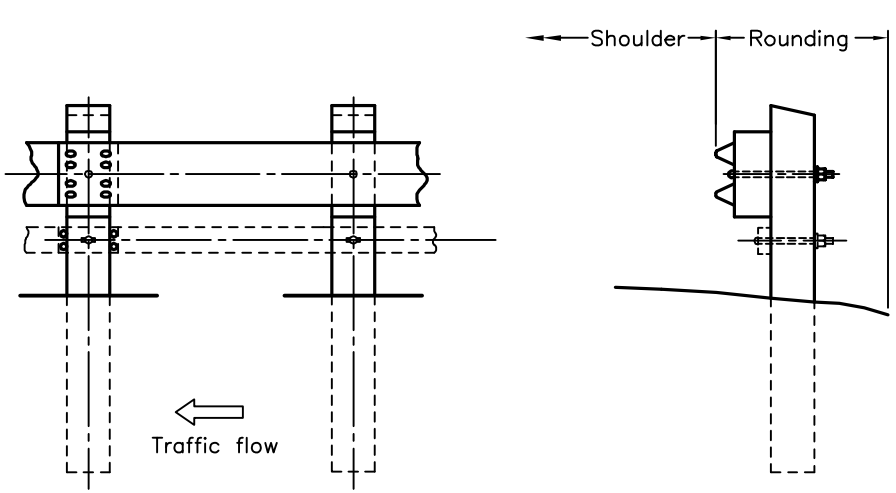



PLAN

| | NEW POST BOLT AND HOLE | |
|---|---|---|
| | Hole Dia | Post Bolt Size and Type |
| Ⓐ | 18 | 16x460 BH |
| Ⓑ | 18 | 16x310 CaB |

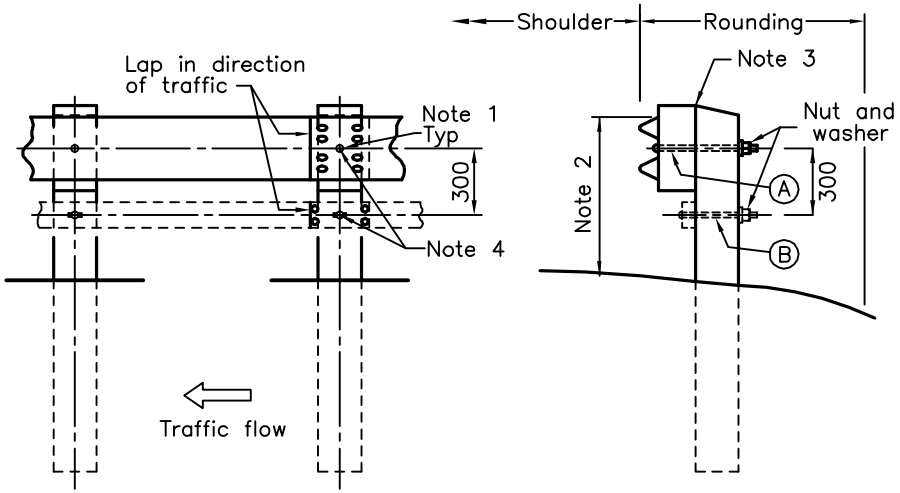



PLAN




ELEVATION SIDE VIEW

EXISTING SINGLE RAIL




ELEVATION SIDE VIEW

ADJUSTED SINGLE RAIL

NOTES:

1 Washer shall not be installed at front face of rail. Type Ⓐ bolt located at centre of steel beam guide rail.

2 Steel beam guide rail mounting heights shall be as specified.

3 The top of the offset block shall not extend beyond the top of the existing post.

4 One new hole shall be drilled as required to attach rail and new offset blocks. At locations where channel exists, an additional hole shall be drilled as required. Holes shall be treated with two applications of 2% copper naphthenate wood preservative.

A All dimensions are in millimetres unless otherwise shown.

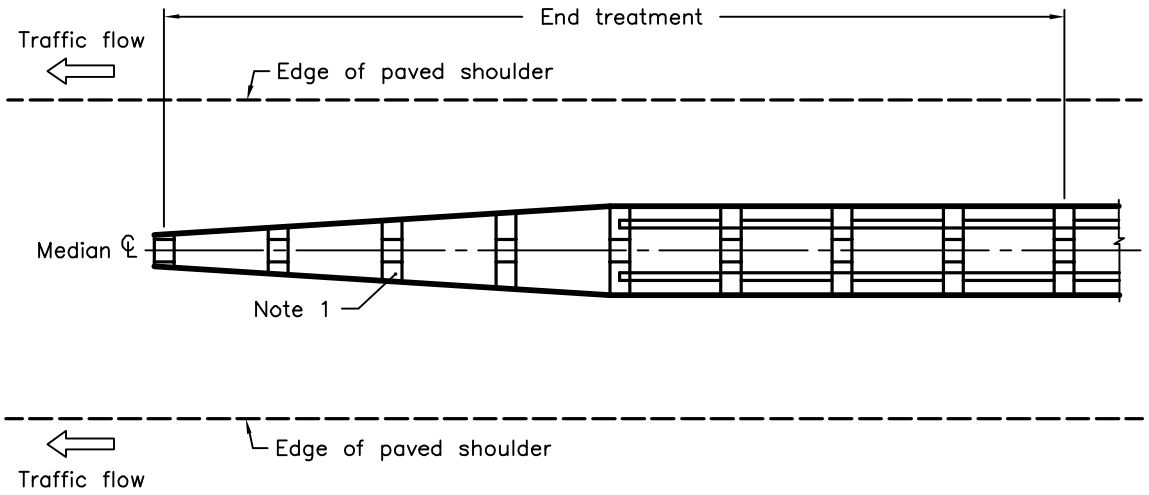
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, STEEL BEAM WOODEN POST ASSEMBLY ADJUSTMENT – SINGLE RAIL

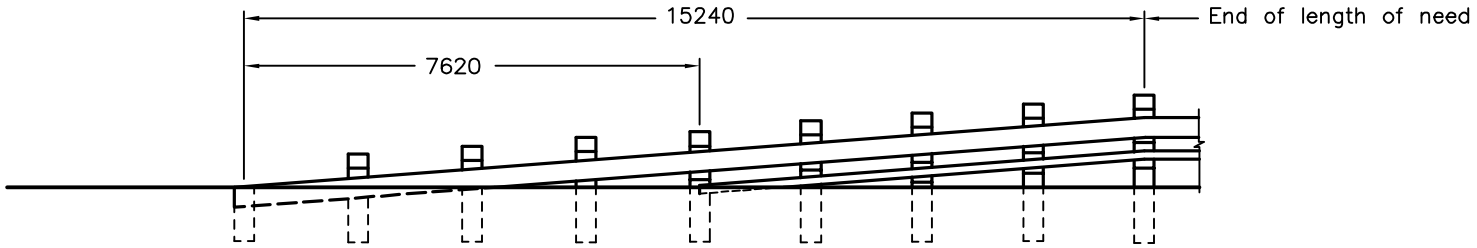
| Nov 2013 | Rev | 0 |
|---|---|---|

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 912.145




**PLAN**




**ELEVATION**

NOTES:

1 End treatment offset blocks to be trimmed as required.

A This OPSD to be read in conjunction with OPSD 912.141.

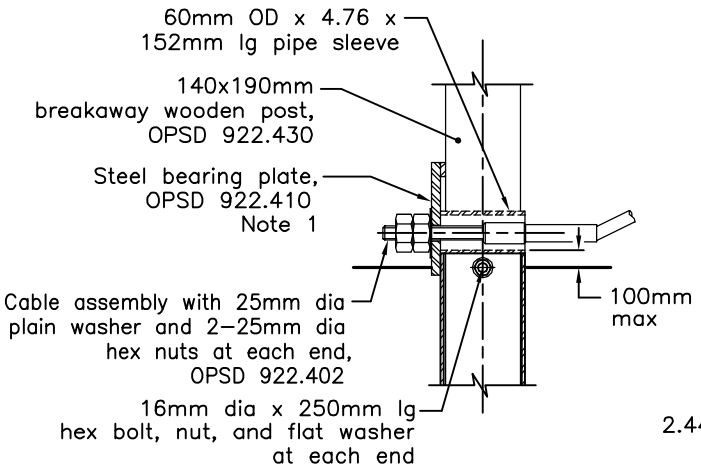
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

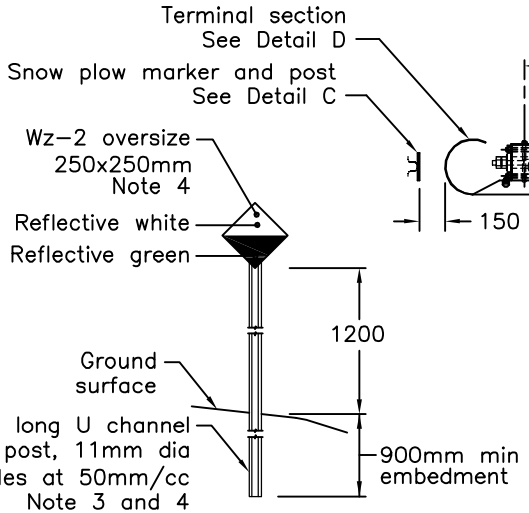
# GUIDE RAIL SYSTEM, STEEL BEAM END TREATMENT INSTALLATION – LEAVING END COLLECTOR MEDIAN

Nov 2010 | Rev 1

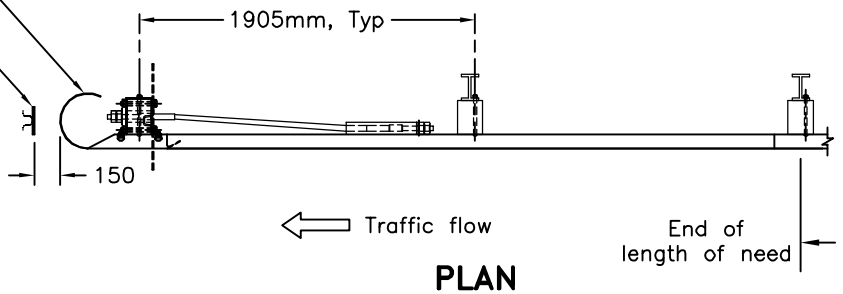
OPSD 912.234



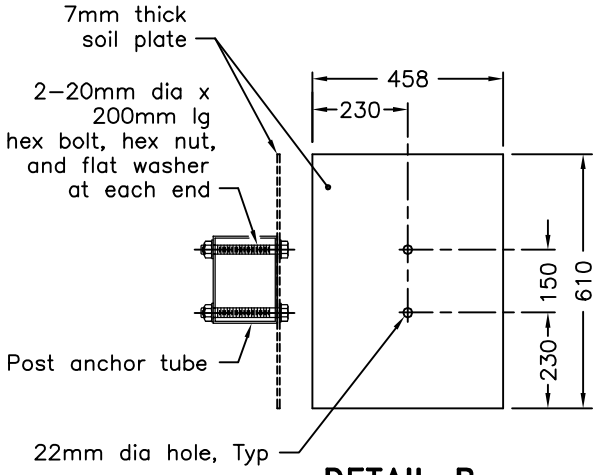

DETAIL A



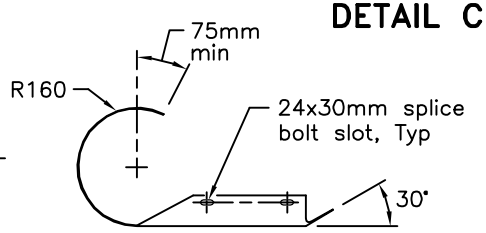

DETAIL C



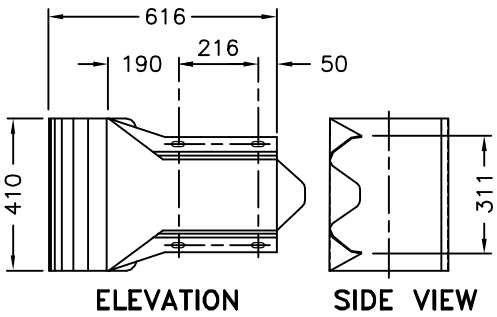

PLAN




DETAIL B

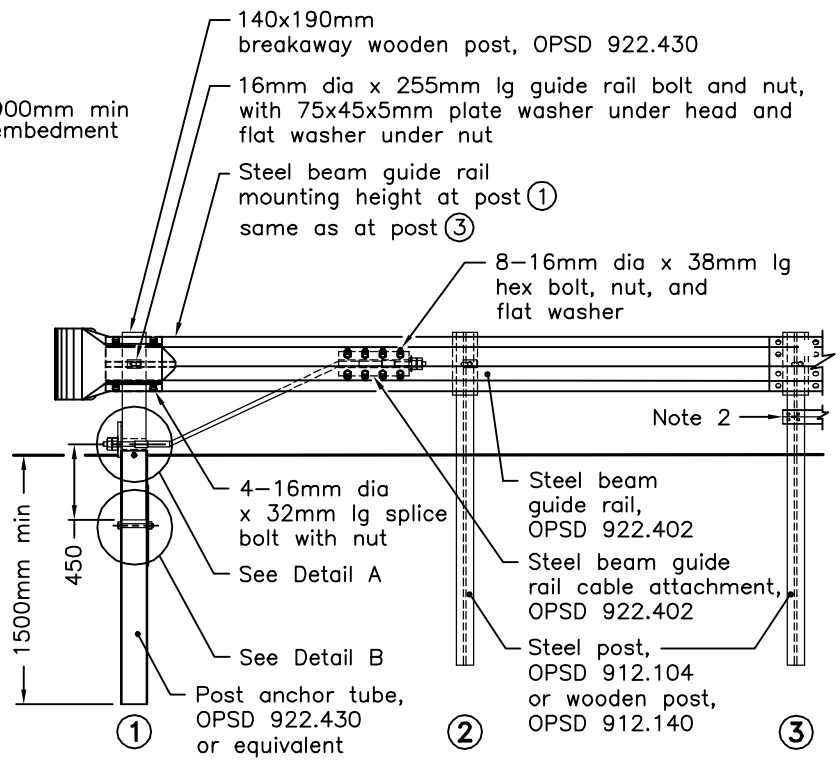



PLAN




ELEVATION SIDE VIEW

DETAIL D




ELEVATION

## NOTES:

1 Steel bearing plate shall be secured against rotation using nails into post.

2 When channel specified, channel shall be terminated at post ③.

3 Minimum weight of post shall be 4.46kg/m.

4 Post and mounting hardware shall be hot dip galvanized according to CSA G164.

A Steel beam guide rail mounting heights shall be as specified.

B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2010 | Rev 1

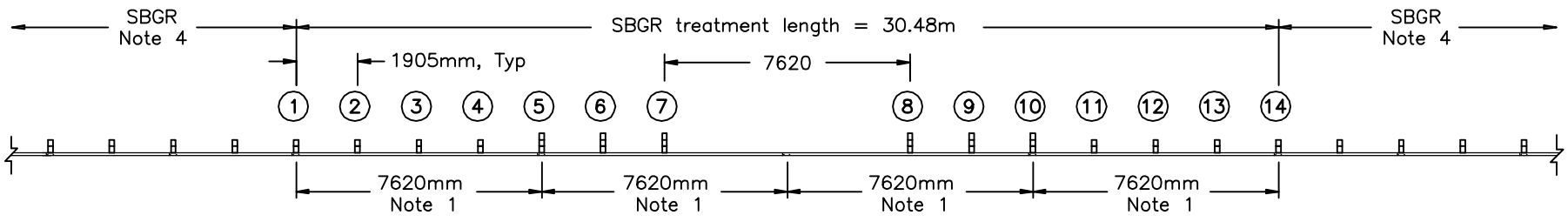
GUIDE RAIL SYSTEM, STEEL BEAM

# LEAVING END TREATMENT

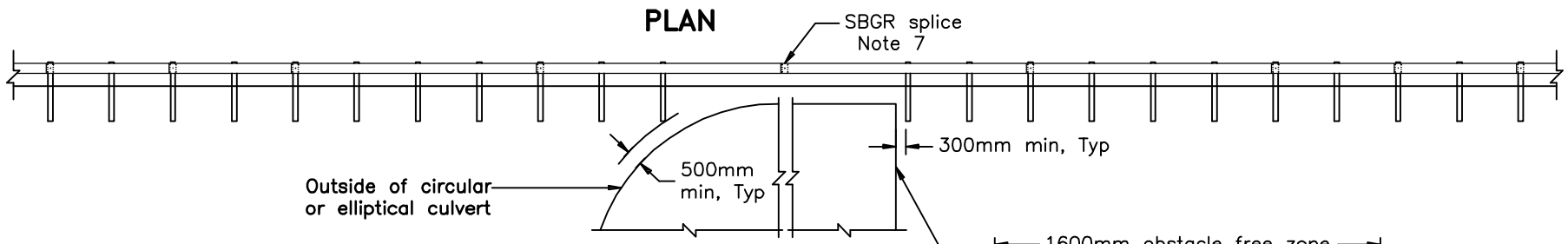
INSTALLATION

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

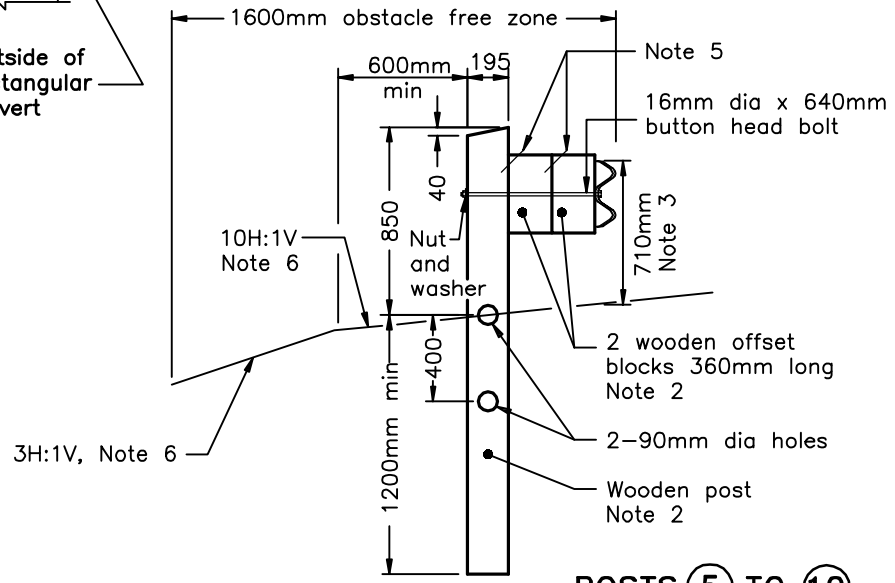
OPSD 912.235




**PLAN**




**ELEVATION**




**POSTS (5) TO (10)**

## NOTES:

1 Two 7936mm long SBGR elements, one set inside the other.
2 Wooden posts and offset blocks shall be 145 x 195mm.
3 Mounting height to top of steel beam measured vertically at face of guide rail.
4 Single rail SBGR according to OPSD 912.130 or 912.140 or steel beam energy attenuating terminal.
5 #8 x 75mm deck screws installed in pre–drilled holes.
6 Slope shall be flatter when specified.
7 SBGR splice shall be bolted according to OPSD 912.101.

A Posts (1) to (4) and (11) to (14) assembled according to OPSD 912.130 or 912.140, single rail.
B System configuration meets NCHRP Report 350 TL–3.
C All dimensions are in millimetres unless otherwise shown.

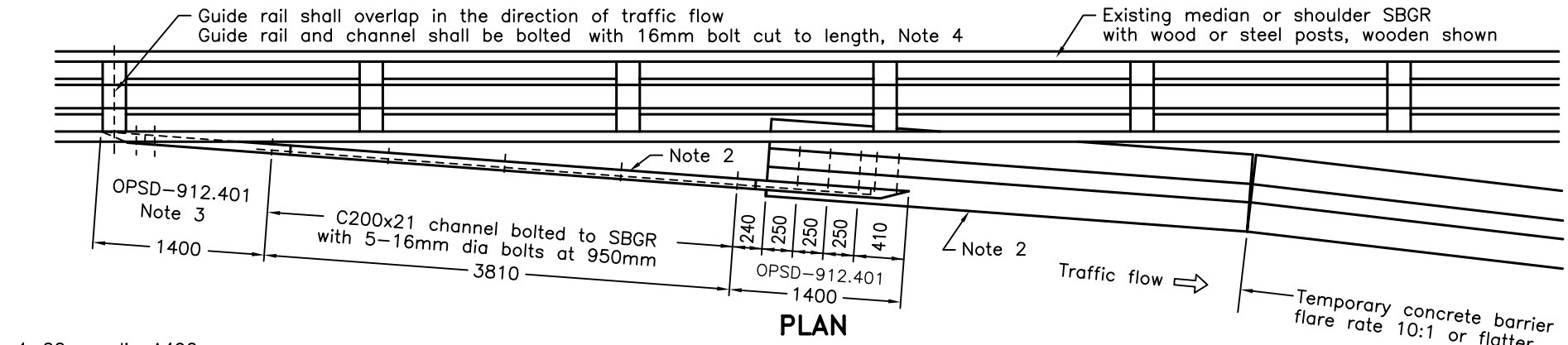
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, STEEL BEAM TREATMENT AT CULVERTS WITH MINIMAL COVER INSTALLATION – SINGLE RAIL

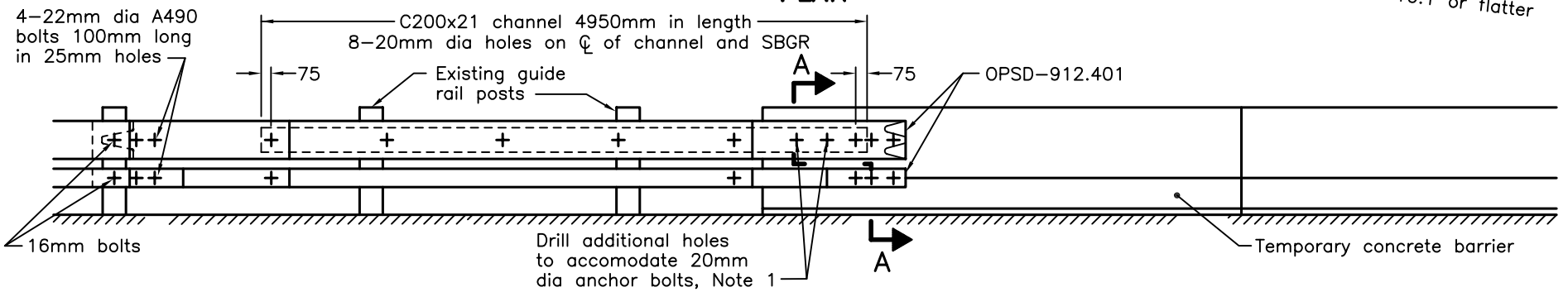
Nov 2010 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

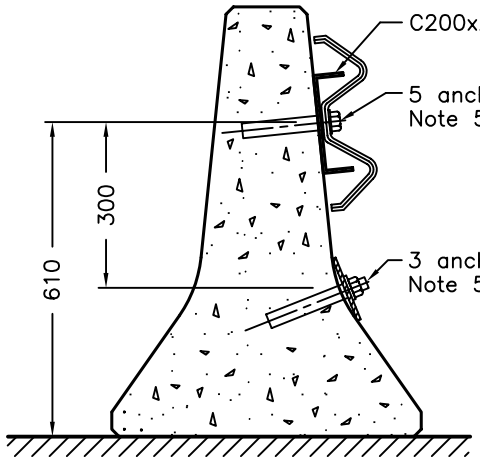
OPSD 912.240




**PLAN**




**ELEVATION**




**SECTION A–A**

NOTES:

1 Additional holes may be field drilled.

2 Flare rate of temporary transition rail and first precast concrete barrier unit shall be 16:1 or flatter.

3 Two anchorage back up rails only.

4 Where temporary transition rail cannot be connected at post it shall be connected to existing guide rail between posts using 6–M22 A230 bolts.

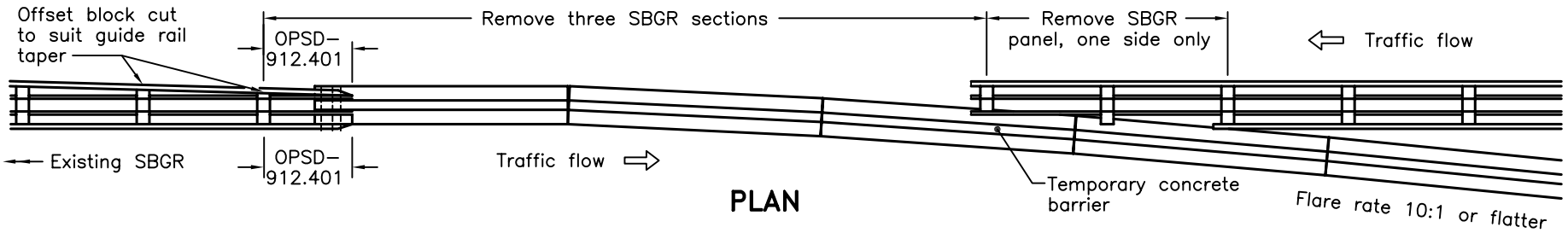
5 20mm dia removable anchor bolts each with an ultimate pullout value of 100kN in 30MPa concrete.

A For Steel Beam Guide Rail detail to be read in conjunction with OPSD–912.130, 912.140, or 912.141.

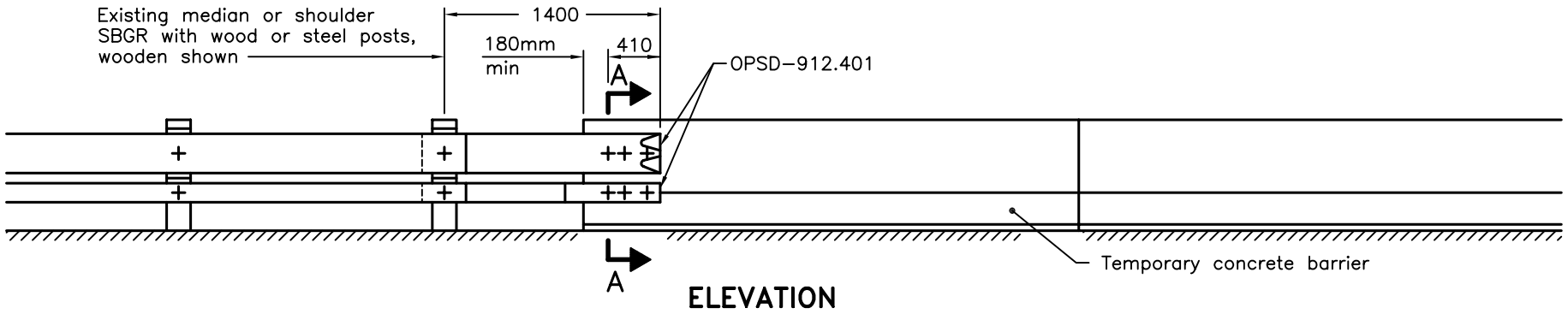
B When transitioning from a curb section onto a lower surface the temporary concrete barrier shall be supported to attain a grade of 10% or flatter.

C All dimensions are in millimetres unless otherwise shown.

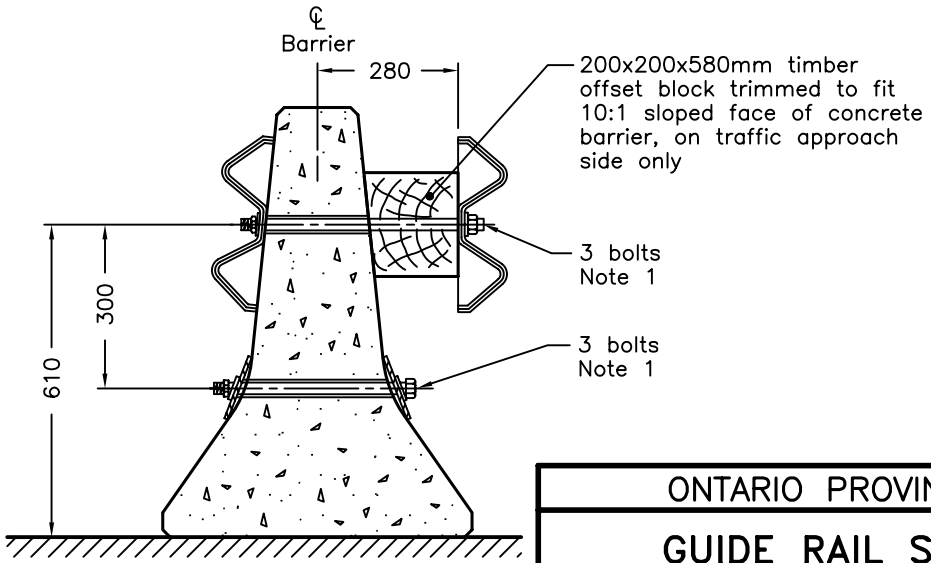
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2002 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM<br>TEMPORARY TRANSITION INSTALLATION–RAIL METHOD<br>SINGLE STEEL BEAM TO TEMPORARY CONCRETE BARRIER | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD – 912.330 | | |




**PLAN**




**ELEVATION**




**SECTION A–A**

NOTES:

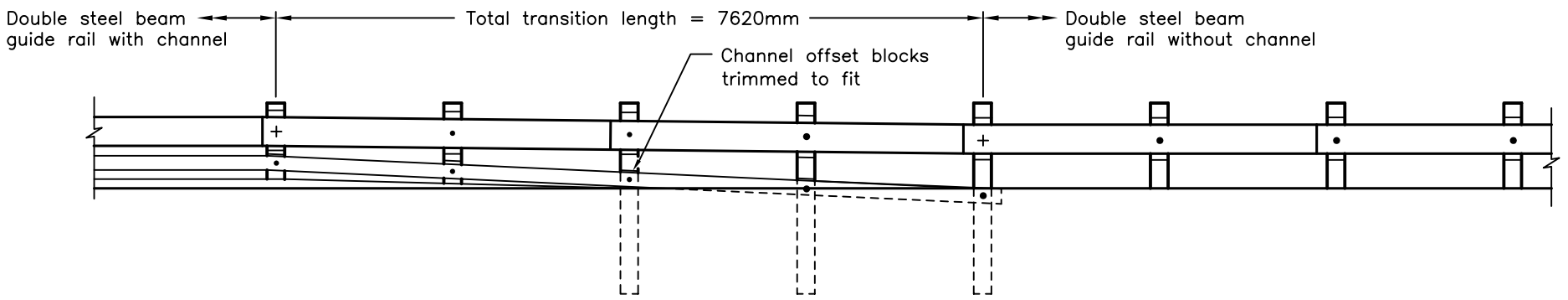
1 22mm dia A490 bolts or equivalent strength threaded bar in 25mm dia holes.

A For Steel Beam Guide Rail detail to be read in conjunction with OPSD–912.130, 912.140, or 912.141.

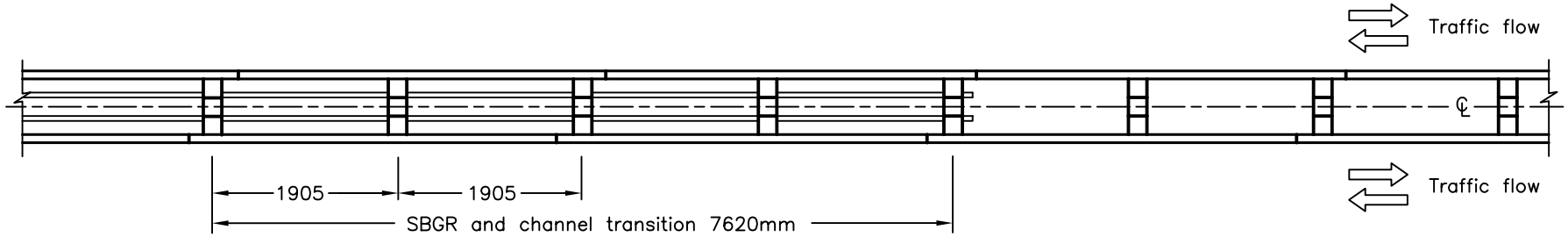
B When transitioning from a curb section onto a lower surface the temporary concrete barrier shall be supported to attain a grade of 10% or flatter.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2002 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM TEMPORARY TRANSITION INSTALLATION SINGLE STEEL BEAM TO TEMPORARY CONCRETE BARRIER | | | |
| | OPSD – 912.331 | | |




**ELEVATION**




**PLAN**

NOTES:

A Steel beam guide rail mounting heights shall be as specified.

B This OPSD to be read in conjunction with OPSD 912.141.

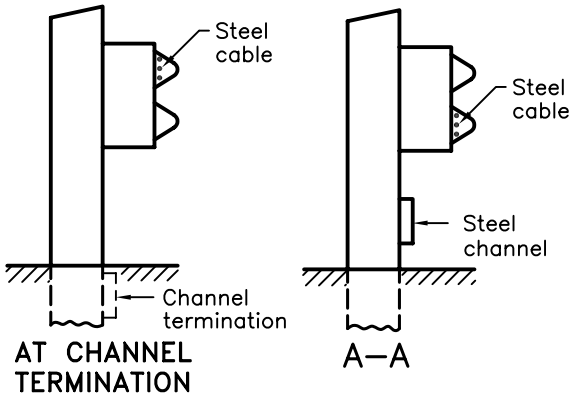
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

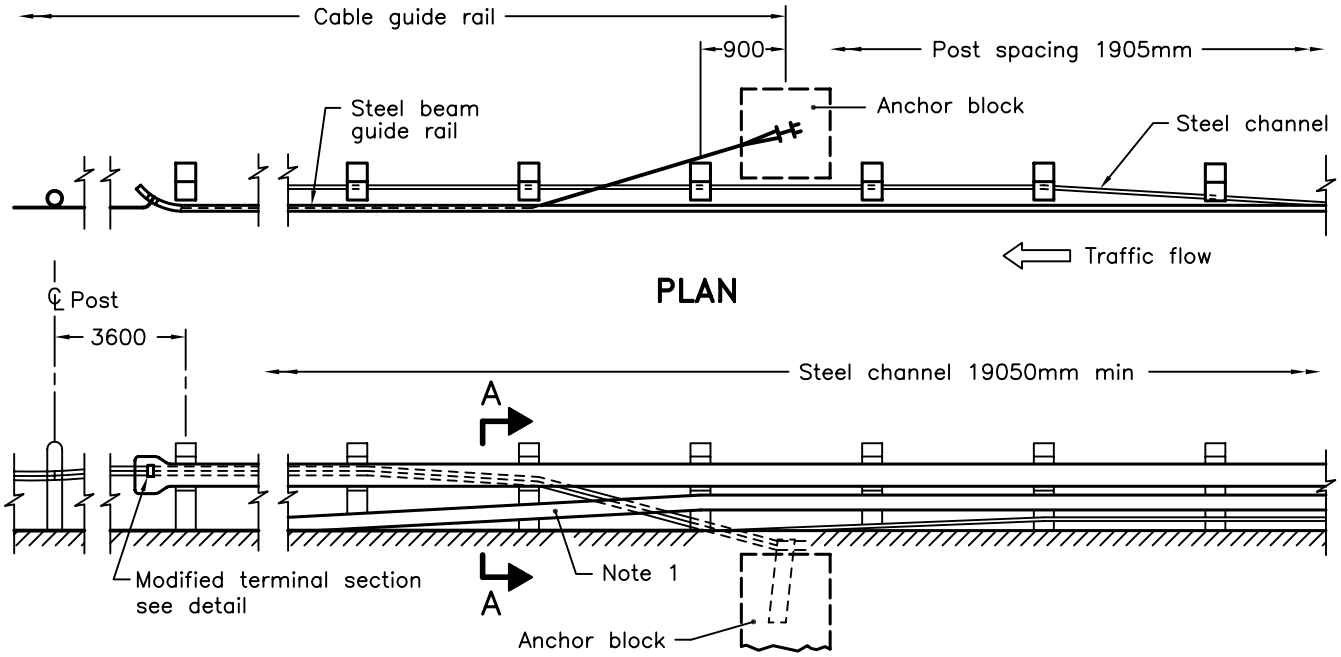
# GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT TRANSITION INSTALLATION CHANNEL TERMINATION MEDIAN

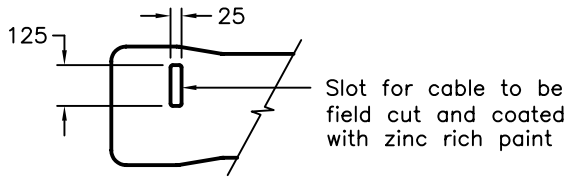
Nov 2008 | Rev 1

OPSD 912.380




SECTIONS




MODIFIED TERMINAL SECTION DETAIL

NOTES:

1 A 7.62m channel termination shall commence at the third beam element beyond the end of structure.

A This OPSD to be read in conjunction with OPSD–912.130, 912.140, and 913.130.

B All dimensions are in millimetres unless otherwise shown.

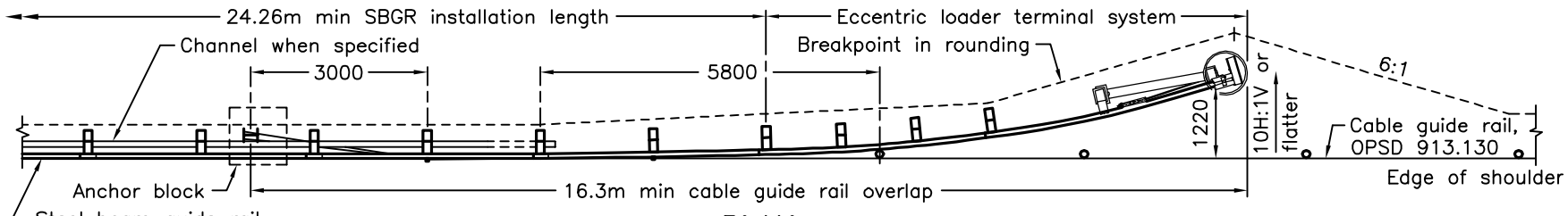
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT TRANSITION INSTALLATION SINGLE STEEL BEAM TO 3 CABLE DIVIDED HIGHWAY

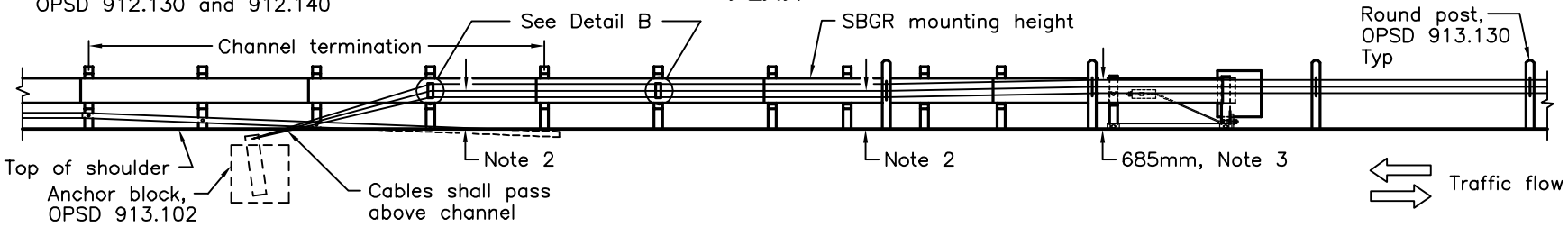
Nov 2002 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

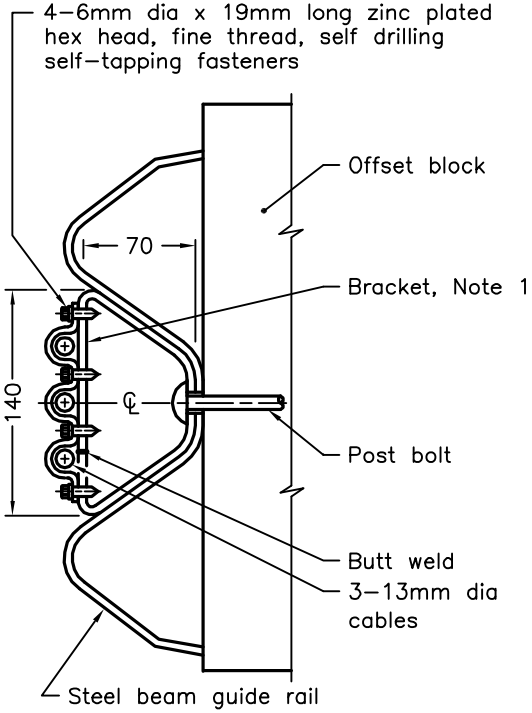
OPSD – 912.381



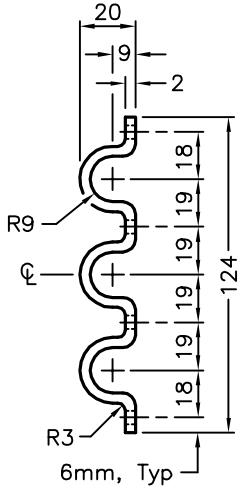

**PLAN**



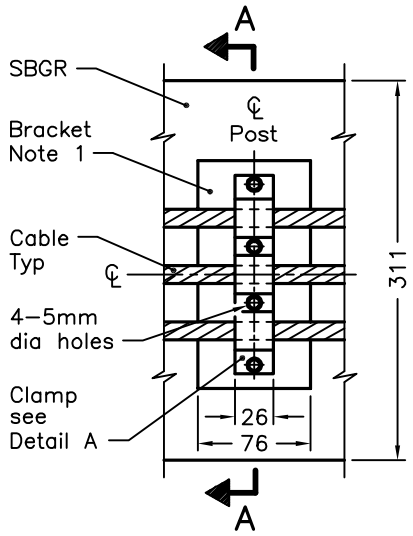

**ELEVATION**




**SECTION A–A**




**DETAIL A**




**DETAIL B**

NOTES:

1 3mm thick galvanized steel plate shaped to fit inside steel beam guide rail.

2 Centre cable shall match elevation of SBGR centreline.

3 Dimension to top of top cable.

A This OPSD to be read in conjunction with OPSD 202.030 and 922.430.

B All dimensions are in millimetres unless otherwise shown.

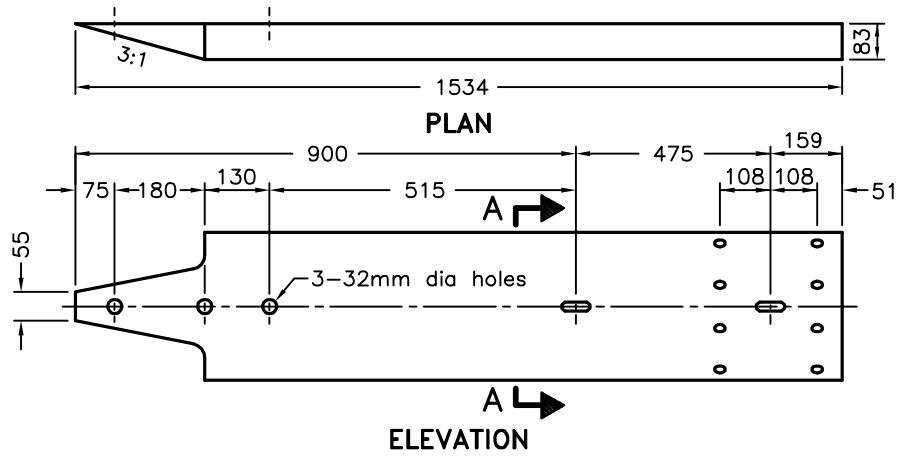
ONTARIO PROVINCIAL STANDARD DRAWING

# GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT TRANSITION INSTALLATION STEEL BEAM WITH ECCENTRIC LOADER TO 3 CABLE DIVIDED AND UNDIVIDED HIGHWAY

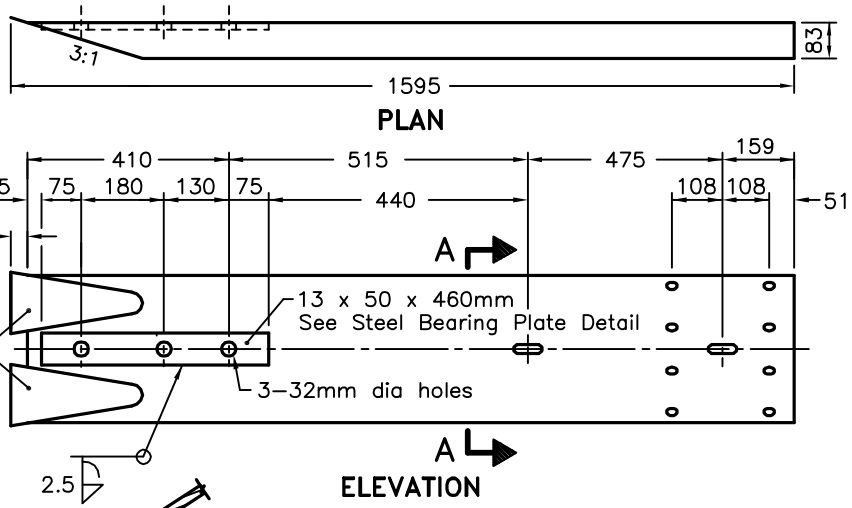
Nov 2009 | Rev 3

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

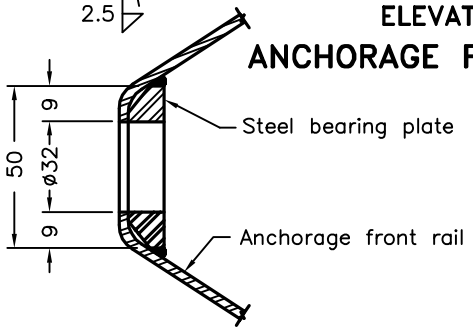
OPSD 912.382



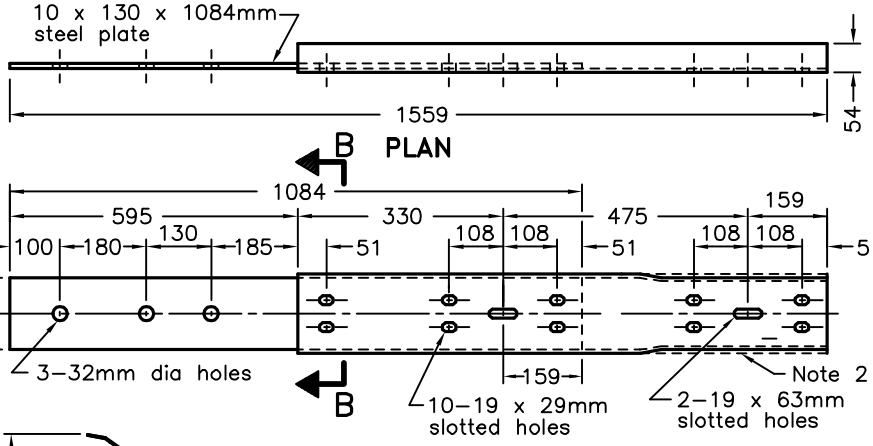

## ANCHORAGE BACKUP RAIL

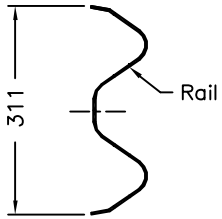



## ANCHORAGE FRONT RAIL

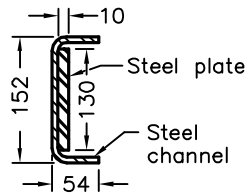



## STEEL BEARING PLATE DETAIL




## SECTION A–A




## SECTION B–B

NOTES:

1 End sections shall be welded with 2.5mm fillets and standard guide rail element materials shall be used.

2 Channel with swaged end shall be used at structure approach and non–swaged end section shall be used at structure exit.

A All welds shall be according to CSA W59, low hydrogen classification, and ground smooth.

B This OPSD to be read in conjunction with OPSD 912.101 and 912.102.

C All dimensions are in millimetres unless otherwise shown.

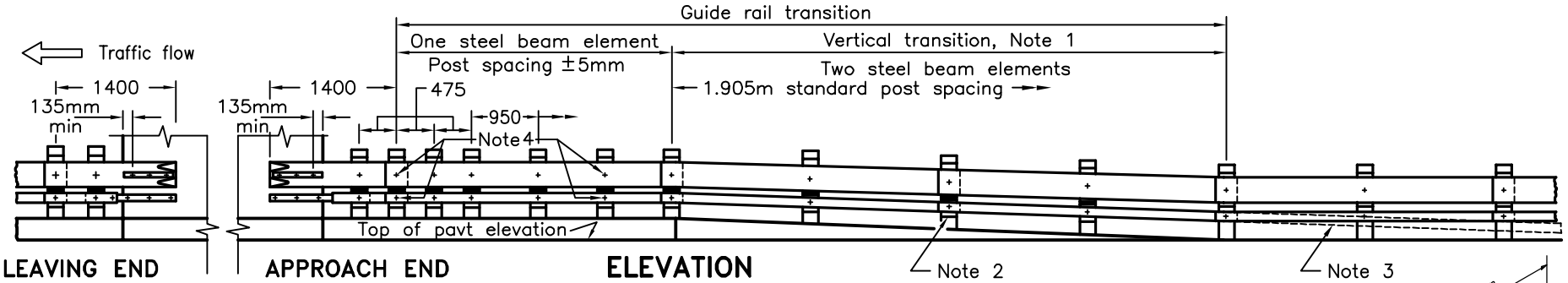
ONTARIO PROVINCIAL STANDARD DRAWING

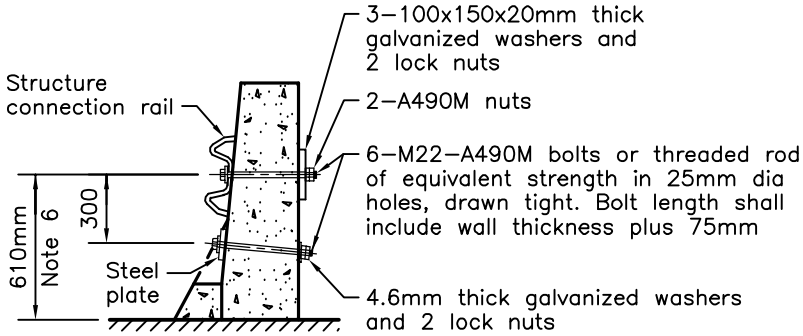
Nov 2010 | Rev 1

# GUIDE RAIL SYSTEM, STEEL BEAM STRUCTURE CONNECTION COMPONENT – RAIL AND CHANNEL

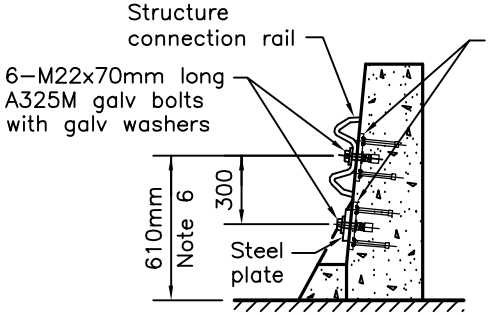
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

# OPSD 912.401

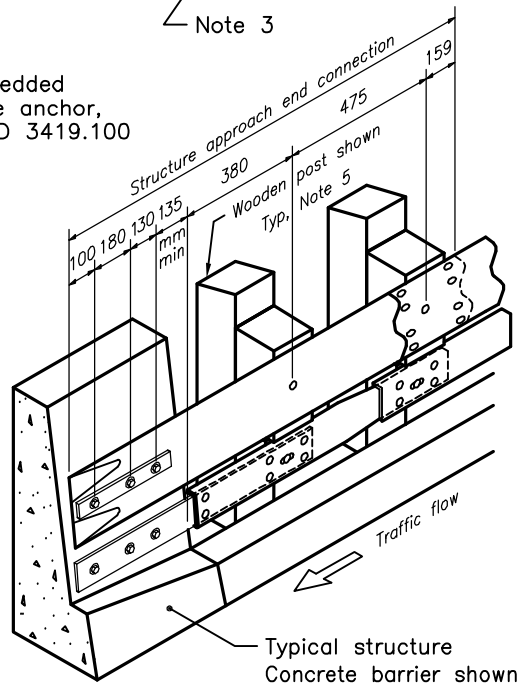


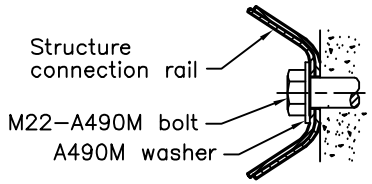




EXISTING CONCRETE BARRIER




EMBEDDED ANCHORAGE
NEW CONCRETE BARRIER




BOLT THROUGH
ANCHORAGE DETAIL

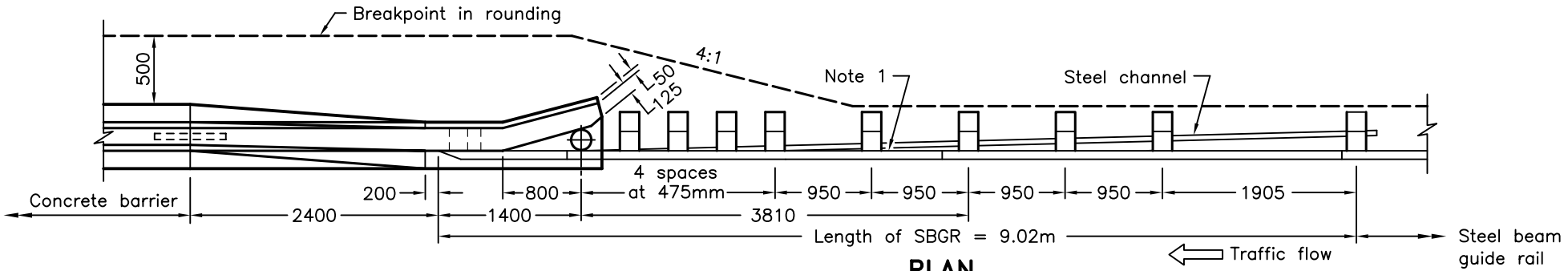
NOTES:

1 Horizontal and vertical transitions apply to structure approach and leaving end curb with gutter termination.
2 Channel post bolt at offset blocks to be 510mm long. End of bolts to be saw cut, flush with face of nut.
3 When channel is to be discontinued, a 7.62m termination shall commence at the third beam element joint beyond the end of approach slab.
4 Steel beam guide rail and channel to be field drilled to suit. Coat holes and bolt heads with approved zinc rich paint.
5 Wooden or steel posts as specified.
6 If curb or sidewalk in front of the barrier wall is 300mm or greater in width, the mounting height shall be measured vertically to the top of the concrete surface.

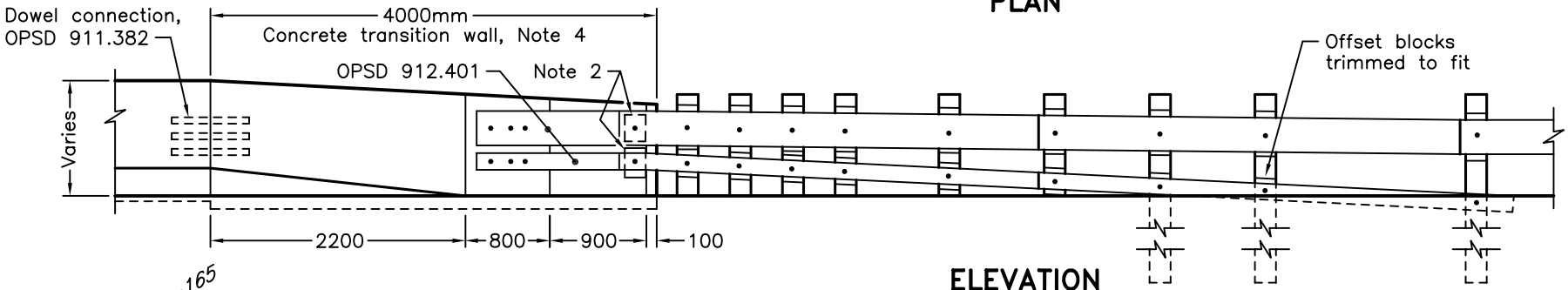
A This OPSD to be read in conjunction with OPSD 912.130, 912.140, 912.401, and 912.530.

B All dimensions are in millimetres unless otherwise shown.

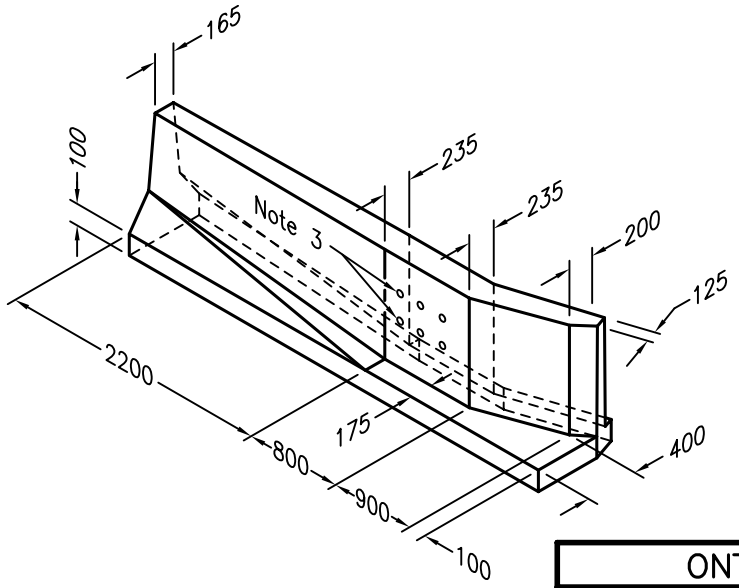
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 3 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM<br>STRUCTURE CONNECTION | | | |
| | OPSD 912.430 | | |




**PLAN**




**ELEVATION**




**CONCRETE TRANSITION WALL**

NOTES:

1 Two SBGR elements one set inside the other for the first 5.21m length of guide rail on traffic approach to wingwall side only.

2 Two 150mm ID 8x230mm long steel spacer tubes, schedule 40 galvanized pipe connected only to SGBR and channel.

3 Six 25mm dia holes cast–in–place or drilled to receive 6–M22 x 310mm long A490 bolts.

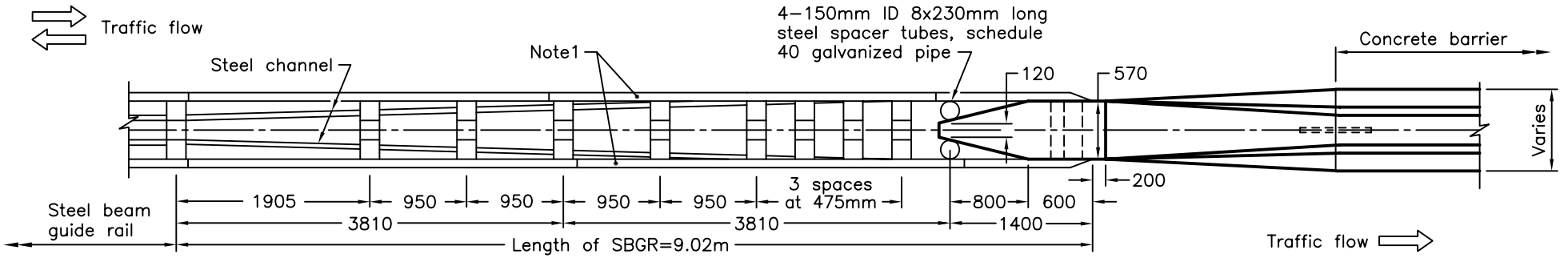
4 Vertical transition required for connection to tall wall barrier or bridge wingwalls greater than 825mm high.

A Steel beam guide rail mounting heights shall be as specified.

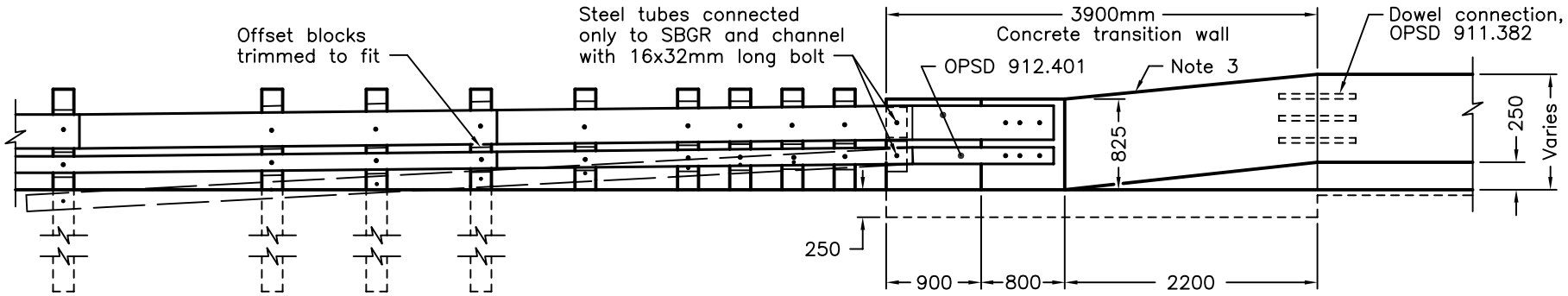
B This OPSD to be read in conjunction with OPSD 912.130 and 912.140.

C All dimensions are in millimetres unless otherwise shown.

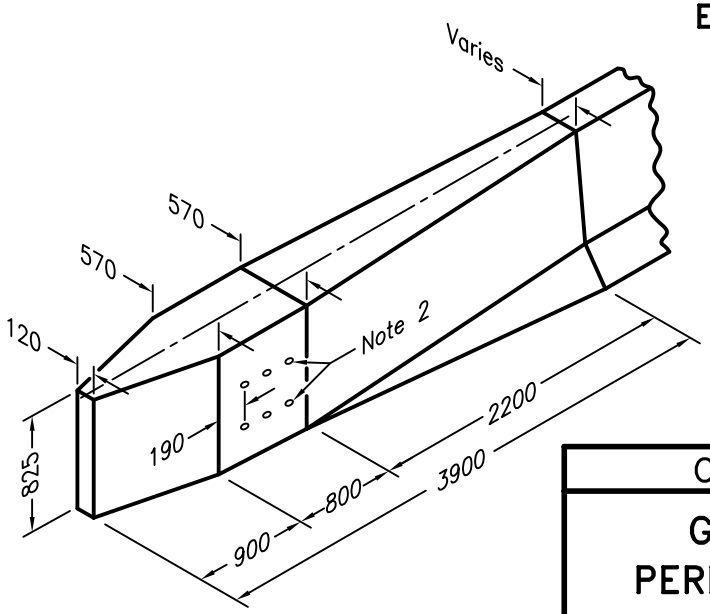
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 2 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM<br>PERMANENT CONNECTION INSTALLATION<br>SINGLE STEEL BEAM TO CONCRETE BARRIER | | | |
| | | | OPSD 912.480 |




**PLAN**




**ELEVATION**




**CONCRETE TRANSITION WALL**

NOTES:

1 Two SBGR elements one set inside the other for the first 5.21m length of guide rail on traffic approach to wingwall side only.

2 Six 25mm dia holes cast–in–place or drilled to receive 6–M22 x 650mm long A490 bolts.

3 Vertical transition required for connection to tall wall barrier or bridge wingwalls greater than 825mm high.

A Steel beam guide rail mounting heights shall be as specified.

B This OPSD to be read in conjunction with OPSD 912.141.

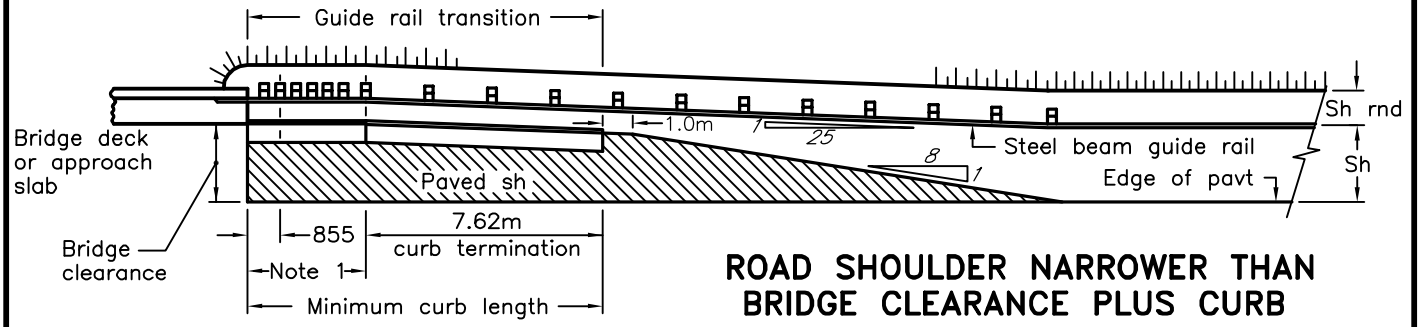
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 2

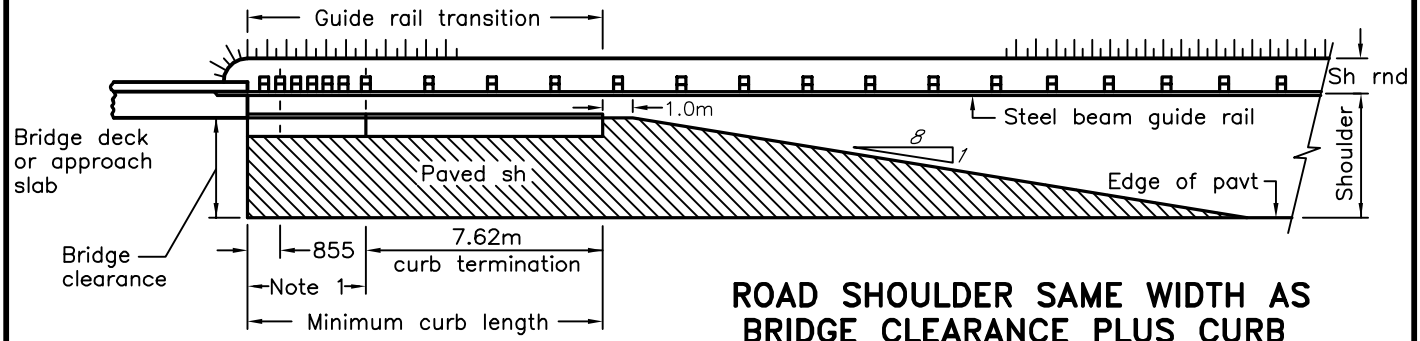
# GUIDE RAIL SYSTEM, STEEL BEAM PERMANENT CONNECTION INSTALLATION DOUBLE STEEL BEAM TO CONCRETE BARRIER

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

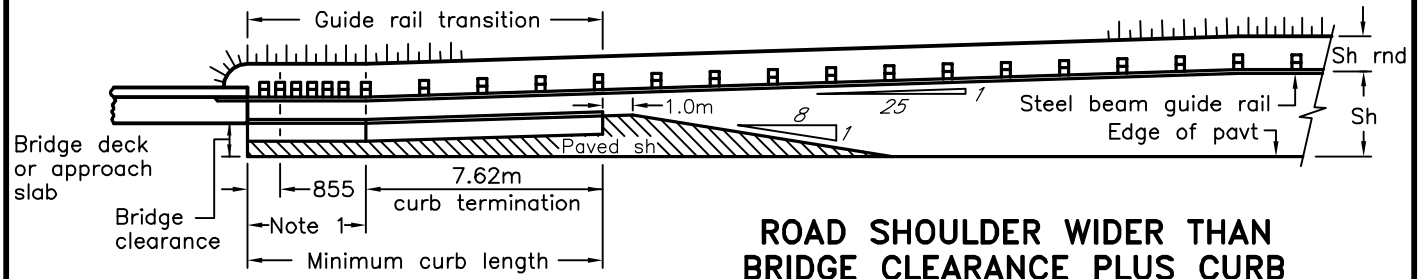
**OPSD 912.481**



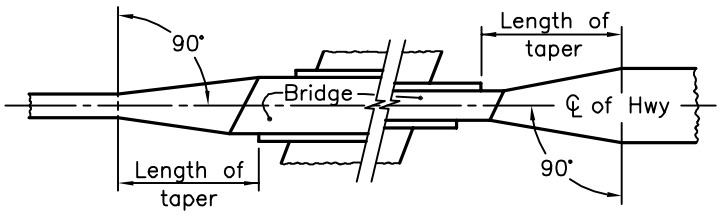

## ROAD SHOULDER NARROWER THAN BRIDGE CLEARANCE PLUS CURB




## ROAD SHOULDER SAME WIDTH AS BRIDGE CLEARANCE PLUS CURB




## ROAD SHOULDER WIDER THAN BRIDGE CLEARANCE PLUS CURB




### FOR SKEWED STRUCTURE:

The pavement taper is to end on a line at right angles to ℄ of highway, length of taper shall be measured from bridge corner that allows greatest length of tapered section.

NOTES:

1 Tangent to structure shall be one standard rail length +855mm long minimum. If approach slab is more than one standard beam element +855mm beyond wing wall, then tangent section shall be taken to end of approach slab.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM STRUCTURE APPROACH TREATMENT INSTALLATION – RURAL HIGHWAY | | | |
| | OPSD 912.530 | | |

| Steel Beam Guide Rail Installation on Curve | | | | | | |
|---|---|---|---|---|---|---|
| Post Spaces | SBGR Elements | SBGR Curve Radius, m, Note 4 | | | Object Free Zone | |
| | | $D$ = 70° | $D$ = 90° | $D$ = 110° | $L$, m | $W$, m |
| 2 | 1 | 3.19 | 2.44 | N/A | 7.50 | 4.50 |
| 4 | 2 | 6.24 | 4.85 | 3.96 | 10.00 | 4.50 |
| 6 | 3 | 9.36 | 7.28 | 5.95 | 12.50 | 6.00 |
| 8 | 4 | 12.47 | 9.70 | 7.94 | 15.00 | 6.00 |

## NOTES:

1 Posts shall be breakway wooden post ③ to ⑥ shown on OPSD 922.430. Guide rail shall be bolted to offset block and post with a 16mm bolt and no washer.

2 Post shall be breakaway wooden post ③ to ⑥ shown on OPSD 922.430. Guide rail at this post shall be held in position with a metal shelf angle detailed on OPSD 922.410. On larger radii with two or more SBGR elements, guide rail shall be bolted to the posts with a 16mm bolt with no offset block and no washer.

3 Post located at end of radius shall be as per post ① and ② with post anchor tube and soil plate according to OPSD 922.430.

4 SBGR shall be shop bent to the specified radius.

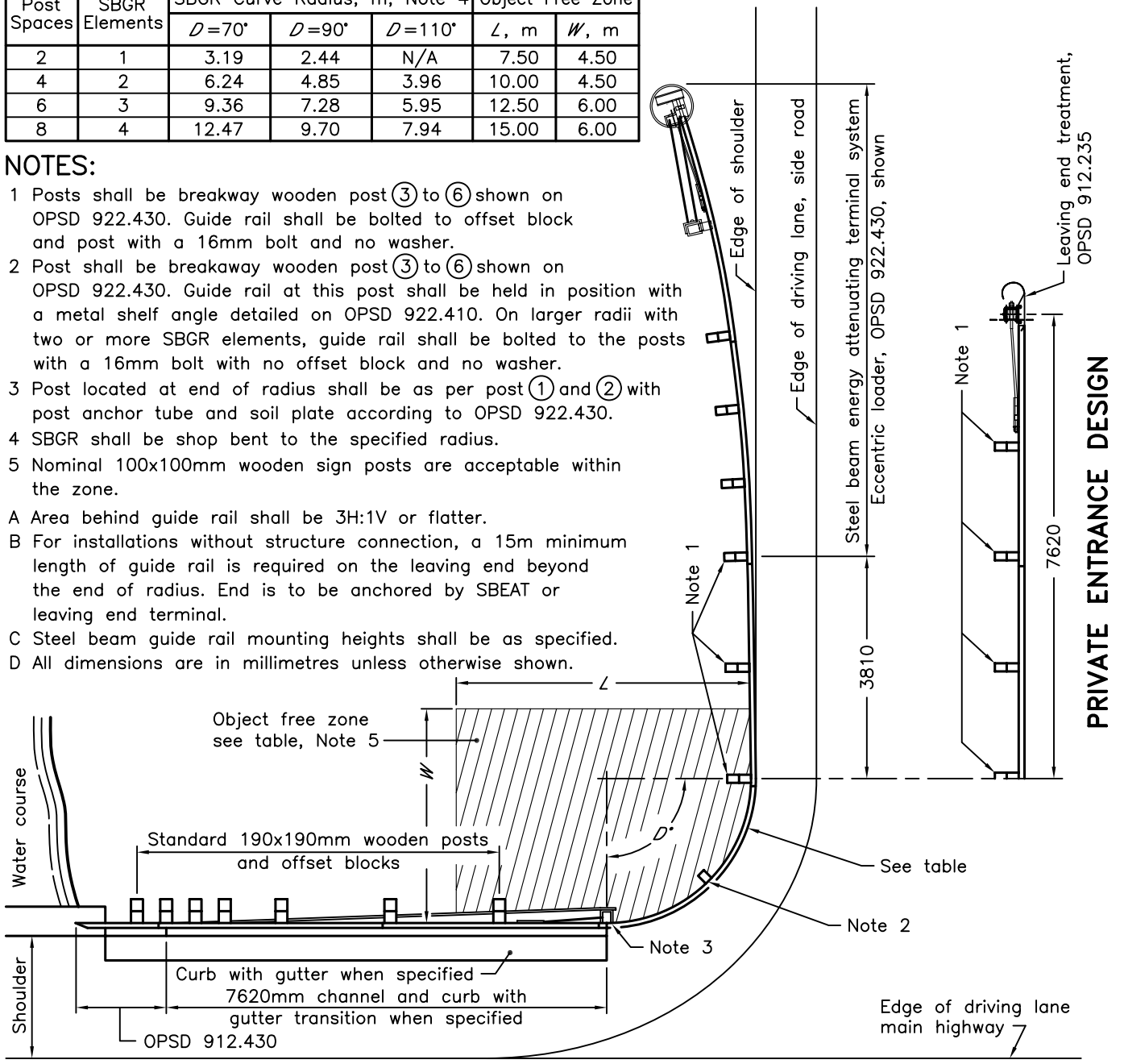
5 Nominal 100x100mm wooden sign posts are acceptable within the zone.

A Area behind guide rail shall be 3H:1V or flatter.

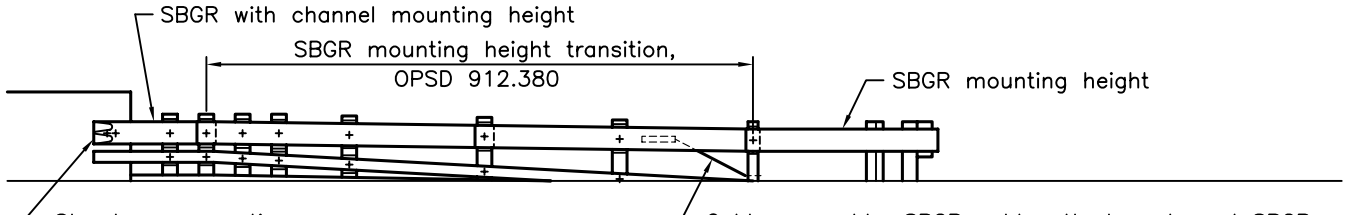
B For installations without structure connection, a 15m minimum length of guide rail is required on the leaving end beyond the end of radius. End is to be anchored by SBEAT or leaving end terminal.

C Steel beam guide rail mounting heights shall be as specified.

D All dimensions are in millimetres unless otherwise shown.




**PLAN**



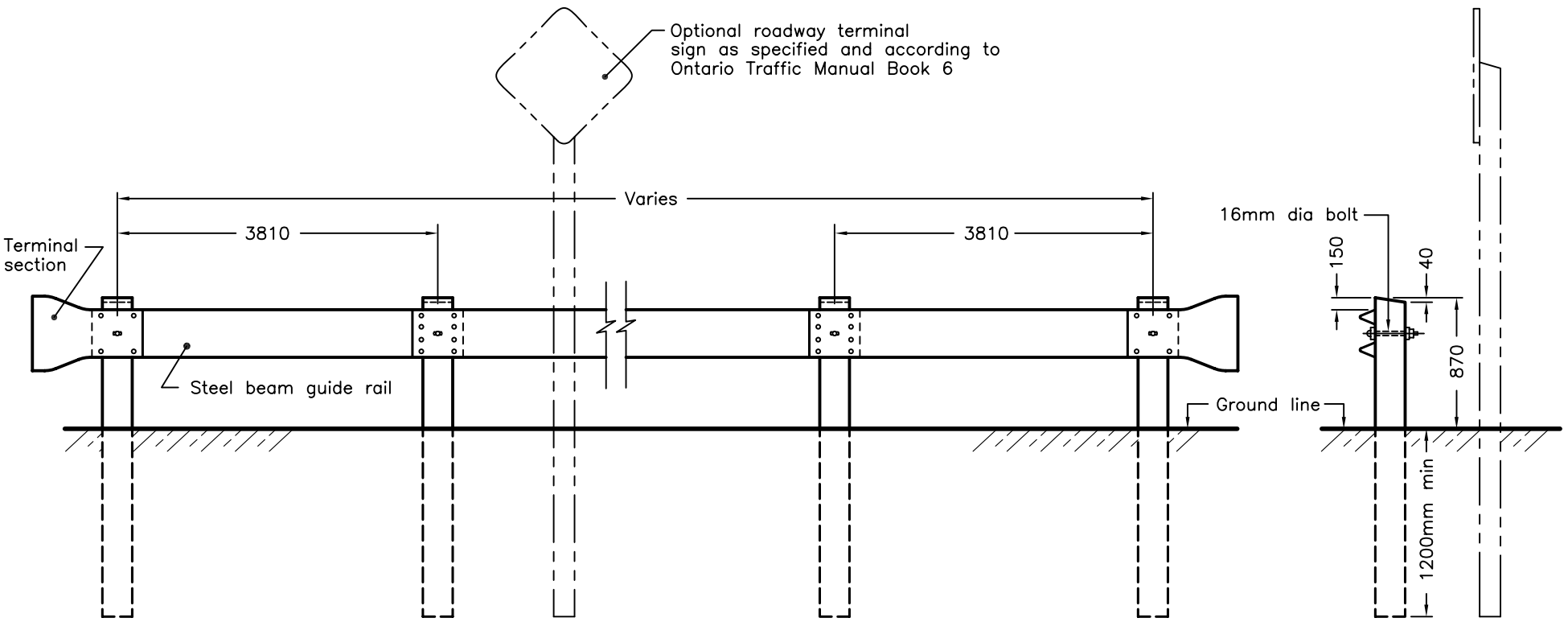

**ELEVATION**

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2008 | Rev 2

# GUIDE RAIL SYSTEM, STEEL BEAM INSTALLATION – ENTRANCES AND INTERSECTING ROADWAYS

OPSD 912.531

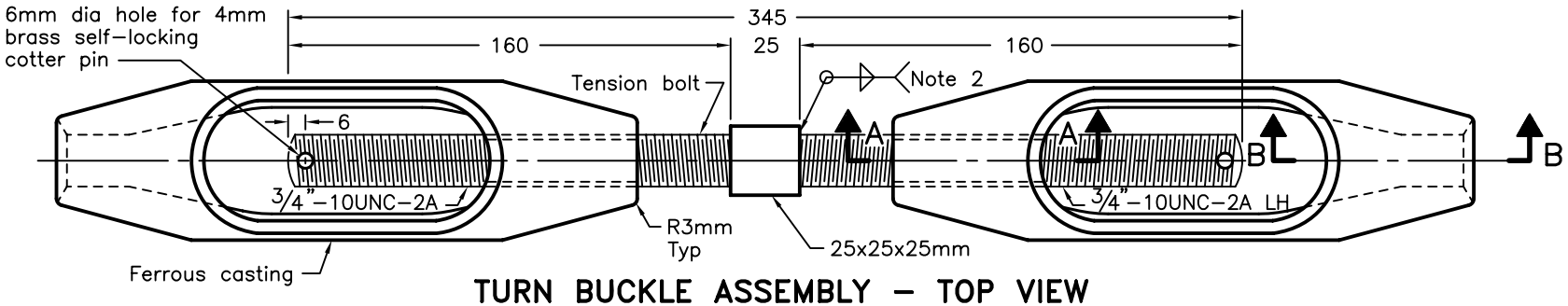



**ELEVATION** **SIDE**

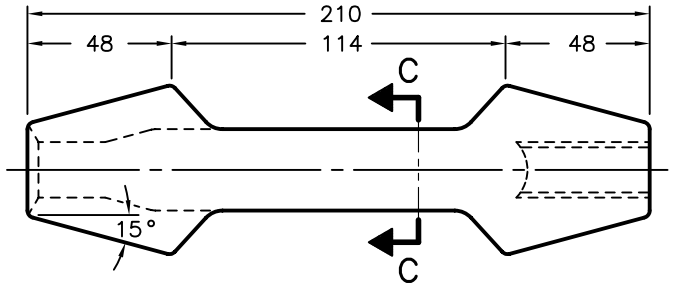
NOTES:

A Steel beam guide rail mounting heights shall be as specified.
B This OPSD to be read in conjunction with OPSD 912.101.
C Posts: Size 200x200mm nominal, 190x190mm ±1.5mm dressed, tops to have 25mm chamfer.
D All dimensions are in millimetres unless otherwise shown.

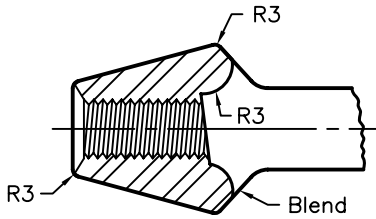
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, STEEL BEAM BARRICADE INSTALLATION | | | |
| | OPSD 912.532 | | |



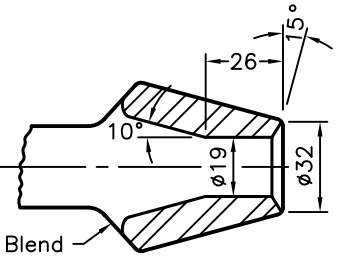

TURN BUCKLE ASSEMBLY – TOP VIEW



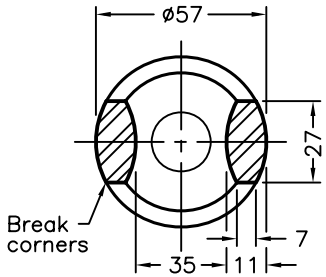

END FITTING – SIDE VIEW



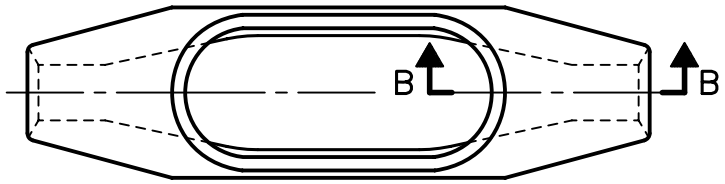

SECTION A–A



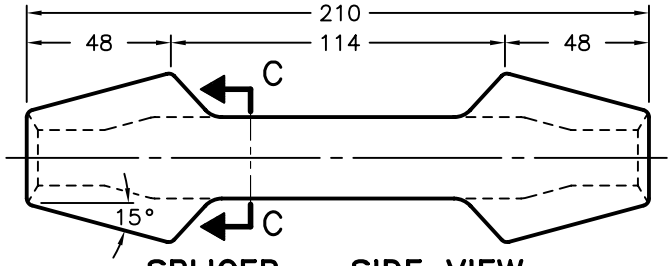

SECTION B–B



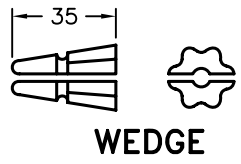

SECTION C–C



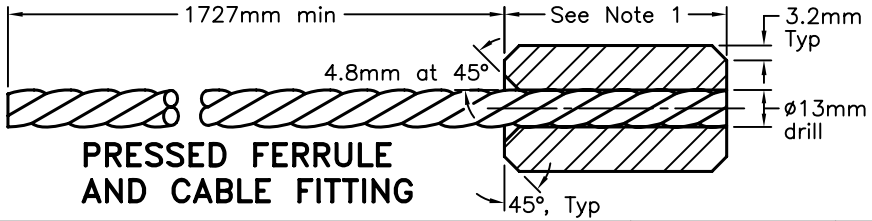

SPLICER – TOP VIEW



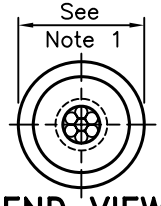

SPLICER – SIDE VIEW




WEDGE




PRESSED FERRULE AND CABLE FITTING




END VIEW

NOTES:

1 Uncompressed ferrule: length 90mm, diameter 30mm.
Compressed ferrule: length 100mm min, diameter 25mm min.

2 As an option, a square or hex nut may be welded to a 3/4"–10UNC–2A threaded bar.

A Dimensions of ferrous castings to have tolerance of ±0.7mm.

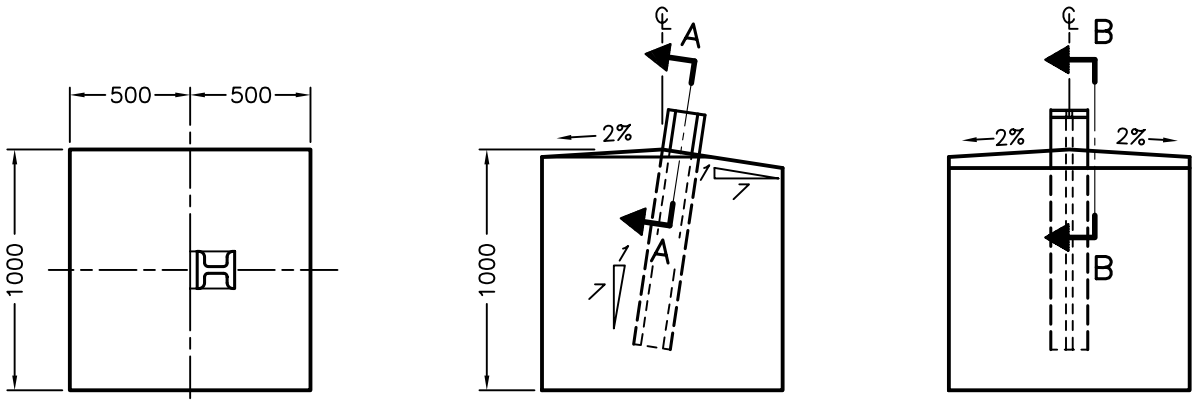
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

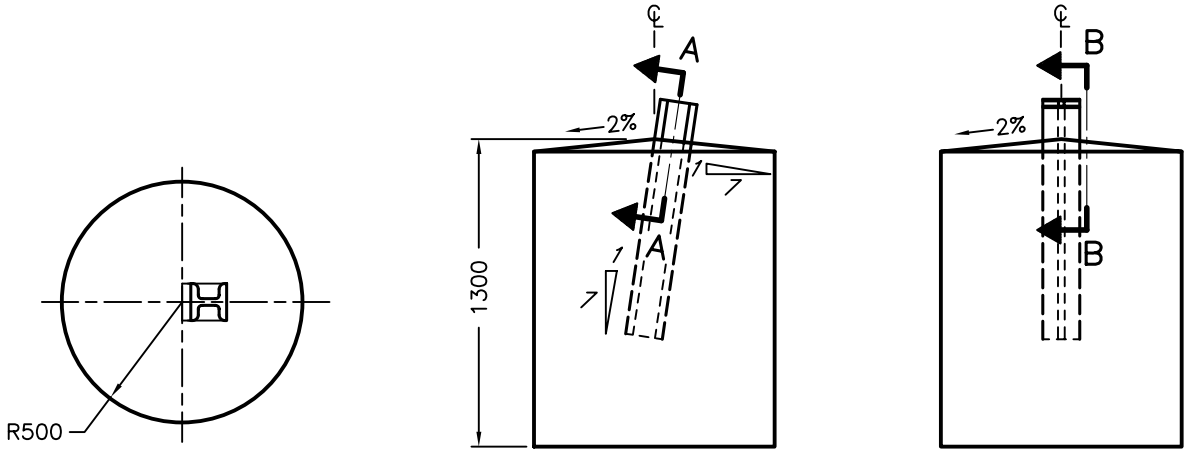
Nov 2008 | Rev 1

# GUIDE RAIL SYSTEM, CABLE COMPONENT – CABLE FITTINGS

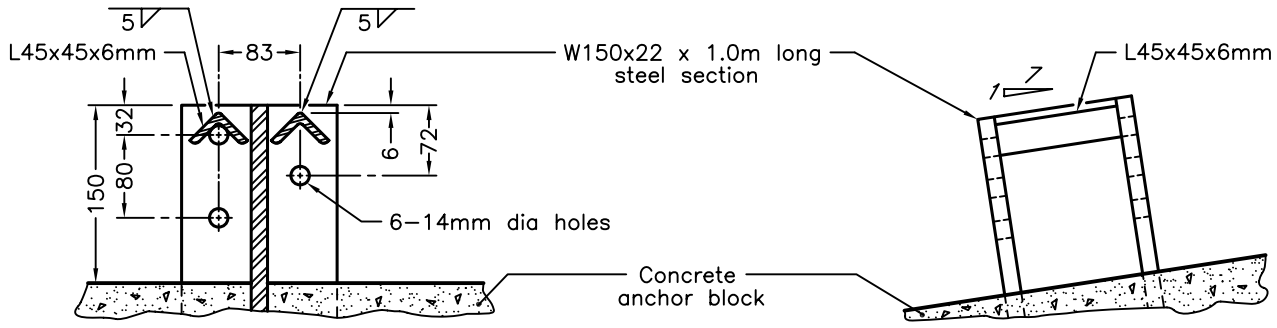
OPSD 913.101




CUBICAL ANCHOR BLOCK




CYLINDRICAL ANCHOR BLOCK



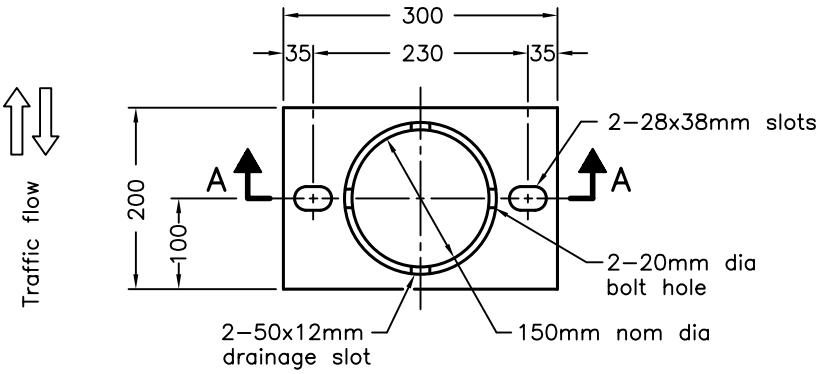

SECTION A–A

SECTION B–B

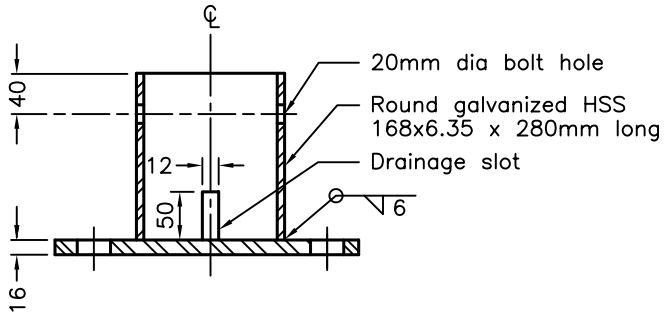
NOTES:

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CABLE COMPONENT – CONCRETE ANCHOR BLOCKS | | | |
| | OPSD 913.102 | | |




PLAN

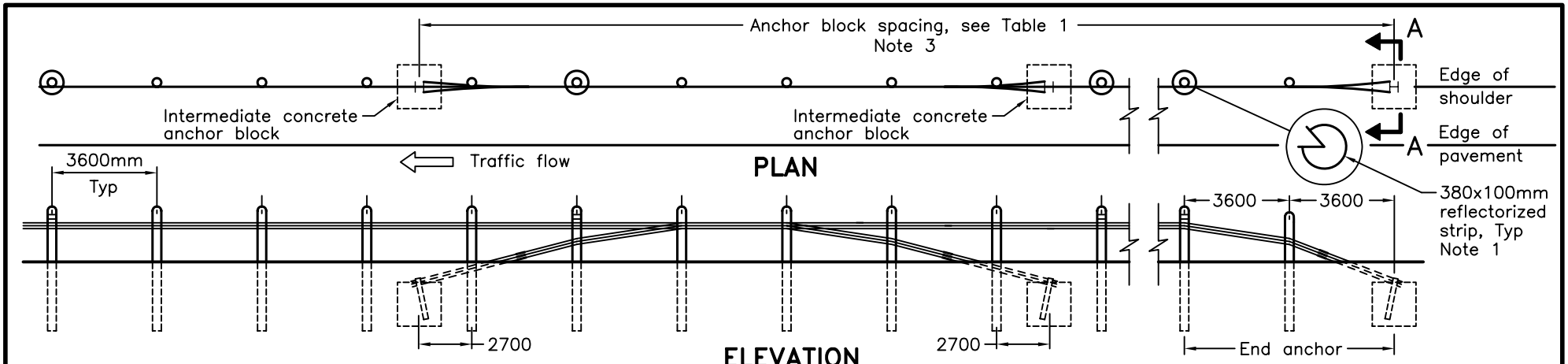


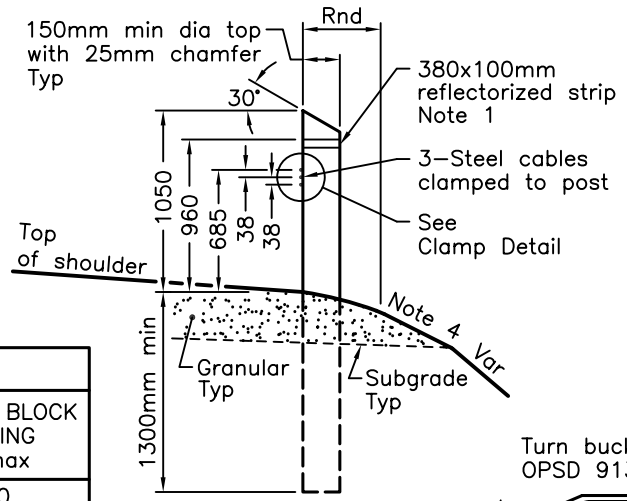

SECTION A–A

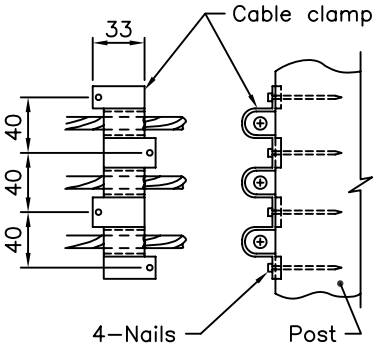
NOTES:

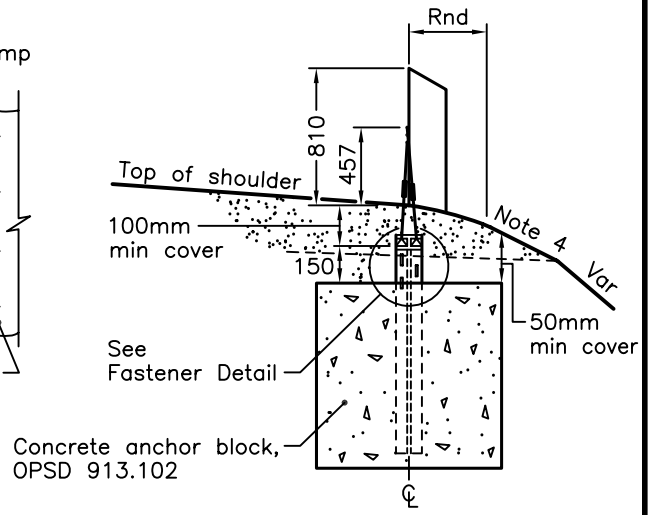
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev | 1 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CABLE<br>COMPONENT – WOODEN POST BASE PLATE | | | |
| | OPSD 913.103 | | |

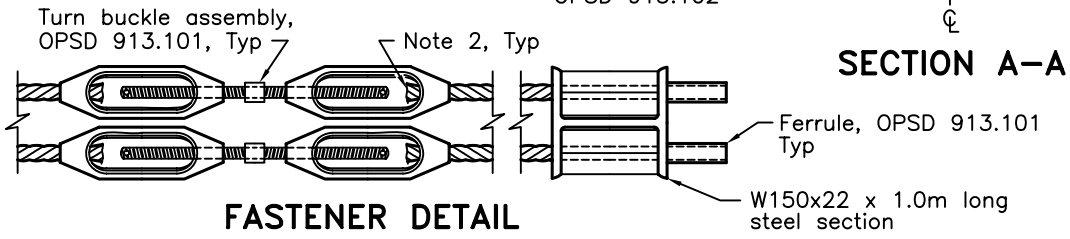



| TABLE 1 | |
|---|---|
| RADIUS OF CURVATURE m | ANCHOR BLOCK SPACING m max |
| Over 600 | 300 |
| 250 to 600 | 100 |




NOTES:

1 Reflectorized strips as specified.
2 Ends of cable strands shall protrude past the end of the wedge 10mm.
3 Minimum installation length of 46.8m.
4 Slope 3H:1V or flatter when specified.

A All dimensions are in millimetres unless otherwise shown.

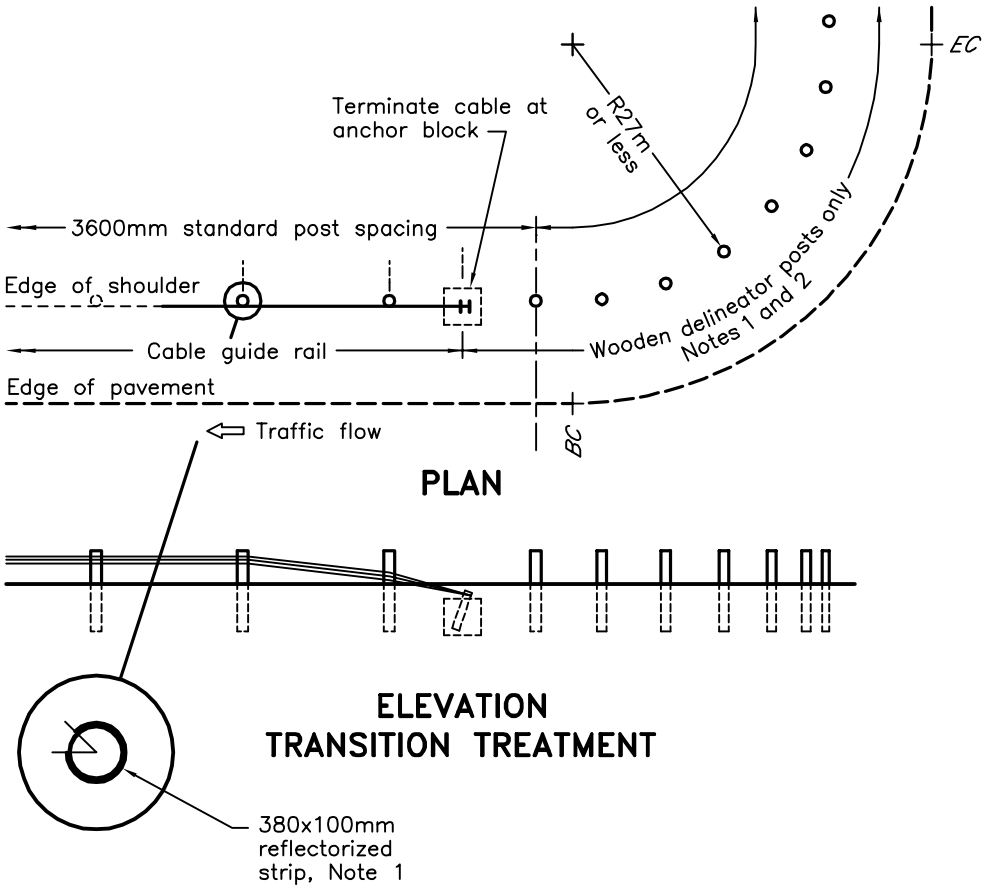
ONTARIO PROVINCIAL STANDARD DRAWING

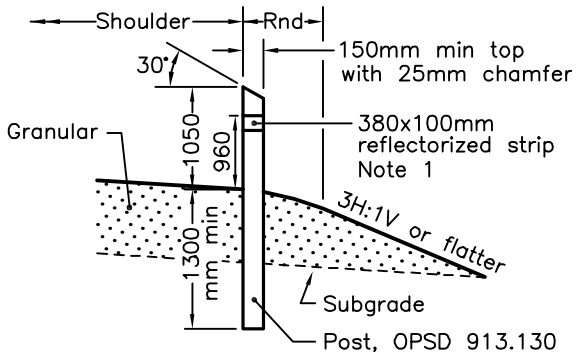
# GUIDE RAIL SYSTEM, CABLE INSTALLATION – SHOULDER

Nov 2008 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 913.130




## WOODEN DELINEATOR POST

NOTES:

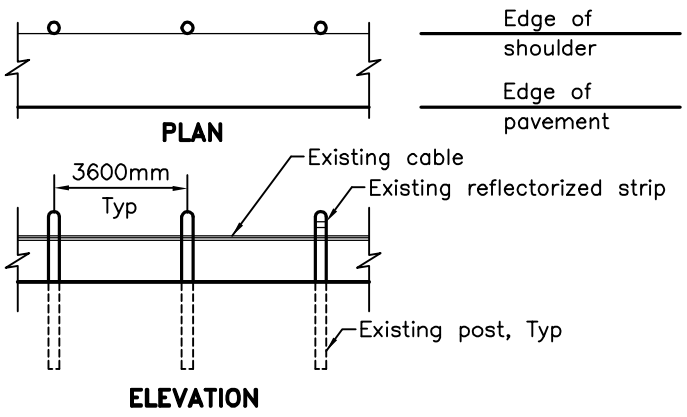
1 All posts shall be fitted with a reflectorized strip on 0.5mm aluminum, fastened with two 50mm aluminum nails.
Reflectors shall be according to Ontario Traffic Manual Book 11.

2 Post spacing shall be 1.8m.

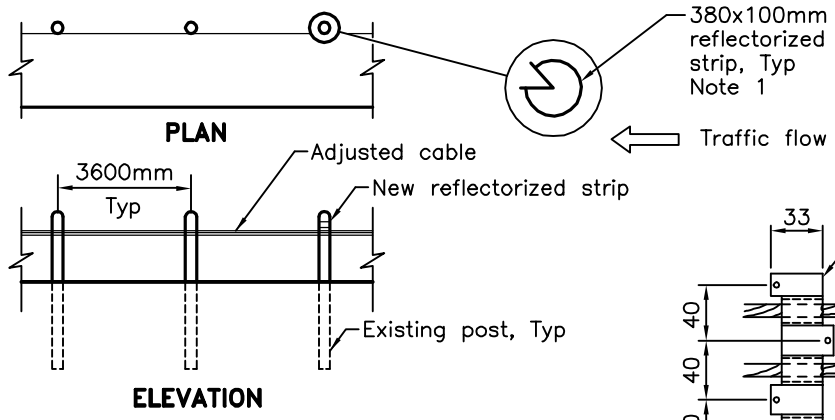
A This OPSD shall be read in conjunction with OPSD 913.130.

B All dimensions are in millimetres unless otherwise shown.

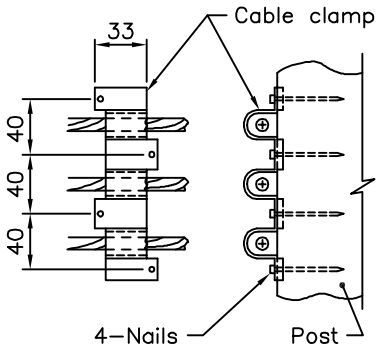
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 0 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, CABLE INSTALLATION ENTRANCES AND INTERSECTING ROADWAYS | | | |
| | OPSD 913.131 | | |



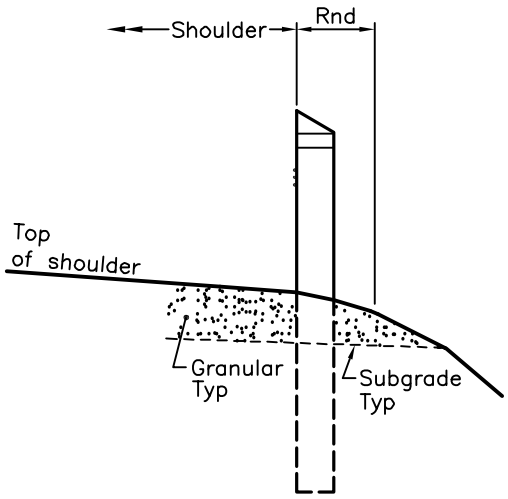

## EXISTING CABLE GUIDE RAIL



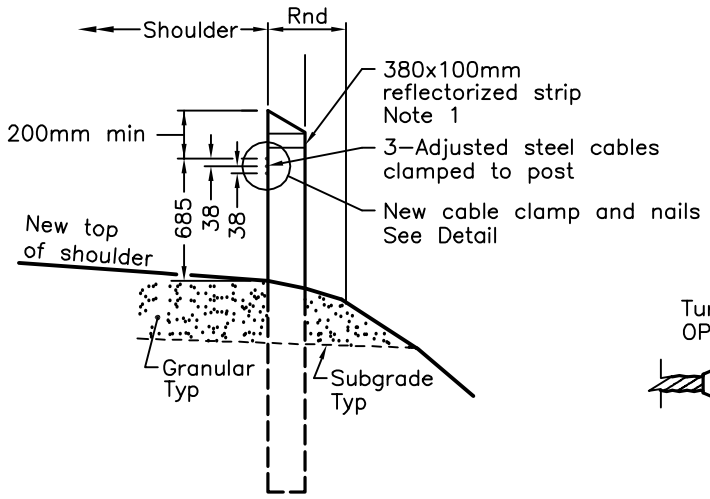

## ADJUSTED CABLE GUIDE RAIL



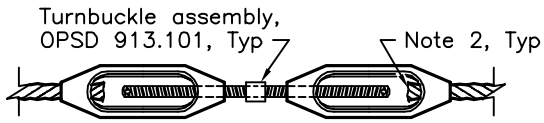

## CLAMP DETAIL




## EXISTING POST DETAIL




## ADJUSTED POST DETAIL




## TURNBUCKLE DETAIL

NOTES:

1 Reflectorized strips as specified.

2 Ends of cable strands shall protrude past the end of the wedge 10mm.

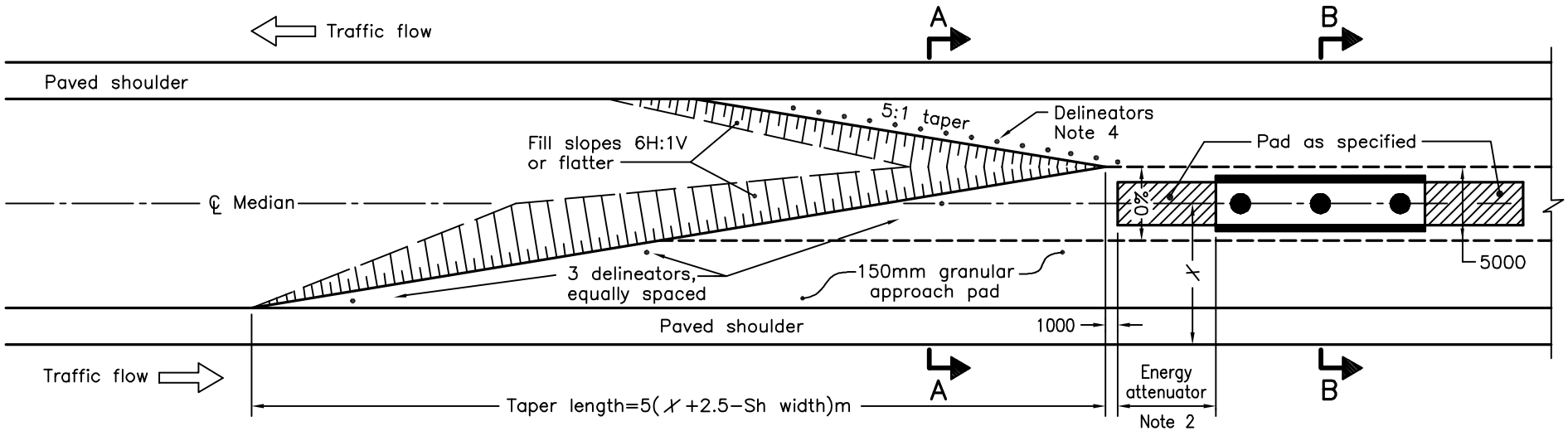
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

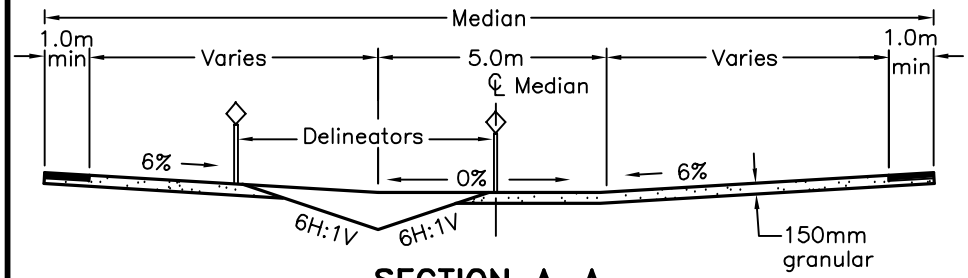
# GUIDE RAIL SYSTEM, CABLE ADJUSTMENT – SHOULDER

| Nov 2013 | Rev | 0 |
|---|---|---|

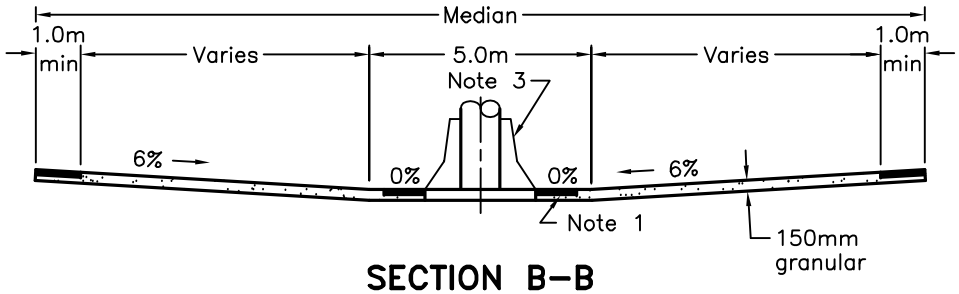
# OPSD 913.135




**PLAN**




**SECTION A–A**




**SECTION B–B**

NOTES:

1 When concrete barrier is used around piers, a 1.0m wide paved area is required in front of barrier.

2 Length varies depending on the length of energy attenuator plus the length of barrier transition required to accommodate the width of hazard.

3 Traffic barriers as specified.

4 Delineators shall be installed at 1.5m intervals at the leaving end of the energy attenuator.

A Delineator installation heights shall be according to OPSD 984.101.

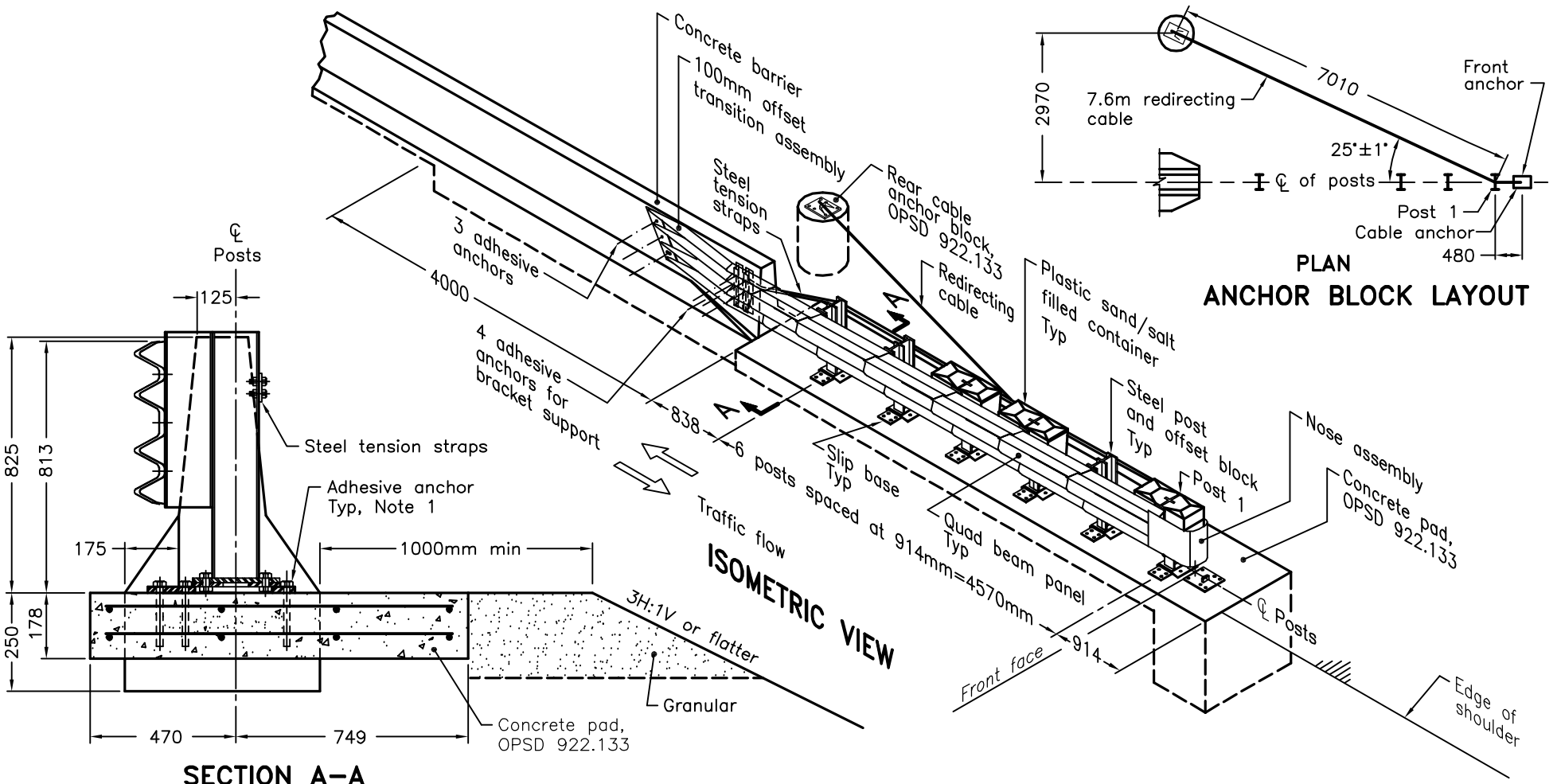
B Drainage as required.

C All dimensions are in millimetres unless otherwise shown.

LEGEND:

$X$ = distance from edge of driving lane to ℄ of energy attenuator

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 1 |
|---|---|---|---|
| **ENERGY ATTENUATOR, GENERAL INSTALLATION–GRANULAR APPROACH PAD, MEDIAN** | | | |
| | **OPSD 921.101** | | |




## NOTES:

1 Top of anchor bolt shall not project above concrete pad surface by more than 40mm.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C The system shall be anchored to concrete pad and rear cable anchor block detailed in OPSD 922.133.

D Right side installation is shown. Left side installation is inverse of that shown.

E System configuration meets NCHRP Report 350 TL–3.

F This OPSD shall be read in conjunction with OPSD 202.033.

G All dimensions are in millimetres unless otherwise shown.

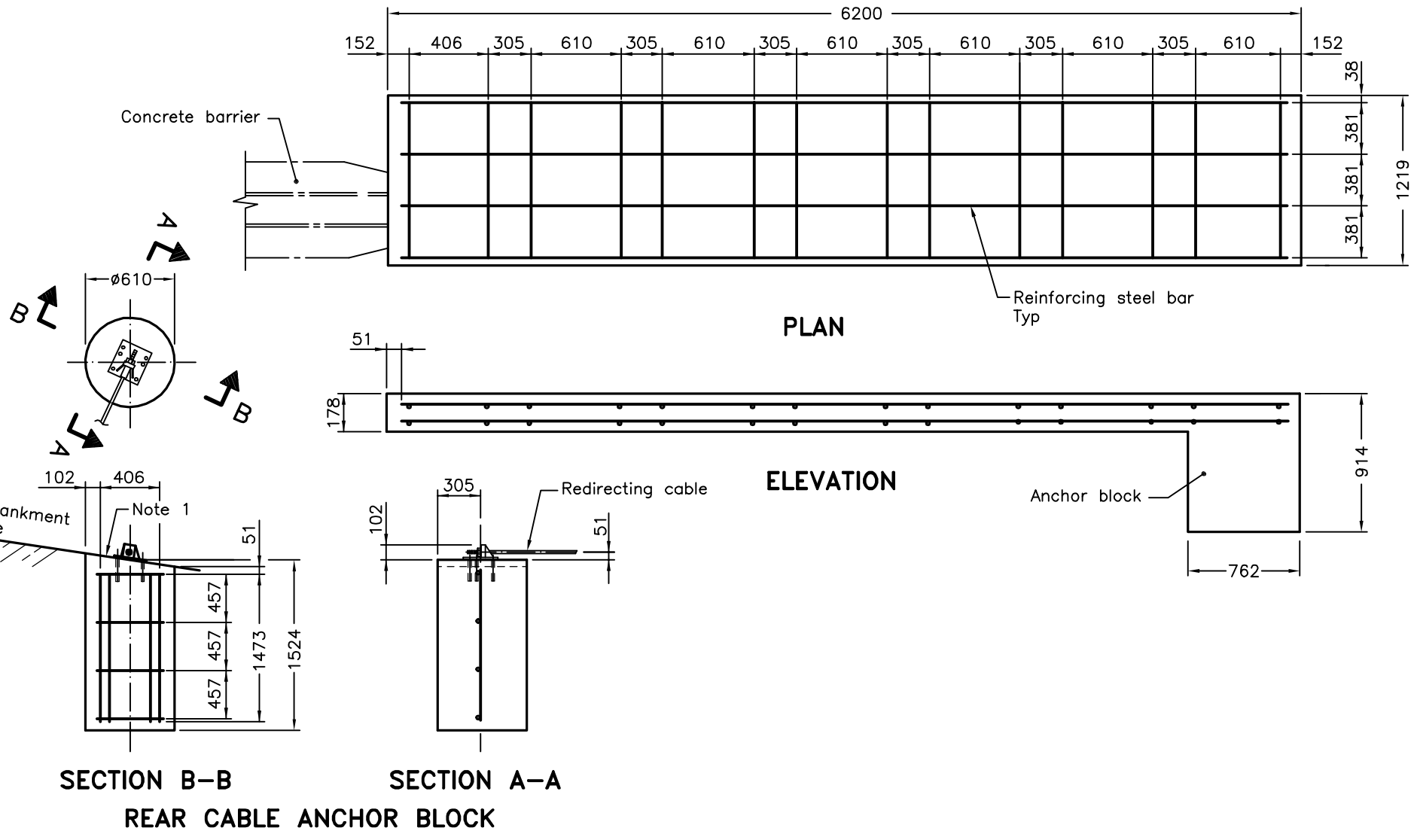
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADTREND SYSTEM INSTALLATION – CONCRETE BARRIER

Nov 2011 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSD

OPSD 922.131




NOTES:

1 Top of anchor block shall match embankment slope.

A All reinforcing shall be 15M reinforcing steel bars.

B All dimensions are in millimetres unless otherwise shown.

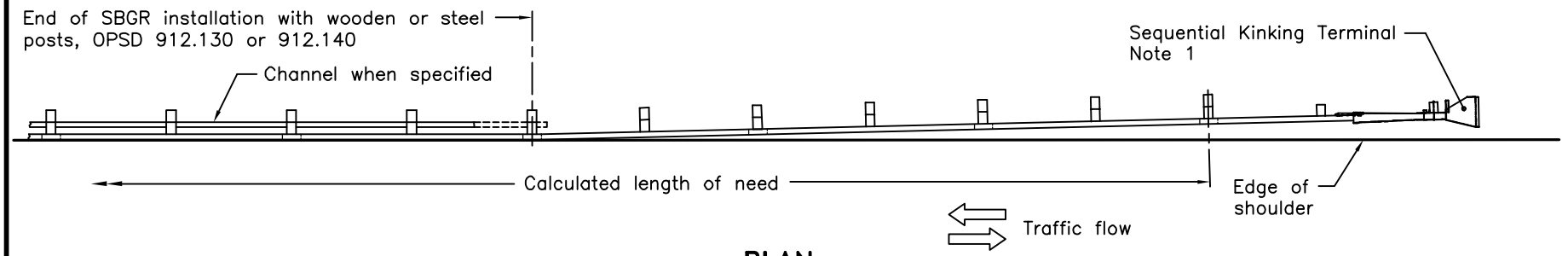
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADTREND SYSTEM INSTALLATION – CONCRETE PAD AND REAR CABLE ANCHOR BLOCK

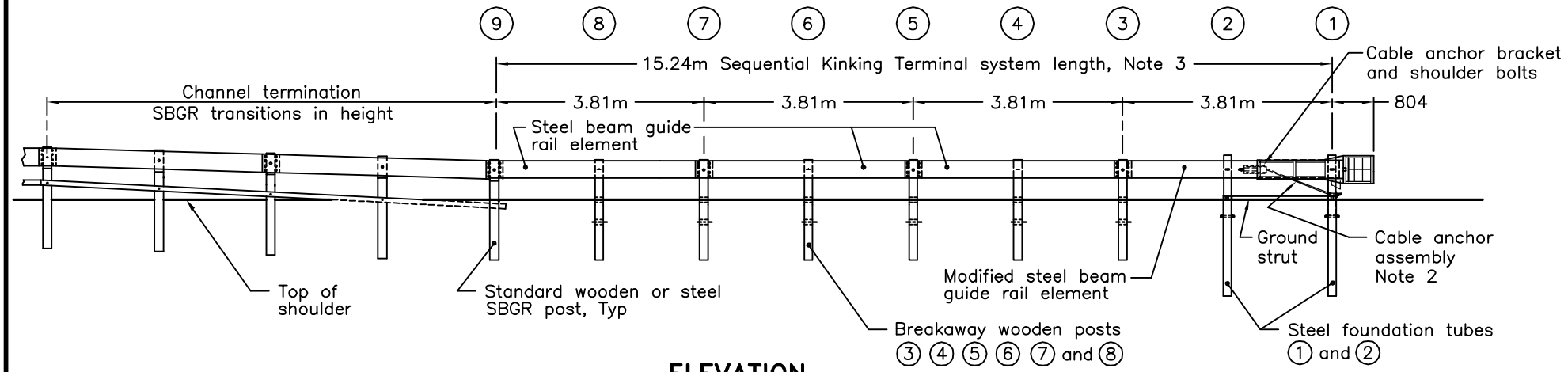
Nov 2011 | Rev 2

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 922.133




**PLAN**




**ELEVATION**

## NOTES:

1 This OPSD shows right shoulder installation. The Sequential Kinking Terminal shall be inverted for left shoulder installation.

2 Two nuts and a washer shall be installed and locked tight at each end of the cable anchor assembly.

3 The system length shall be installed in a straight line parallel to the roadway, at a 50:1 flare rate, or at a 25:1 flare rate as specified.

A Delineation shall be according to OPSD 984.201 and 984.202.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 TL–3.

D This OPSD to be read in conjunction with OPSD 202.031 or 202.032 as specified.

E All dimensions are in millimetres unless otherwise shown.

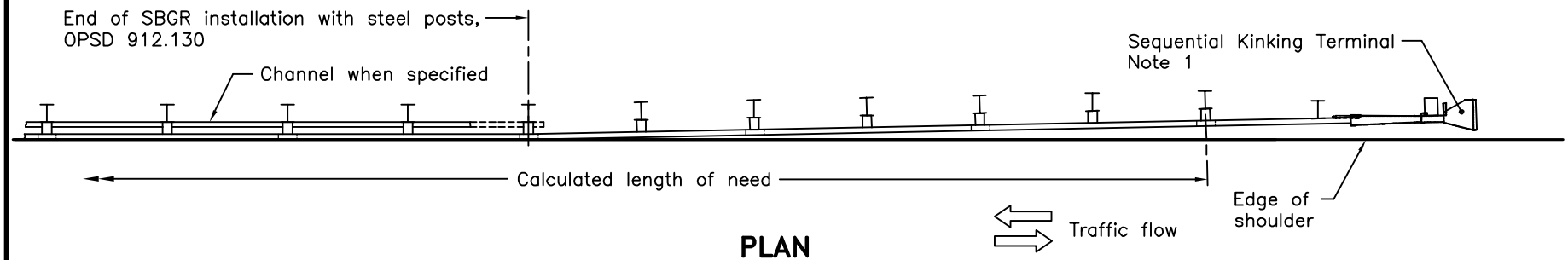
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL SEQUENTIAL KINKING TERMINAL SYSTEM WITH WOODEN POSTS, INSTALLATION

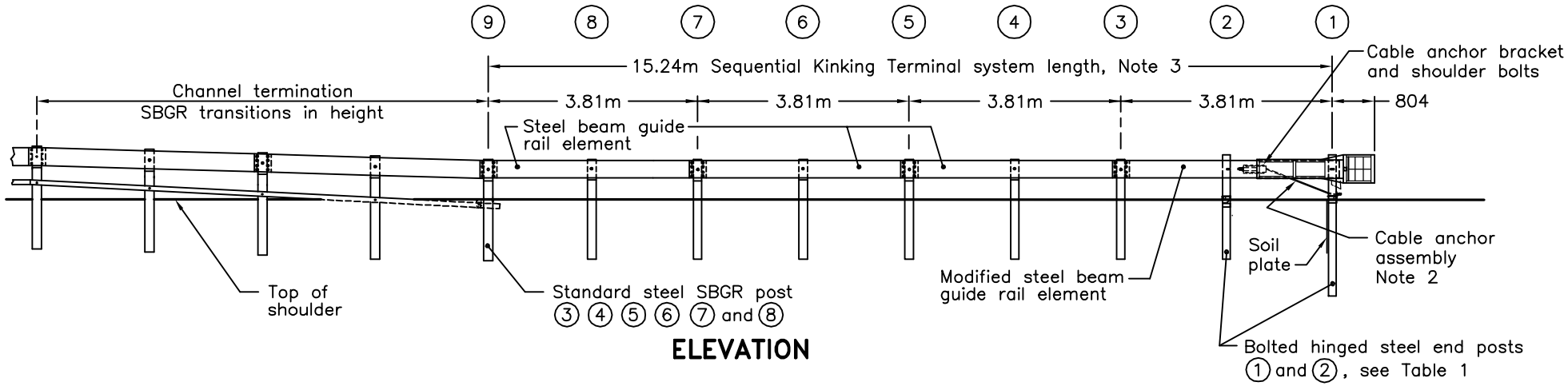
Nov 2010 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 922.180




**PLAN**




**ELEVATION**

## NOTES:

1 This OPSD shows right shoulder installation. The Sequential Kinking Terminal shall be inverted for left shoulder installation.

2 Two nuts and a washer shall be installed and locked tight at each end of the cable anchor assembly.

3 The system length shall be installed in a straight line parallel to the roadway, at a 50:1 flare rate, or at a 25:1 flare rate as specified.

A Delineation shall be according to OPSD 984.201 and 984.202.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 TL–3.

D This OPSD to be read in conjunction with OPSD 202.031 or 202.032 as specified.

E All dimensions are in millimetres unless otherwise shown.

Table 1
Hinged Steel End Posts

| Post | 1 | 2 |
|---|---|---|
| Upper | Tube 6x6x1/8" | W6x9 |
| Lower | W6x15 | W6x9 |

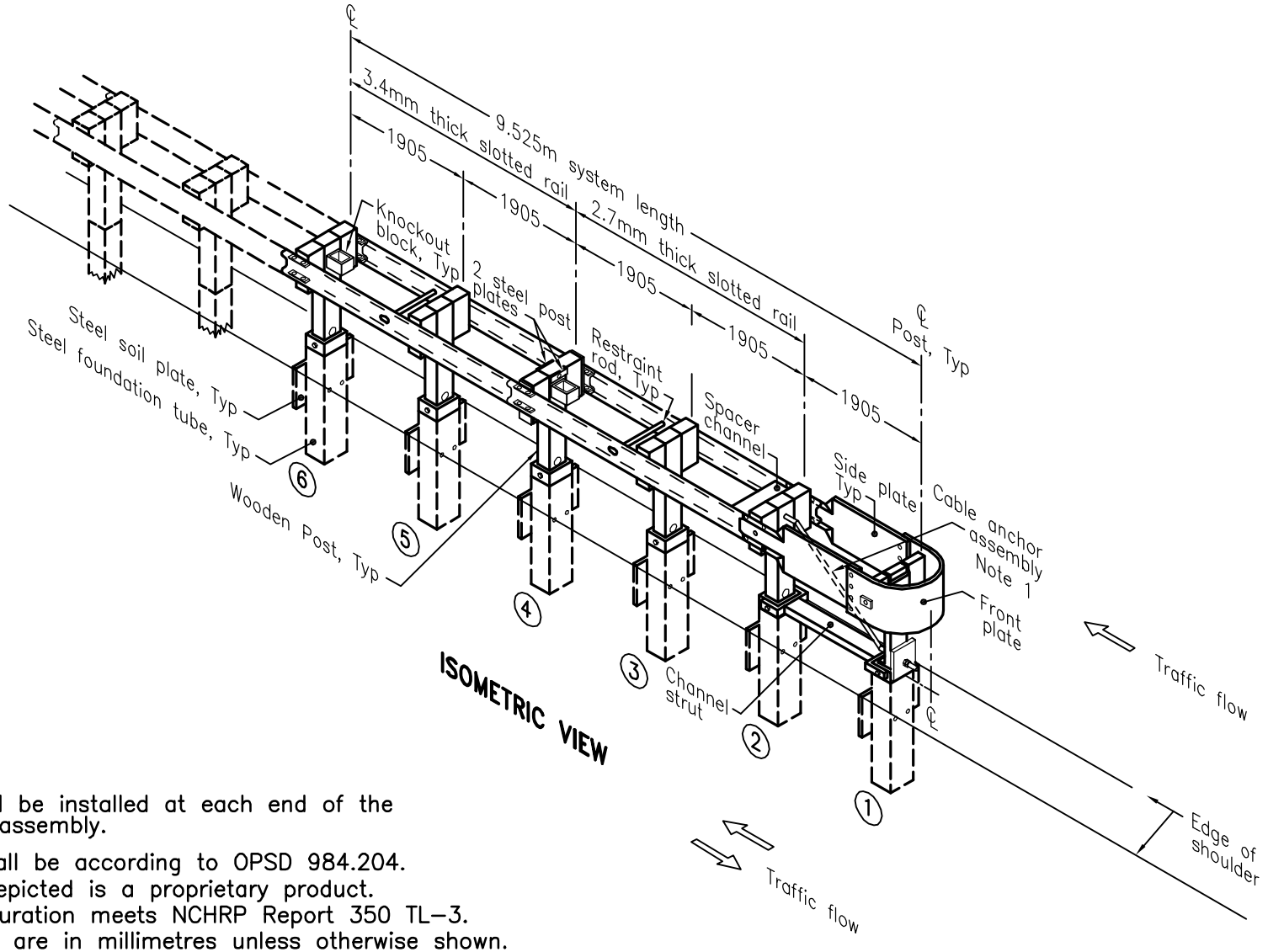
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, END TREATMENT STEEL BEAM ENERGY ATTENUATING TERMINAL SEQUENTIAL KINKING TERMINAL SYSTEM WITH STEEL POSTS, INSTALLATION

Nov 2010 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 922.181



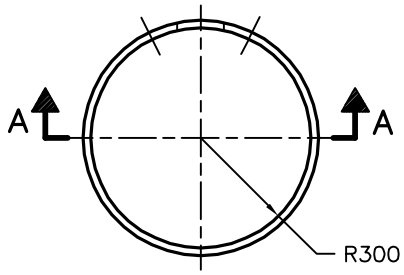

ISOMETRIC VIEW

NOTES:

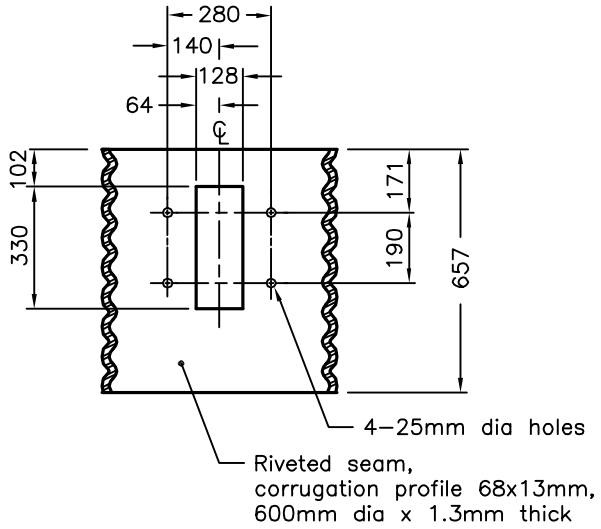
1 Two nuts shall be installed at each end of the cable anchor assembly.

A Delineation shall be according to OPSD 984.204.
B The system depicted is a proprietary product.
C System configuration meets NCHRP Report 350 TL–3.
D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| ENERGY ATTENUATOR, END TREATMENT<br>CRASH–CUSHION ATTENUATING<br>TERMINAL (CAT–350) SYSTEM<br>ASSEMBLY | | | |
| | OPSD 922.330 | | |

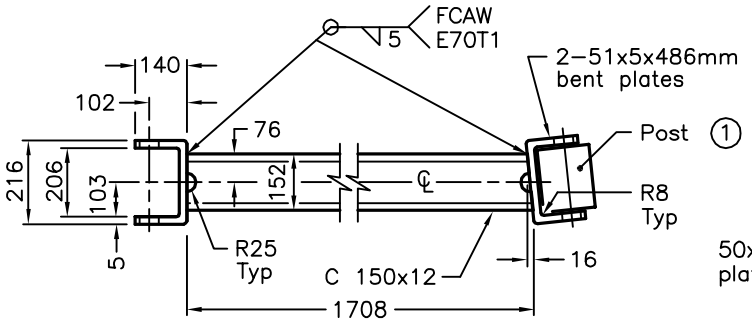



PLAN

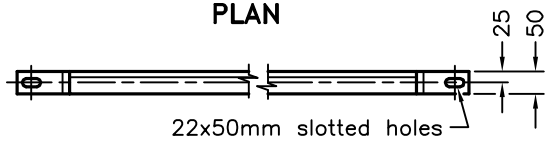



SECTION A–A
Note 1

## RIVETED CORRUGATED STEEL PIPE

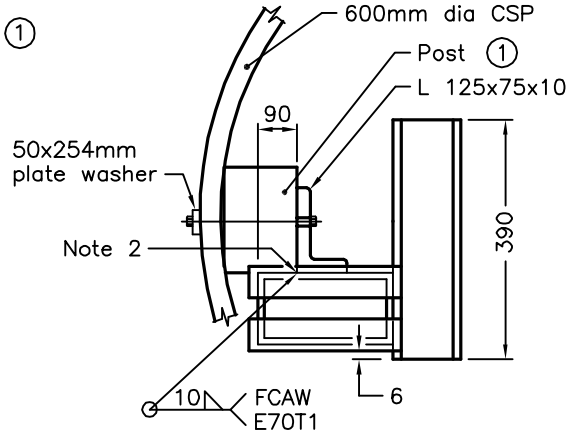



PLAN

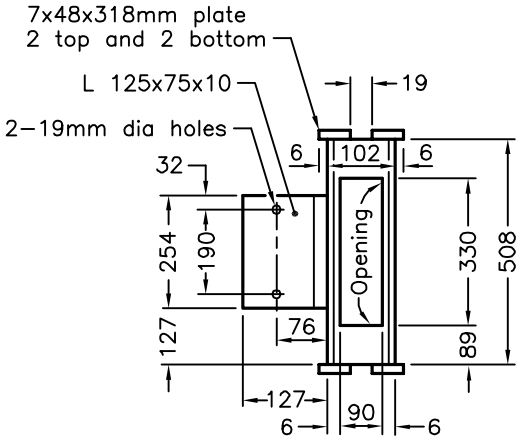



ELEVATION

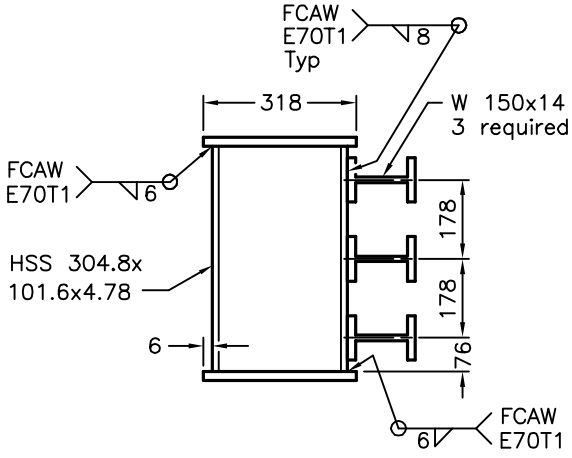
## STRUT




TOP VIEW




SIDE VIEW




FRONT VIEW

## ECCENTRIC LOADER ASSEMBLY

NOTES:

1 Dimensions measured on outer circumference of CSP.

2 Corner of post (1) shall receive 10mm chamfer.

A All dimensions are in millimetres unless otherwise shown.

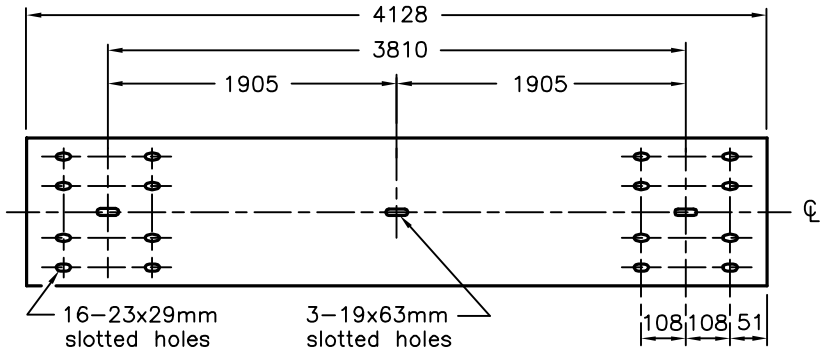
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, END TREATMENT
# ECCENTRIC LOADER TERMINAL SYSTEM
# COMPONENT – LOADER ASSEMBLY

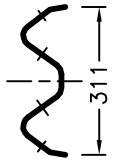
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

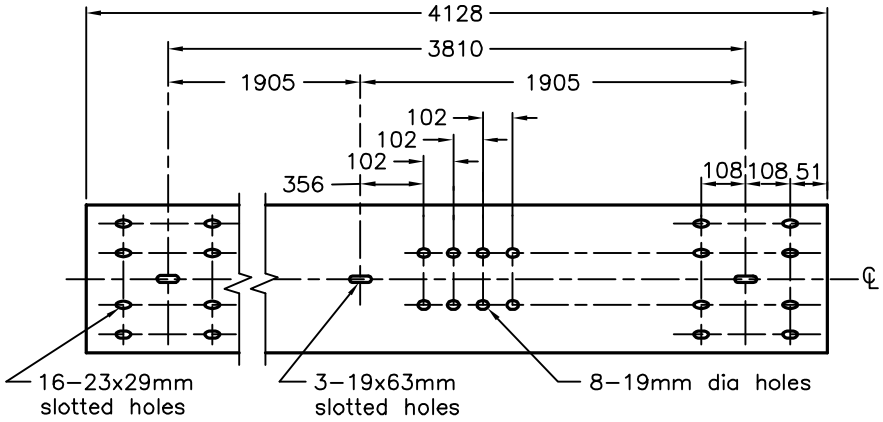
OPSD 922.401




FRONT ELEVATION
FROM POST (3) TO (6)

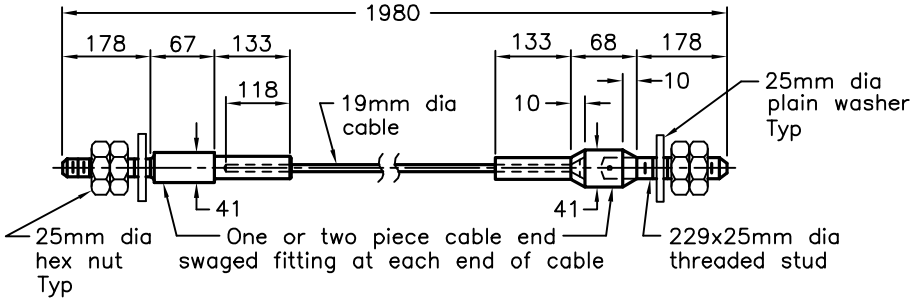



SIDE VIEW



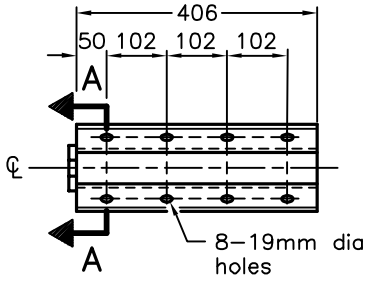

FRONT ELEVATION
FROM POST (1) TO (3)

## STEEL BEAM GUIDE RAIL

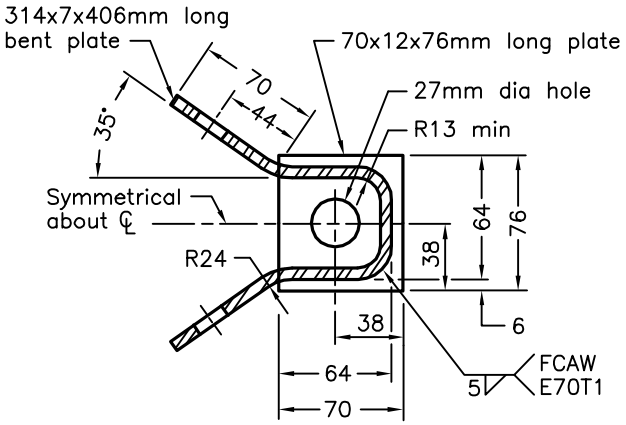



ONE PIECE CABLE END TWO PIECE CABLE END

CABLE ASSEMBLY




STEEL BEAM GUIDE RAIL
CABLE ATTACHMENT




SECTION A–A

NOTES:
A All dimensions are in millimetres unless otherwise shown.

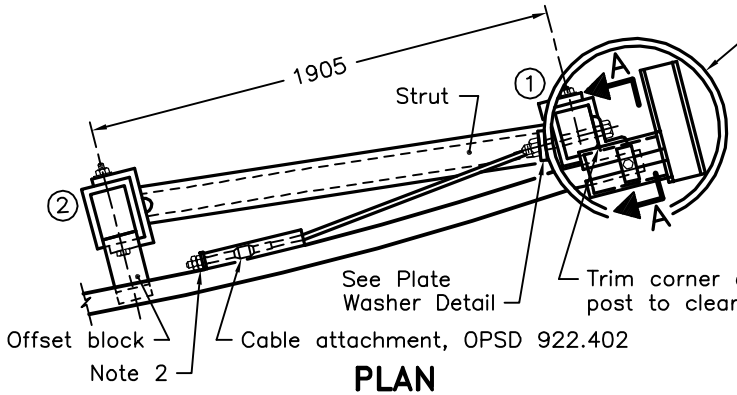
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, END TREATMENT
# ECCENTRIC LOADER TERMINAL SYSTEM
# COMPONENT – RAIL AND CABLE ATTACHMENT

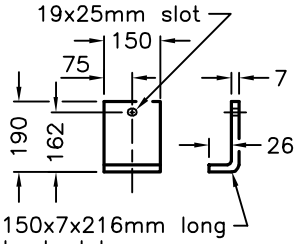
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

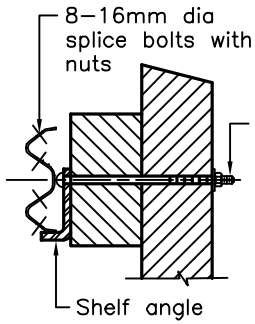
OPSD 922.402



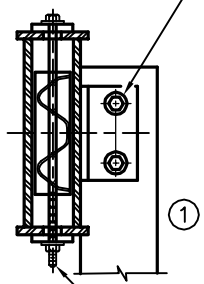

## PLAN



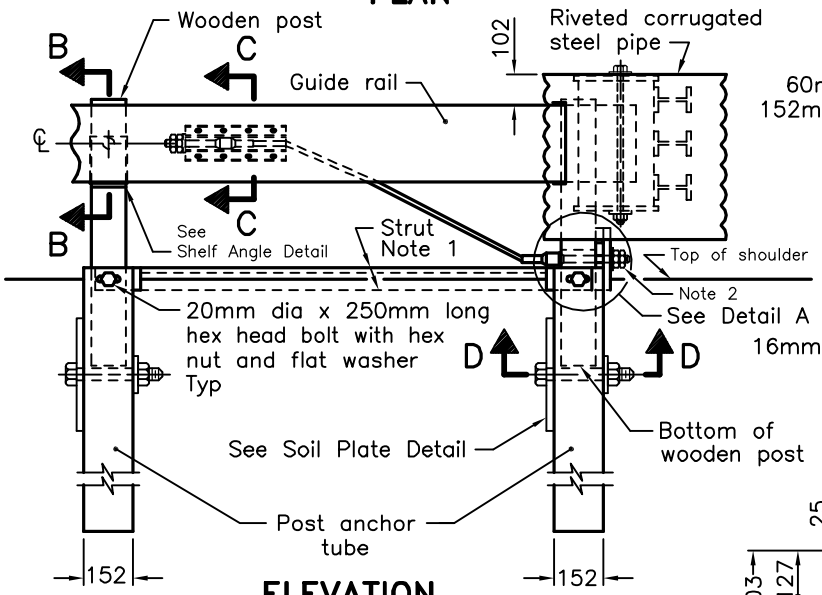

## SHELF ANGLE DETAIL



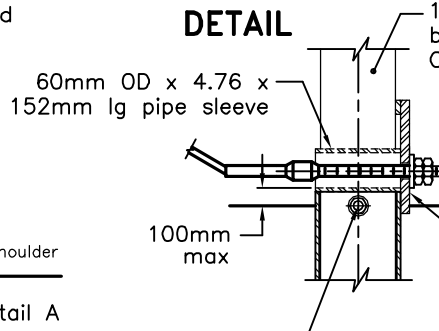

## SECTION B–B



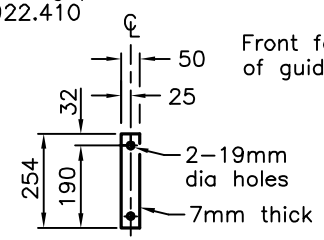

## SECTION A–A



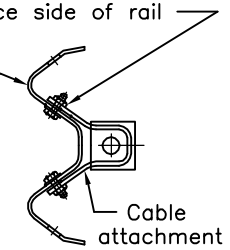

## ELEVATION



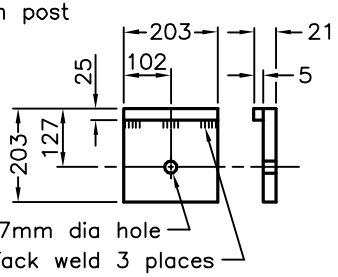

## DETAIL A



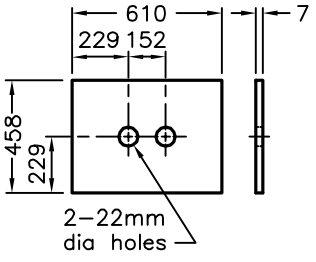

## PLATE WASHER DETAIL



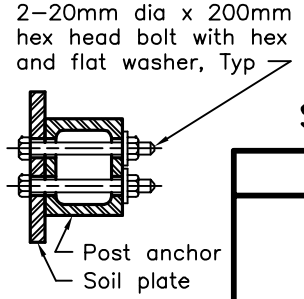

## SECTION C–C




## STEEL BEARING PLATE DETAIL




## SOIL PLATE DETAIL




## SECTION D–D

NOTES:

1 For right shoulder installations the sides of strut shall face downward and shall face upward on left shoulder installations.

2 Two nuts and a washer shall be installed at each end of the cable assembly.

3 Steel bearing plate shall be secured against rotation using nails into post.

A All dimensions are in millimetres unless otherwise shown.

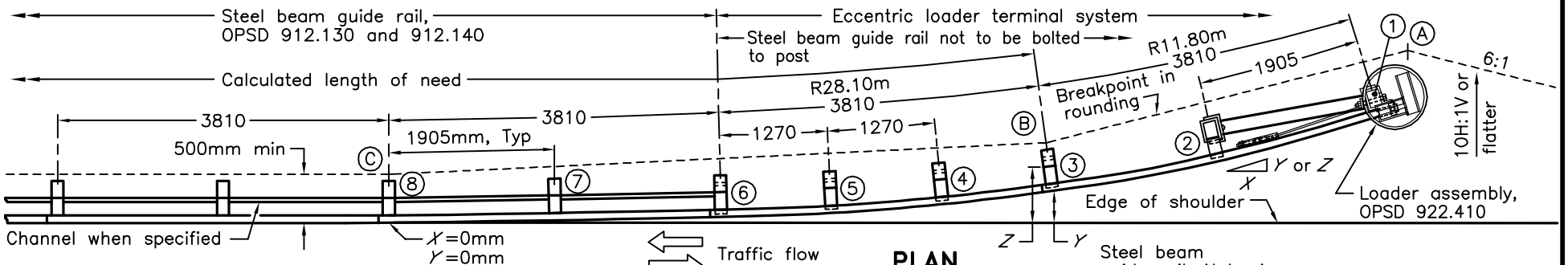
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

# ENERGY ATTENUATOR, END TREATMENT
# ECCENTRIC LOADER TERMINAL SYSTEM
# ASSEMBLY – LOADER DETAIL

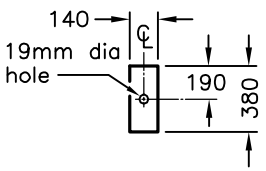
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

OPSD 922.410

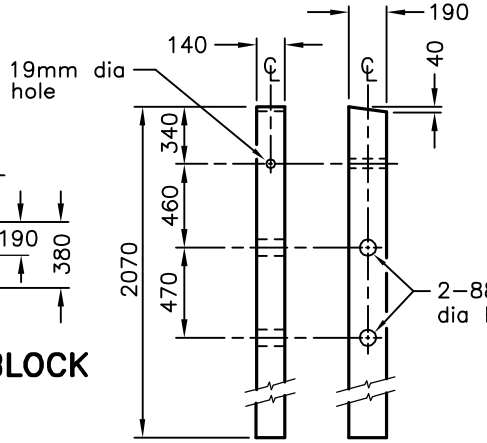



| BREAKPOINT IN ROUNDING MINIMUM OFFSET | | |
|---|---|---|
| FLARE POINT | X | Y |
| C | 0 | 500 |
| B | 7500 | 850 |
| A | 12000 | 2000 |

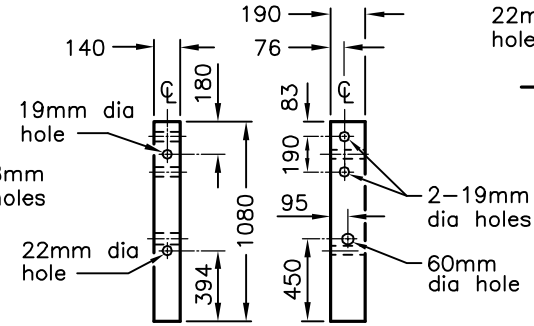
| RAIL AND POST OFFSET | | | |
|---|---|---|---|
| | | SHOULDER TO FACE OF | |
| | | RAIL | POST |
| POSTS | X | Y | Z |
| 8 | 0 | 0 | 270 |
| 7 | 1905 | 25 | 295 |
| 6 | 3810 | 65 | 345 |
| 5 | 5075 | 105 | 385 |
| 4 | 6335 | 202 | 482 |
| 3 | 7595 | 355 | 635 |
| 2 | 9475 | 630 | 910 |
| 1 | 11345 | 1220 | 1310 |



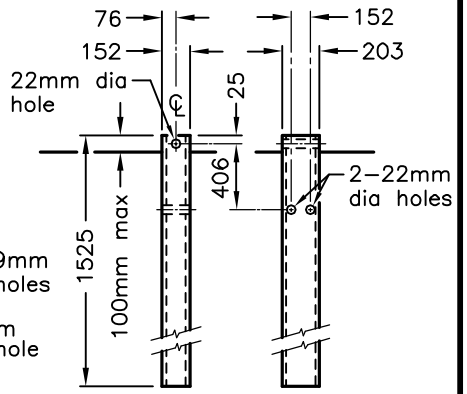

OFFSET BLOCK




FRONT VIEW SIDE VIEW
POSTS ③ TO ⑥




FRONT VIEW SIDE VIEW
POSTS ① AND ②




FRONT VIEW SIDE VIEW
**POST ANCHOR TUBE DETAIL**
**HSS 203.2x152.4x4.78**
**1525mm long**

**BREAKAWAY WOODEN POST DETAIL**

## NOTES:

1 Curved rail elements shall be shop bent to the specified radius.

2 Channel shall not be used within the eccentric loader terminal system.

A Delineation shall be according to OPSD 984.201 and 984.202.

B This OPSD shall be read in conjunction with OPSD 202.030, 922.401, 922.402, and 922.410.

C All dimensions are in millimetres unless otherwise shown.

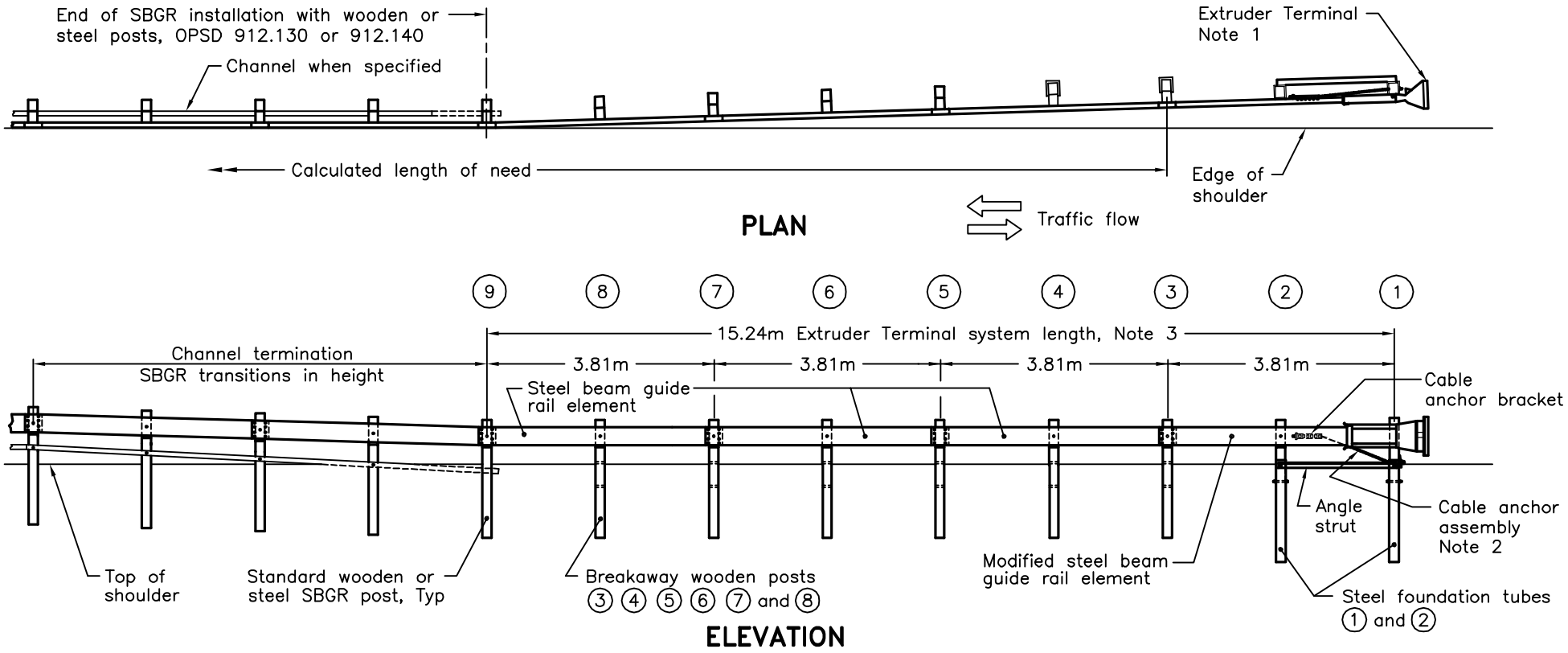
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, END TREATMENT ECCENTRIC LOADER TERMINAL SYSTEM INSTALLATION – LAYOUT AND POST

Nov 2013 | Rev 7

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · STANDARD

OPSD 922.430




NOTES:

1 This OPSD shows right shoulder installation. The Extruder Terminal shall be inverted for left shoulder installation.

2 Two nuts and a washer shall be installed and locked tight at each end of the cable assembly.

3 The system length shall be installed in a straight line parallel to the roadway, at a 50:1 flare rate, or at a 25:1 flare rate as specified.

A Delineation shall be according to OPSD 984.201 and 984.202.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 TL–3.

D This OPSD to be read in conjunction with OPSD 202.031 or 202.032 as specified.

E All dimensions are in millimetres unless otherwise shown.

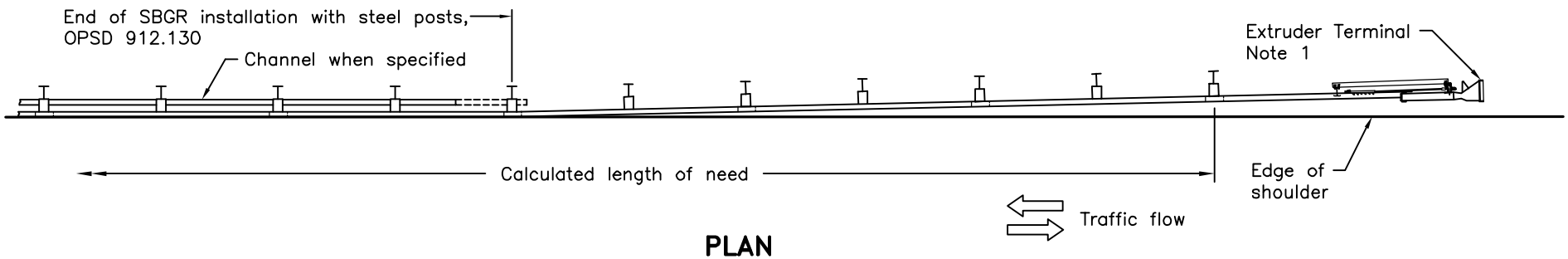
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, END TREATMENT
# STEEL BEAM ENERGY ATTENUATING TERMINAL
# EXTRUDER TERMINAL SYSTEM
# WITH WOODEN POSTS, INSTALLATION

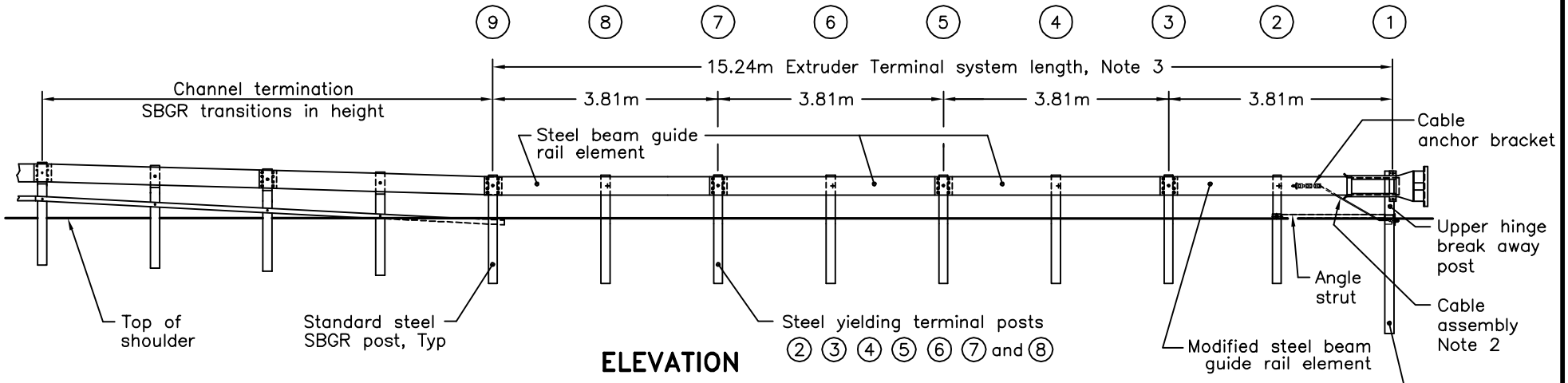
Nov 2010 | Rev 5

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 922.530




**PLAN**




**ELEVATION**

## NOTES:

1 This OPSD shows right shoulder installation. The Extruder Terminal shall be inverted for left shoulder installation.

2 Two nuts and a washer shall be installed and locked tight at each end of the cable assembly.

3 The system length shall be installed in a straight line parallel to the roadway, at a 50:1 flare rate, or at a 25:1 flare rate as specified.

A Delineation shall be according to OPSD 984.201 and 984.202.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 TL–3.

D This OPSD to be read in conjunction with OPSD 202.031 or 202.032 as specified.

E All dimensions are in millimetres unless otherwise shown.

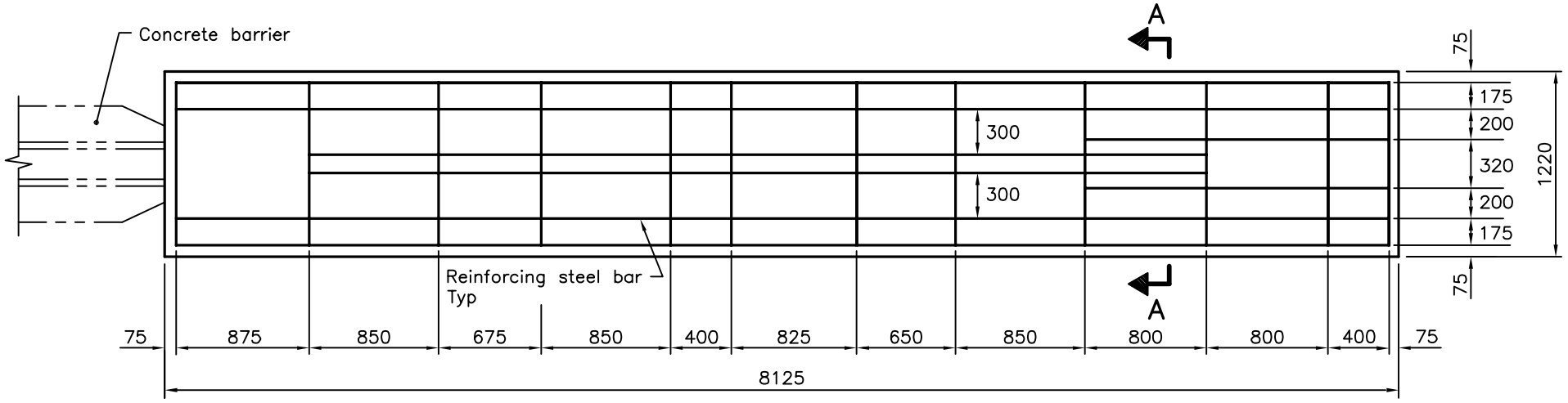
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, END TREATMENT
# STEEL BEAM ENERGY ATTENUATING TERMINAL
# EXTRUDER TERMINAL SYSTEM
# WITH STEEL POSTS, INSTALLATION

Nov 2010 | Rev 2

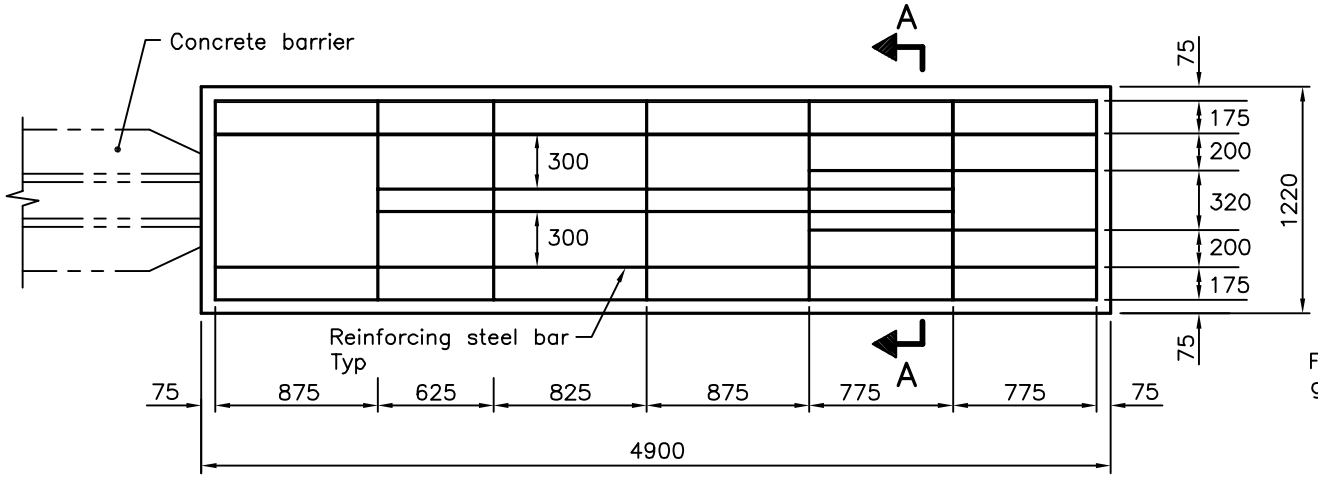
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 922.532



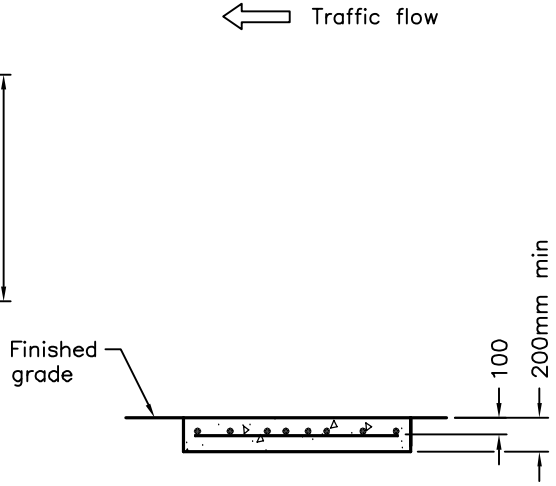

PLAN

## CONCRETE PAD FOR TL-3 SYSTEM CONFIGURATION




PLAN

## CONCRETE PAD FOR TL-2 SYSTEM CONFIGURATION



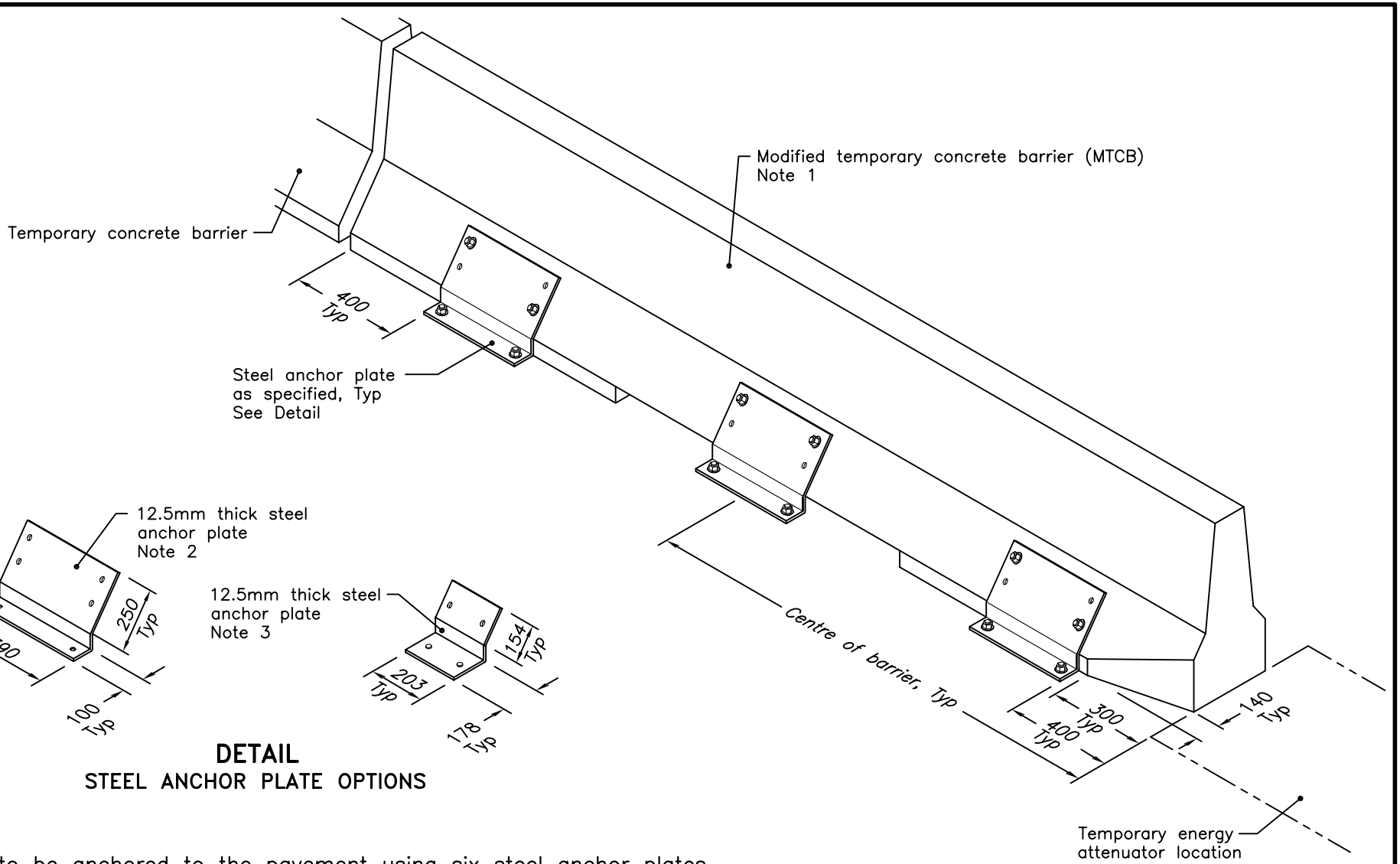

## SECTION A-A

NOTES:

A All reinforcing shall be 15M reinforcing steel bars.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 3 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION<br>NARROW SYSTEMS<br>COMPONENT – REINFORCED CONCRETE PAD | | | |
| | OPSD 923.001 | | |




**DETAIL**
**STEEL ANCHOR PLATE OPTIONS**

NOTES:

1 MTCB to be anchored to the pavement using six steel anchor plates according to system manufacturer's specifications.

2 Steel anchor plate is proprietary to Energy Absorption Systems Inc.

3 Steel anchor plate is proprietary to Barrier Systems Inc.

A All dimensions are in millimetres unless otherwise shown.

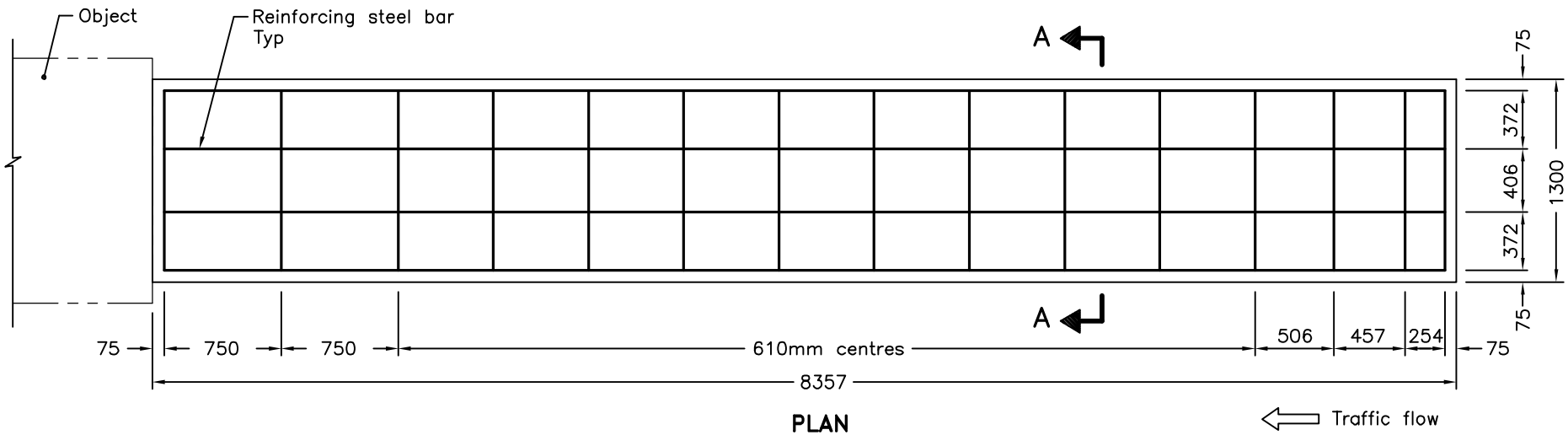
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION COMPONENT–ANCHOR ASSEMBLY

Nov 2005 | Rev 0

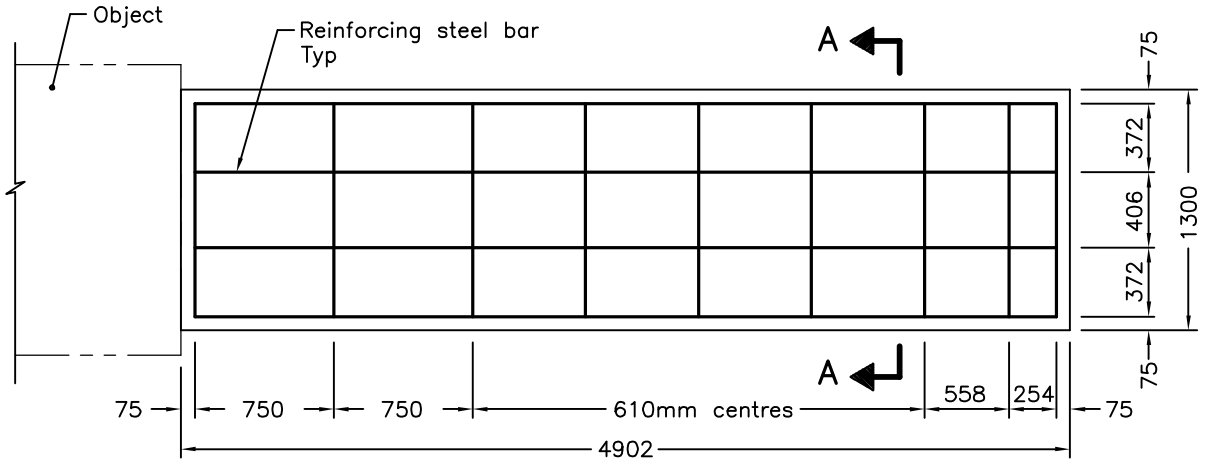
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD – 923.002




PLAN

## CONCRETE PAD FOR TL–3 SYSTEM CONFIGURATION




PLAN




SECTION A–A

## CONCRETE PAD FOR TL–2 SYSTEM CONFIGURATION

NOTES:

A All reinforcing shall be 15M reinforcing steel bars.

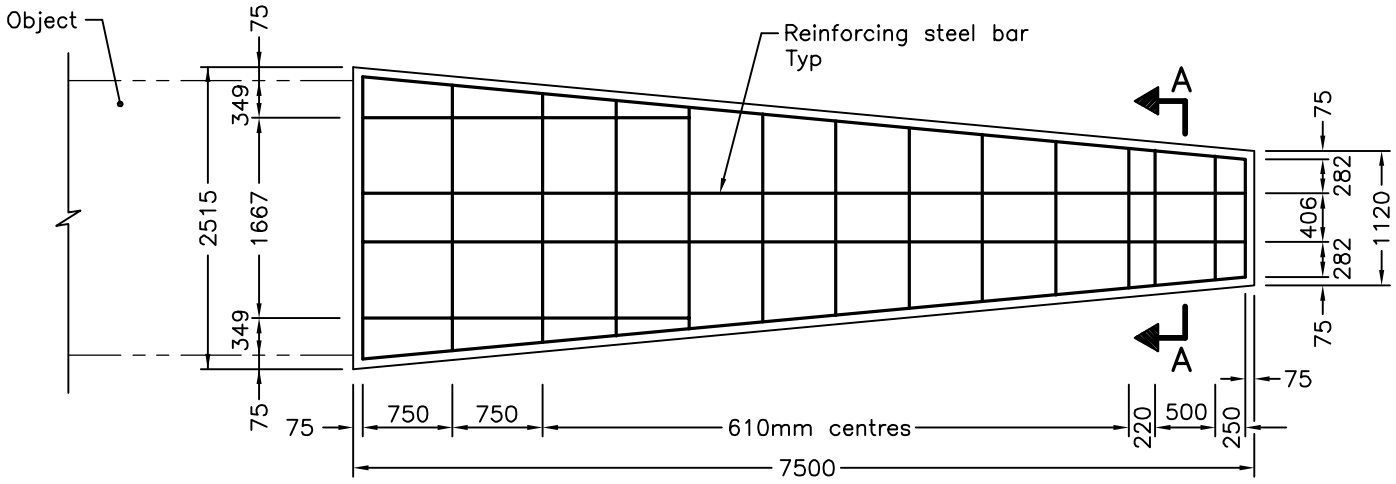
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION WIDE SYSTEMS COMPONENT – REINFORCED CONCRETE PAD

Nov 2011 | Rev 0

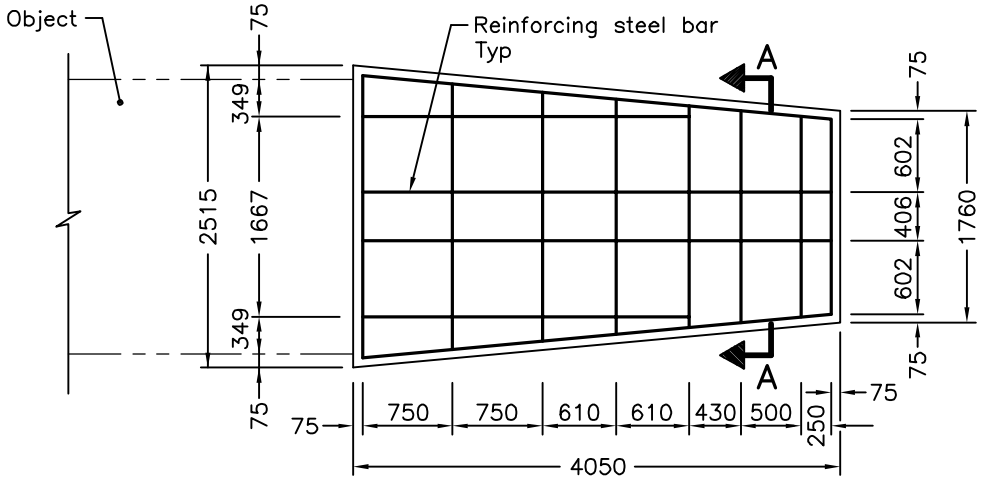
OPSD 923.004



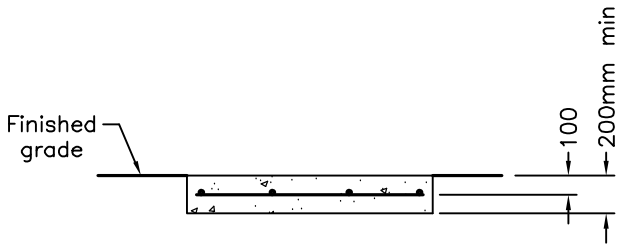

PLAN

Traffic flow

## CONCRETE PAD FOR TL–3 SYSTEM CONFIGURATION




PLAN




SECTION A–A

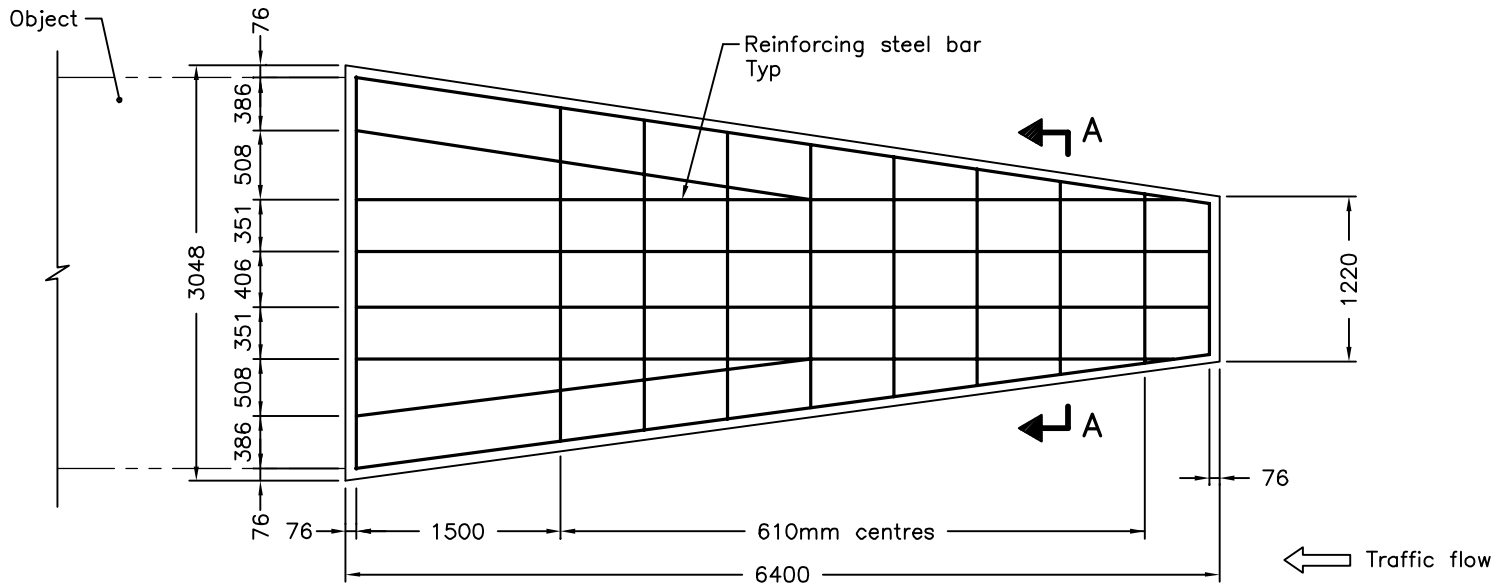
## CONCRETE PAD FOR TL–2 SYSTEM CONFIGURATION

**NOTES:**

A All reinforcing shall be 15M reinforcing steel bars.

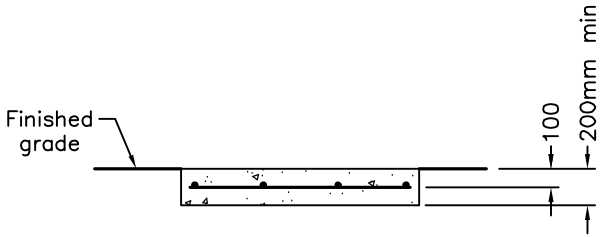
B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION<br>EXTRA WIDE SYSTEMS<br>COMPONENT – REINFORCED CONCRETE PAD | | | |
| | OPSD 923.005 | | |




**PLAN**

**CONCRETE PAD FOR TL–3 SYSTEM CONFIGURATION**



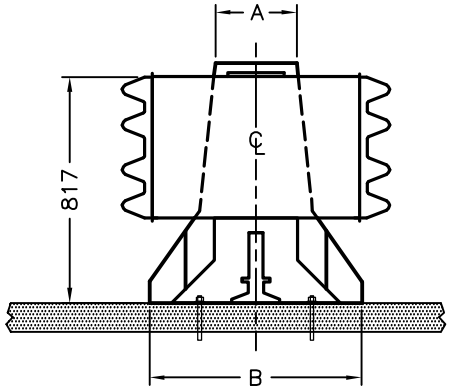

**SECTION A–A**

**NOTES:**

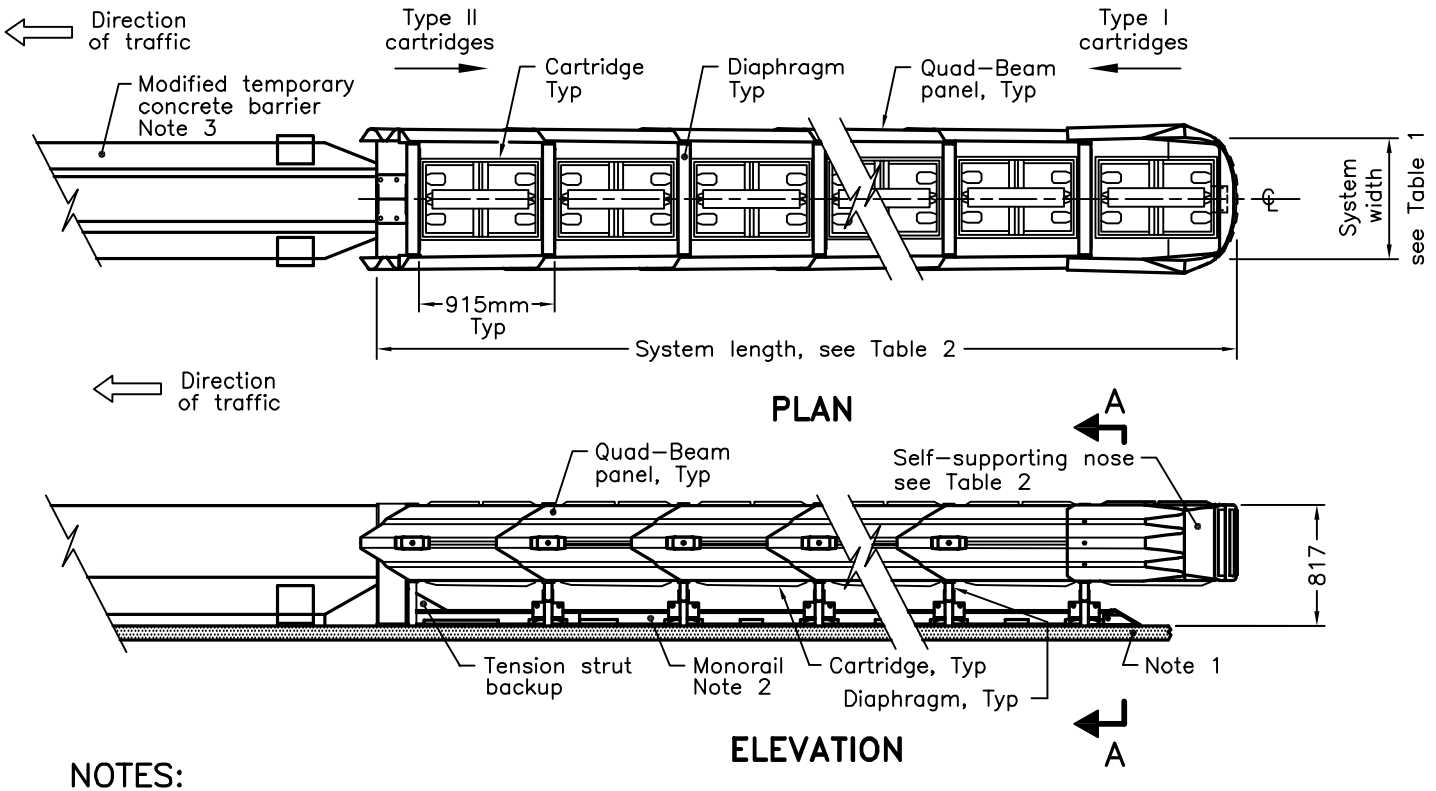
A All reinforcing shall be 15M reinforcing steel bars.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION<br>QUADGUARD SUPER WIDE SYSTEM<br>COMPONENT – REINFORCED CONCRETE PAD | | | |
| | OPSD 923.006 | | |




SECTION A–A




| TABLE 1 | | |
|---|---|---|
| SYSTEM WIDTH | A TOP OF CONCRETE BARRIER OR HAZARD WIDTH | B BOTTOM OF CONCRETE BARRIER OR HAZARD WIDTH |
| 610 | ≤ 406 | ≤ 864 |
| 760 | ≤ 559 | ≤ 1016 |
| 915 | ≤ 711 | ≤ 1168 |

| TABLE 2 | | | | |
|---|---|---|---|---|
| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 2 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 3000 | 5410 |

NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.

2 Monorail may be attached to a modular 19mm thick x 1070mm wide x 6223mm long steel plate.

3 Adjacent temporary concrete barrier unit shall be modified and anchored according to OPSD 923.002.

A Delineation shall be according to OPSD 984.203.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

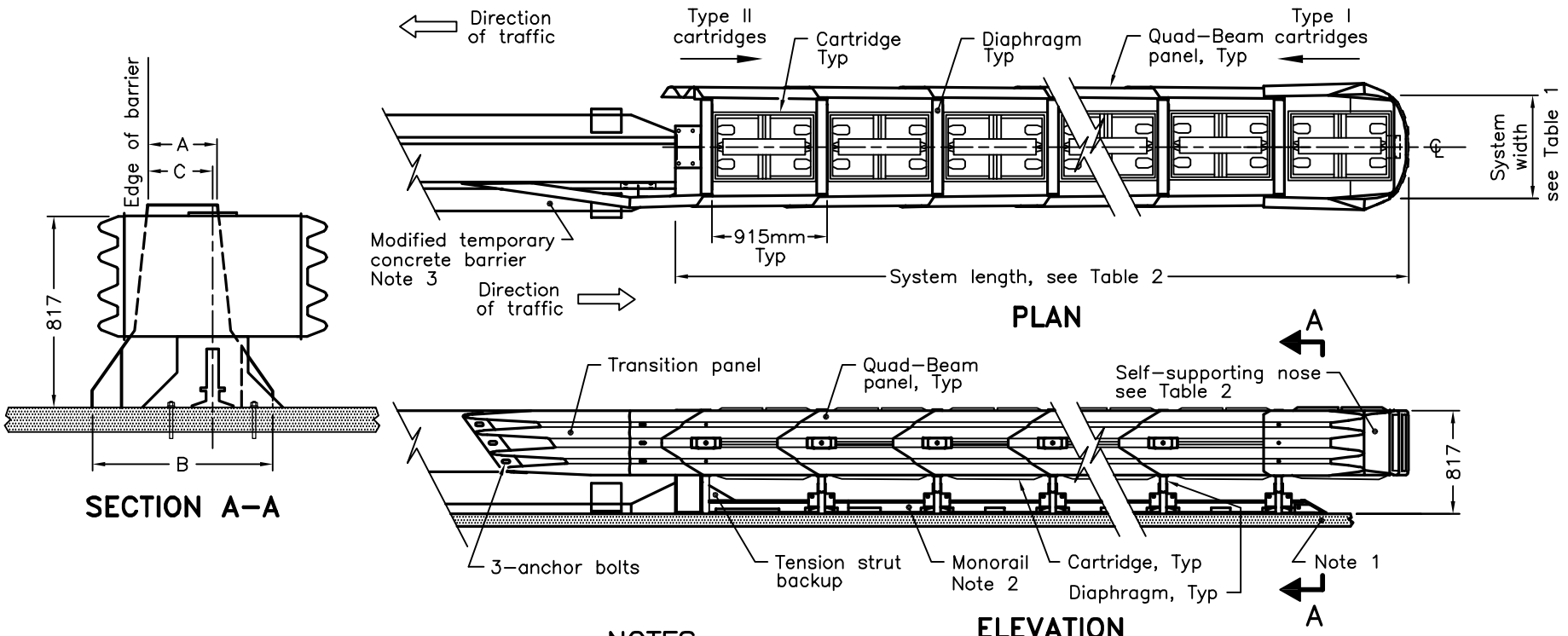
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 923.180




NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.
2 Monorail may be attached to a modular 19mm thick x 1070mm wide x 6223mm long steel plate.
3 Adjacent temporary concrete barrier unit shall be modified and anchored according to OPSD 923.002.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM WIDTH | A TOP OF CONCRETE BARRIER OR HAZARD WIDTH | B BOTTOM OF CONCRETE BARRIER OR HAZARD WIDTH | C ℄ OFFSET |
|---|---|---|---|
| 610 | ≤ 406 | ≤ 864 | 205 |
| 760 | ≤ 559 | ≤ 1016 | 280 |
| 915 | ≤ 711 | ≤ 1168 | 355 |

TABLE 2

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 2 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 3000 | 5410 |

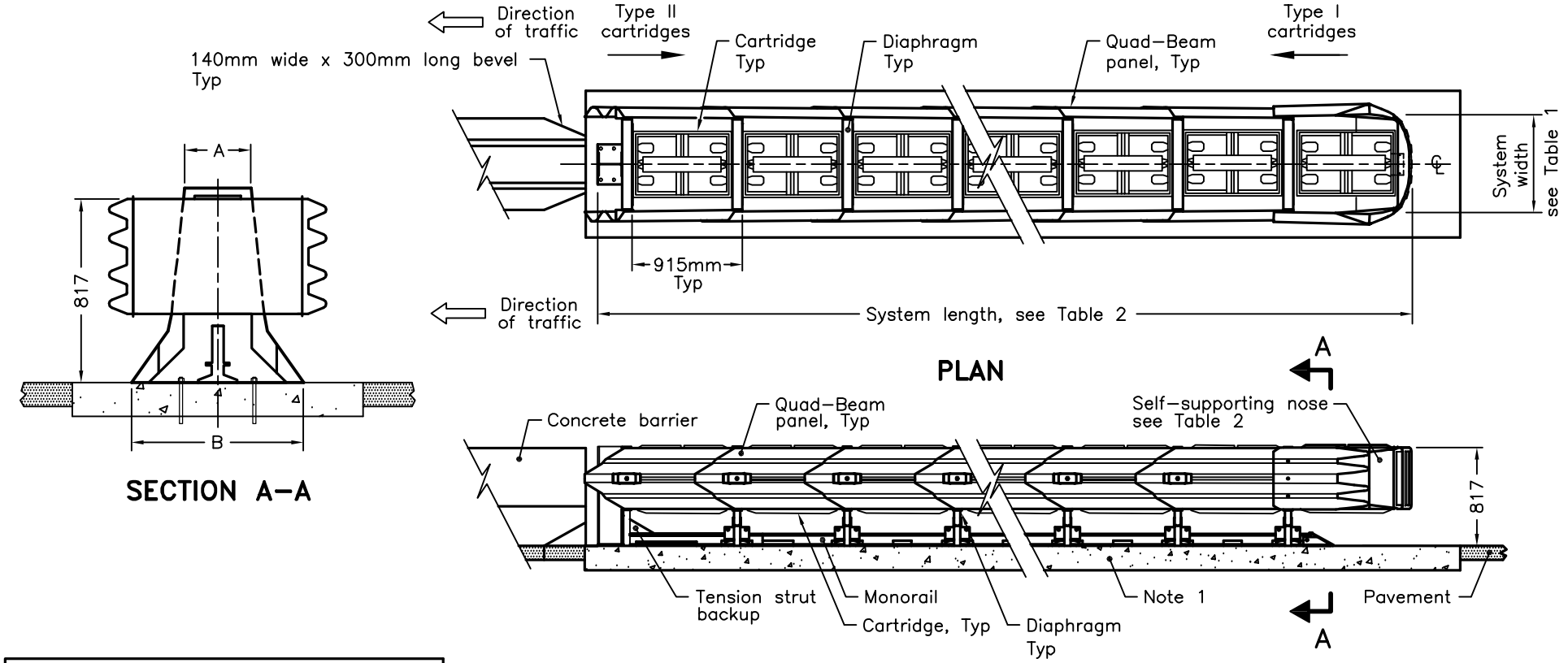
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.181




SECTION A–A

ELEVATION

| TABLE 1 | | |
|---|---|---|
| SYSTEM WIDTH | A TOP OF CONCRETE BARRIER OR HAZARD WIDTH | B BOTTOM OF CONCRETE BARRIER OR HAZARD WIDTH |
| 610 | ≤ 406 | ≤ 864 |
| 760 | ≤ 559 | ≤ 1016 |
| 915 | ≤ 711 | ≤ 1168 |

| TABLE 2 | | | | |
|---|---|---|---|---|
| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 2 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 3000 | 5410 |

NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.001.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

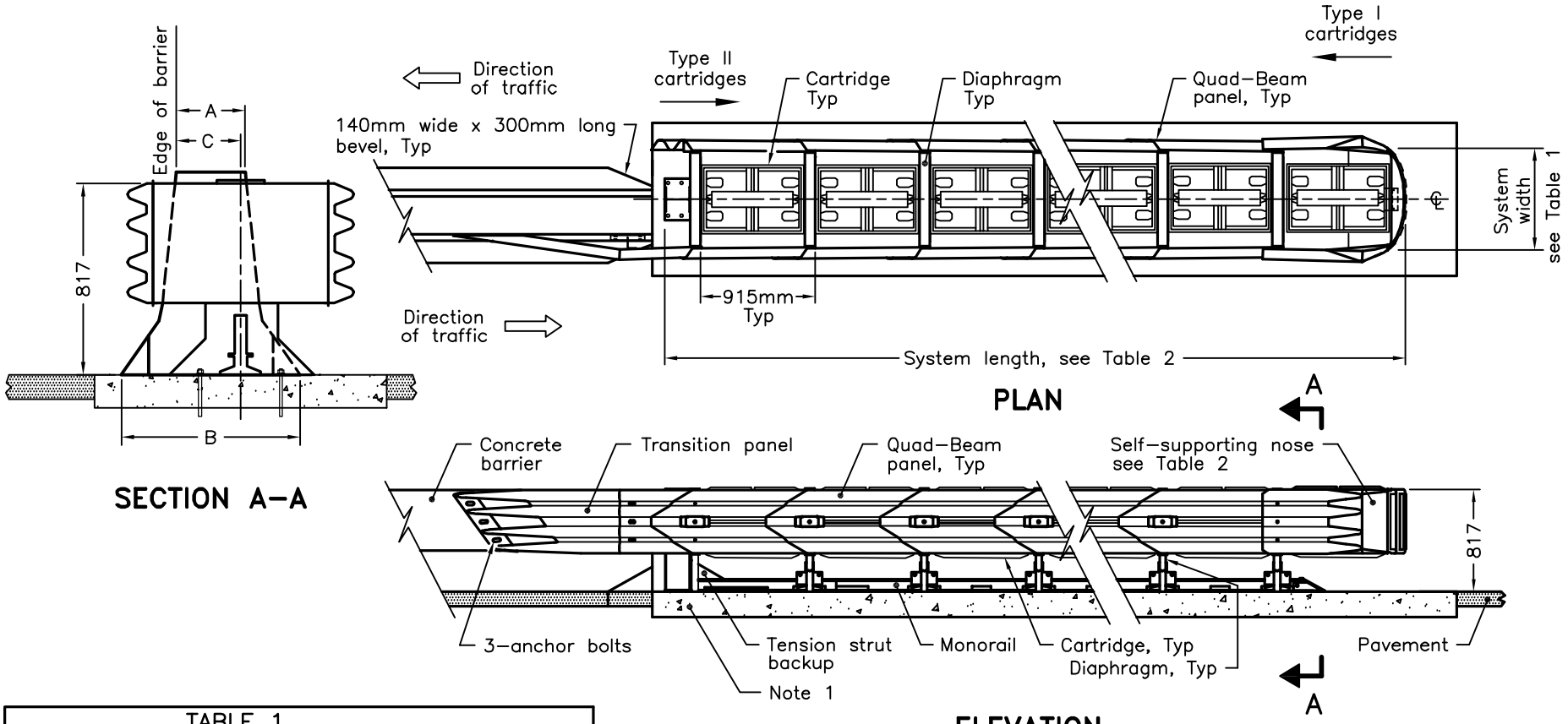
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

Nov 2011 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

OPSD 923.182




| TABLE 1 | | | |
|---|---|---|---|
| SYSTEM WIDTH | A TOP OF CONCRETE BARRIER OR HAZARD WIDTH | B BOTTOM OF CONCRETE BARRIER OR HAZARD WIDTH | C ℄ OFFSET |
| 610 | ≤ 406 | ≤ 864 | 205 |
| 760 | ≤ 559 | ≤ 1016 | 280 |
| 915 | ≤ 711 | ≤ 1168 | 355 |

| TABLE 2 | | | | |
|---|---|---|---|---|
| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 2 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 3000 | 5410 |

## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.001.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

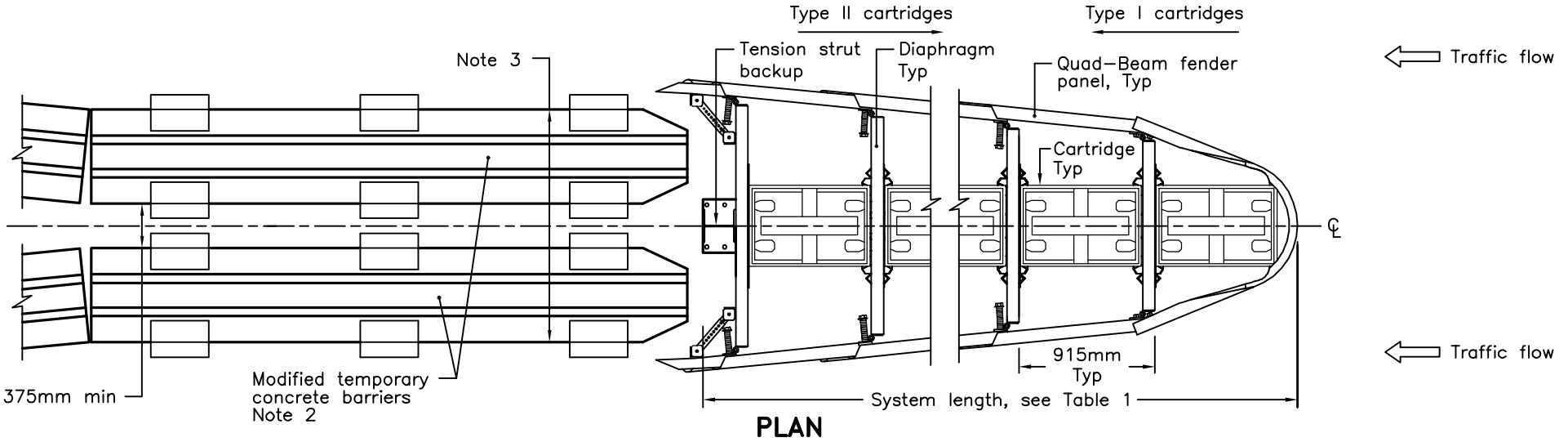
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

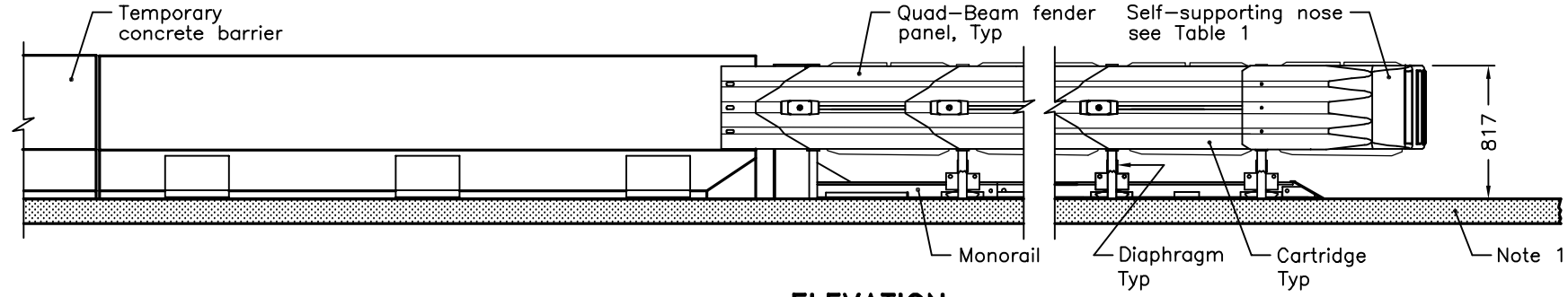
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.183




**PLAN**




**ELEVATION**

## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.004.
2 Adjacent temporary concrete barriers shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

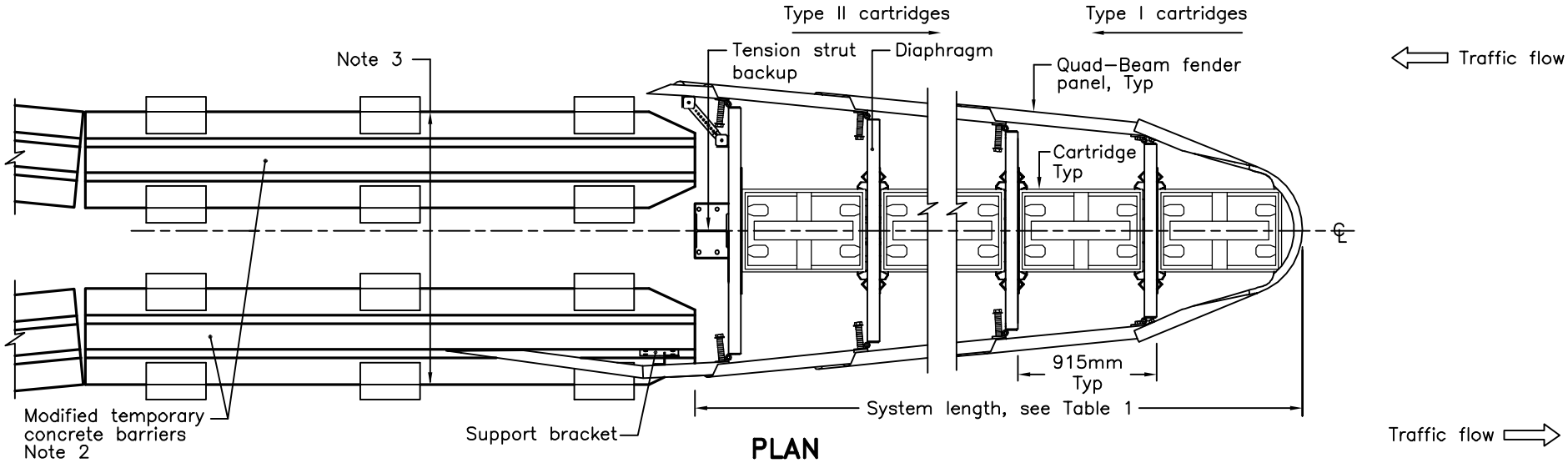
| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 1755 | 1755 | 1755 | 1755 |

ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

Nov 2011 | Rev 0

OPSD 923.184




## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.004.
2 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 1755 | 1755 | 1755 | 1755 |

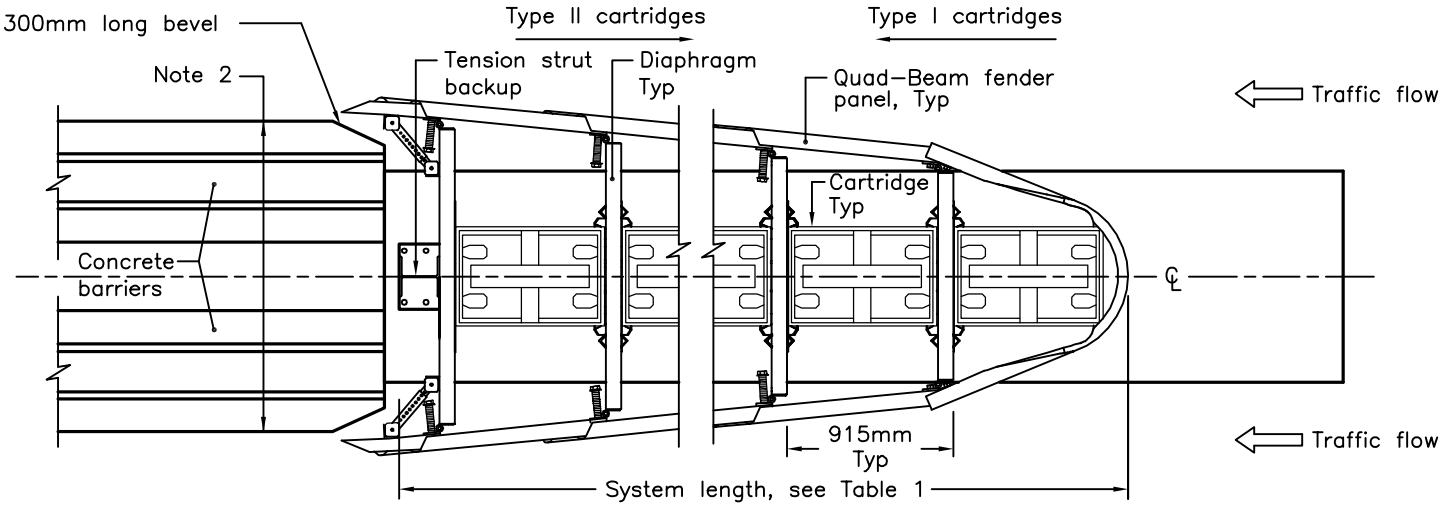
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

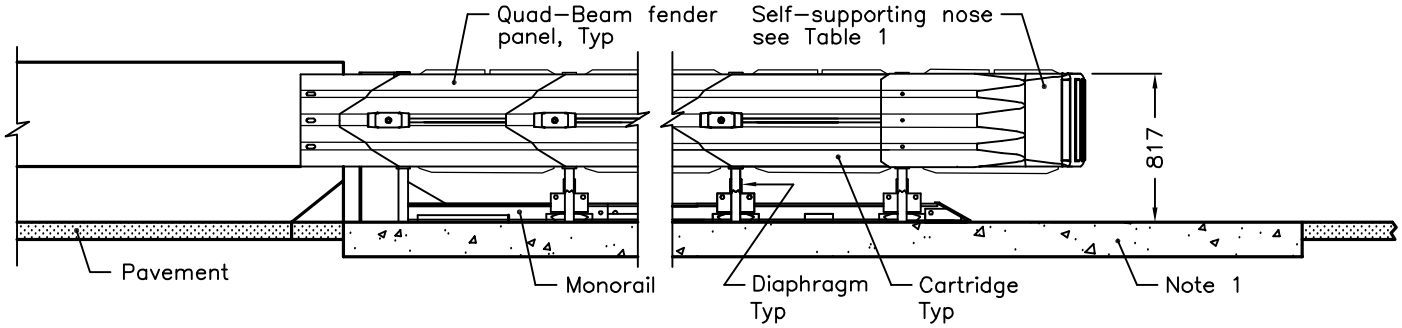
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.185




**PLAN**




**ELEVATION**

## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.004.
2 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.204.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 1755 | 1755 | 1755 | 1755 |

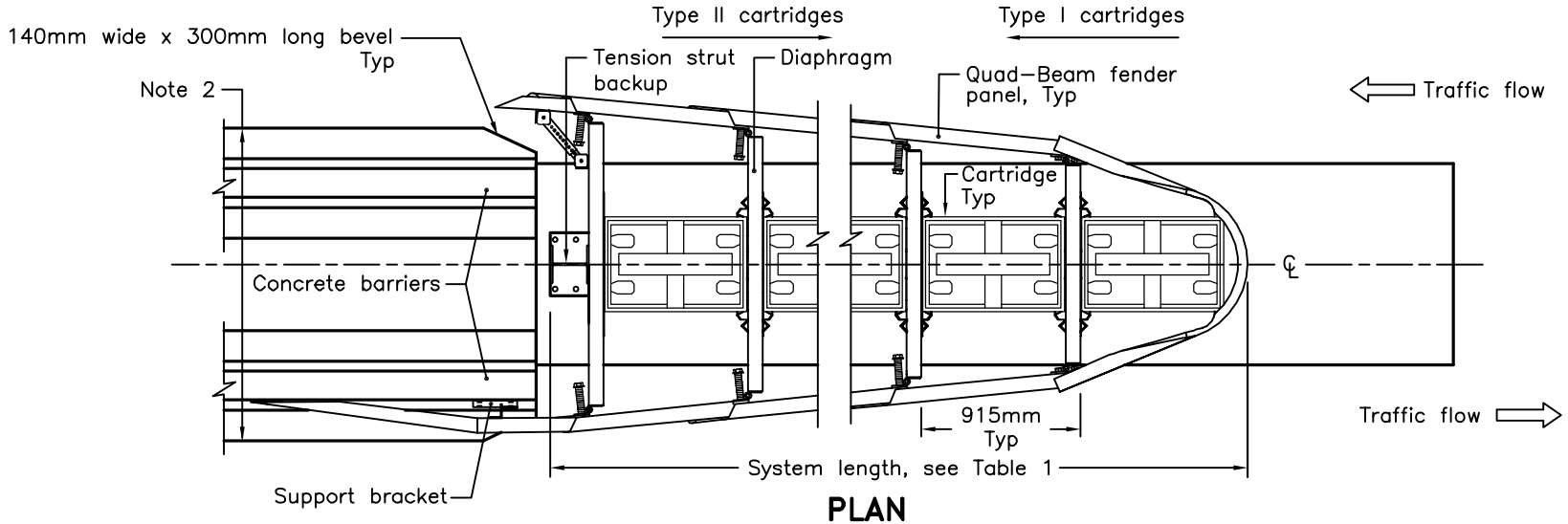
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

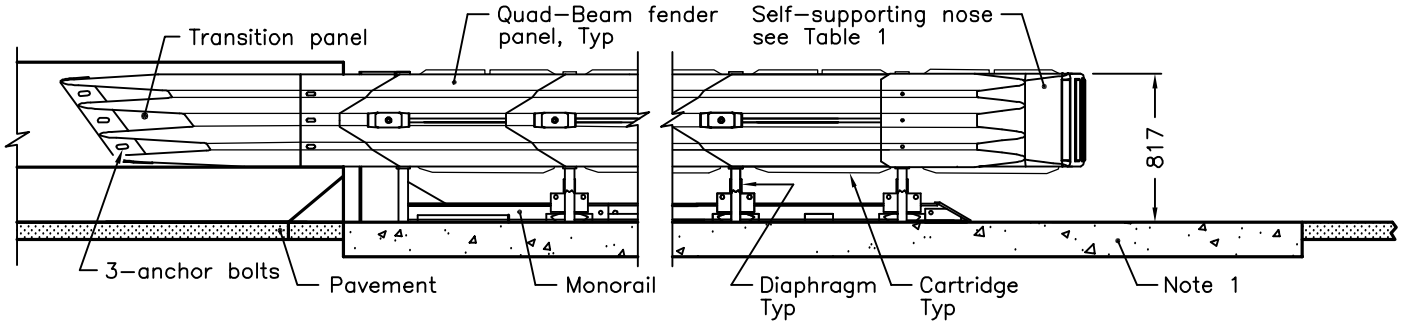
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.186




**PLAN**




**ELEVATION**

## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.004.
2 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.204.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 1755 | 1755 | 1755 | 1755 |

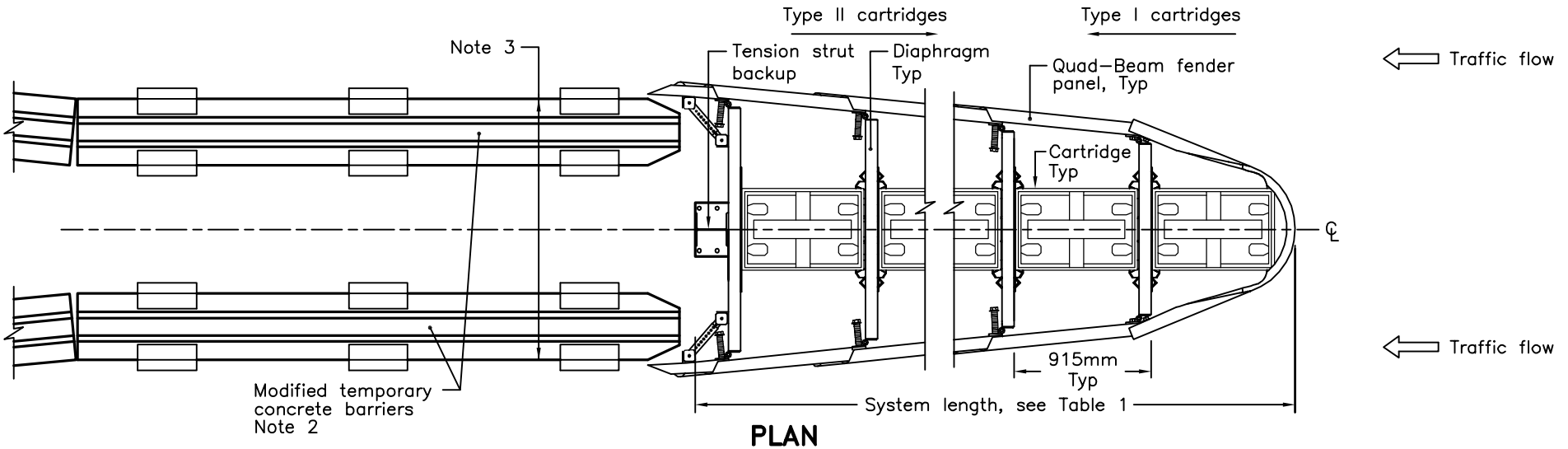
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

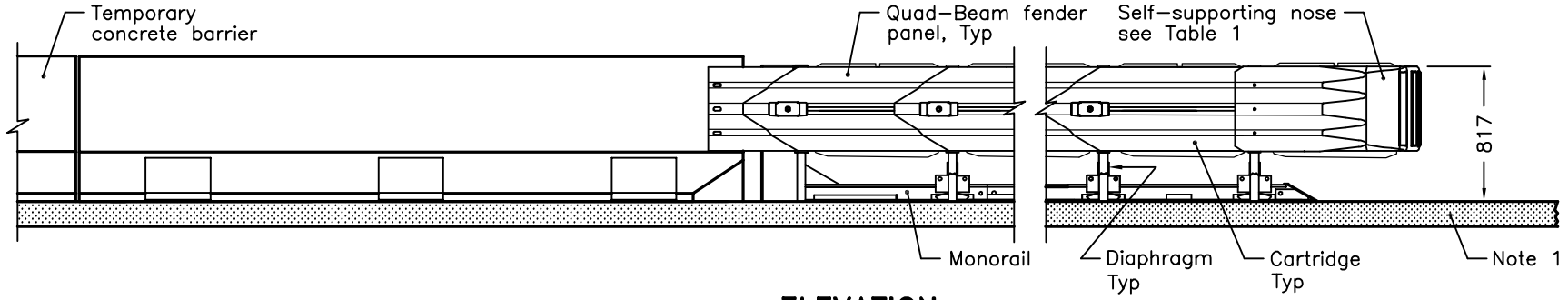
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.187




**PLAN**




**ELEVATION**

## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
2 Adjacent temporary concrete barriers shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 2285 | 2285 | 2285 | 2285 |

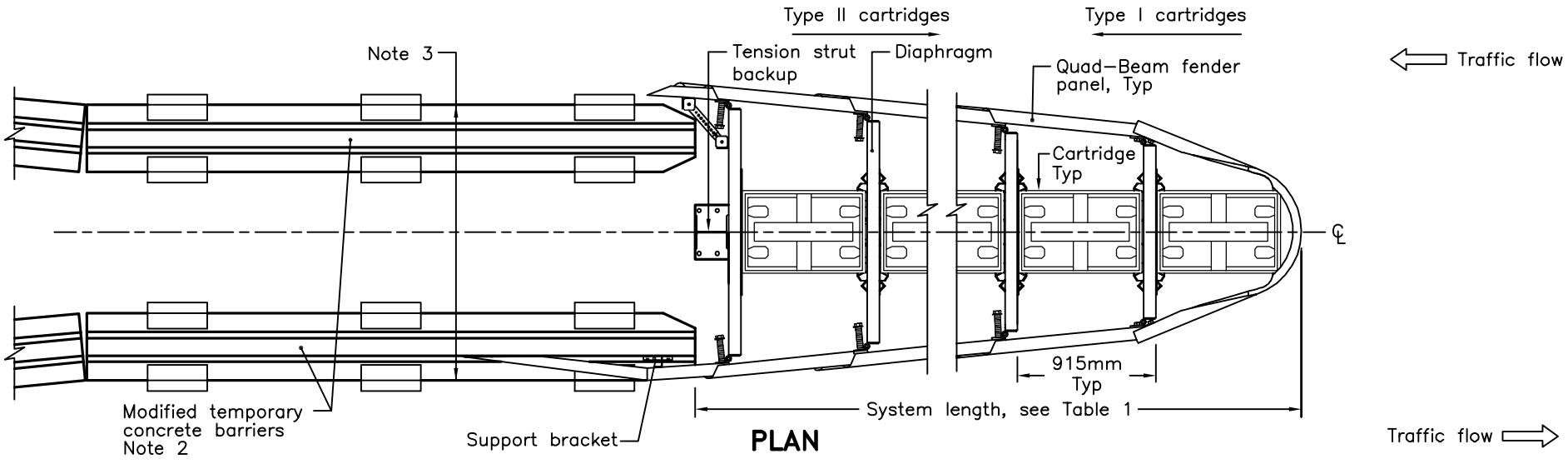
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 923.188




## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
2 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 2285 | 2285 | 2285 | 2285 |

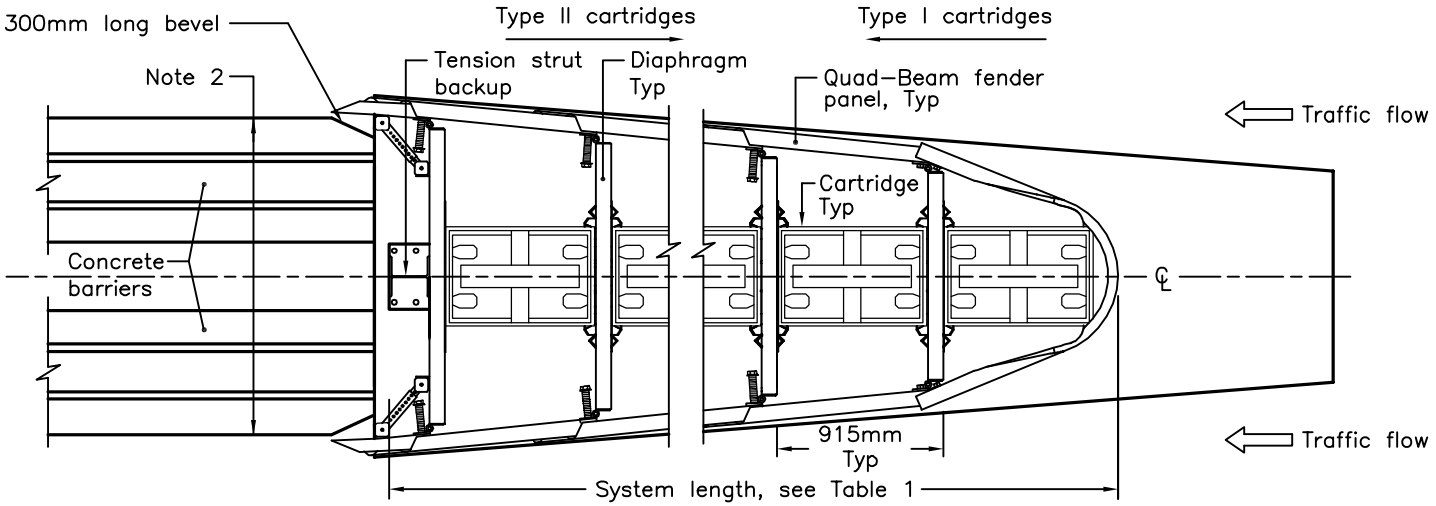
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

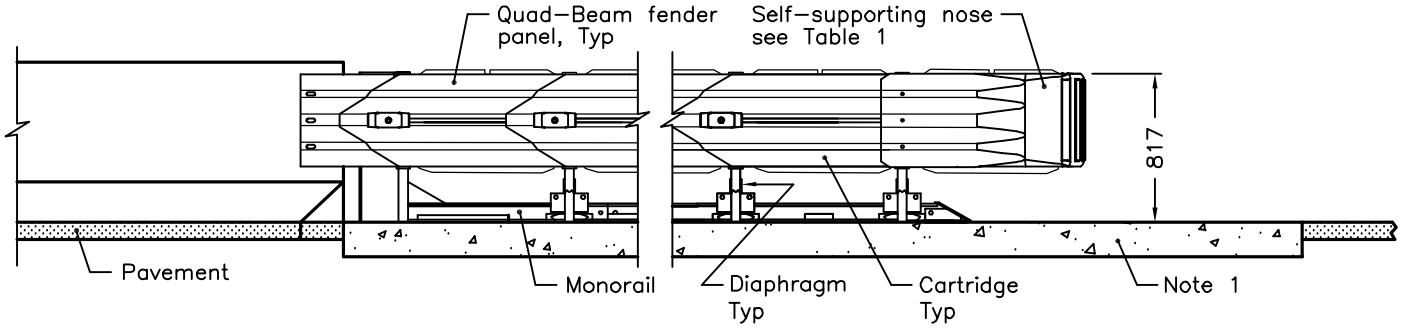
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 923.189




**PLAN**




**ELEVATION**

## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.204.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 2285 | 2285 | 2285 | 2285 |

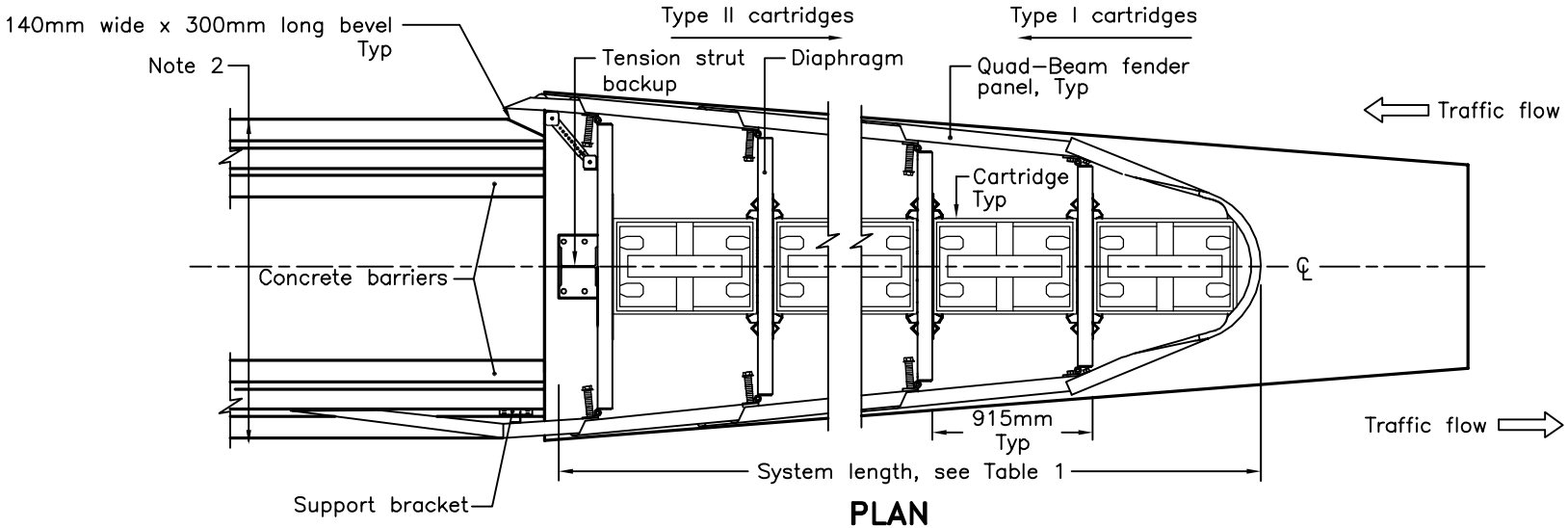
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

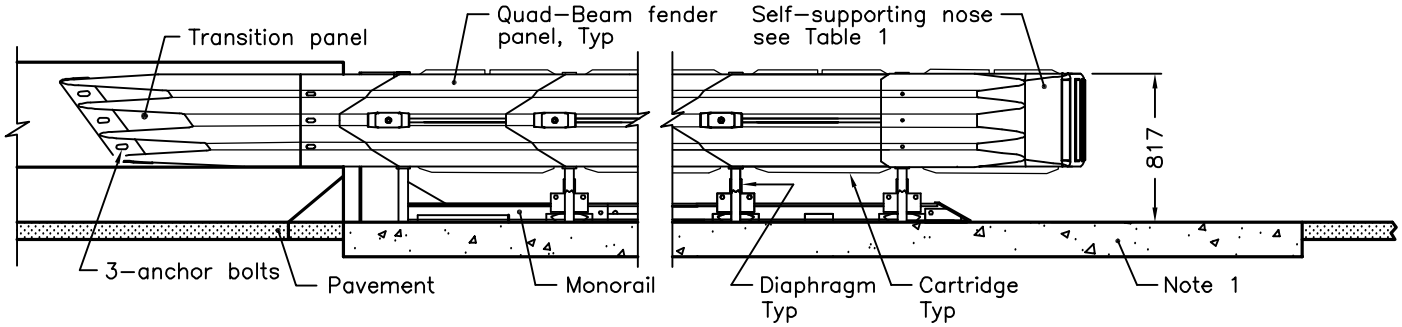
Nov 2011 | Rev 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

**OPSD 923.190**




**PLAN**




**ELEVATION**

## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.204.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

TABLE 1

| SYSTEM CONFIGURATION | PLASTIC NOSE | | STEEL NOSE | |
|---|---|---|---|---|
| | TL–2 | TL–3 | TL–2 | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 3 | 4 | 3 | 3 |
| TYPE II CARTRIDGES REAR REQ'D | 1 | 3 | 1 | 3 |
| SYSTEM LENGTH | 4000 | 6740 | 4000 | 5780 |
| NOMINAL SYSTEM WIDTH | 2285 | 2285 | 2285 | 2285 |

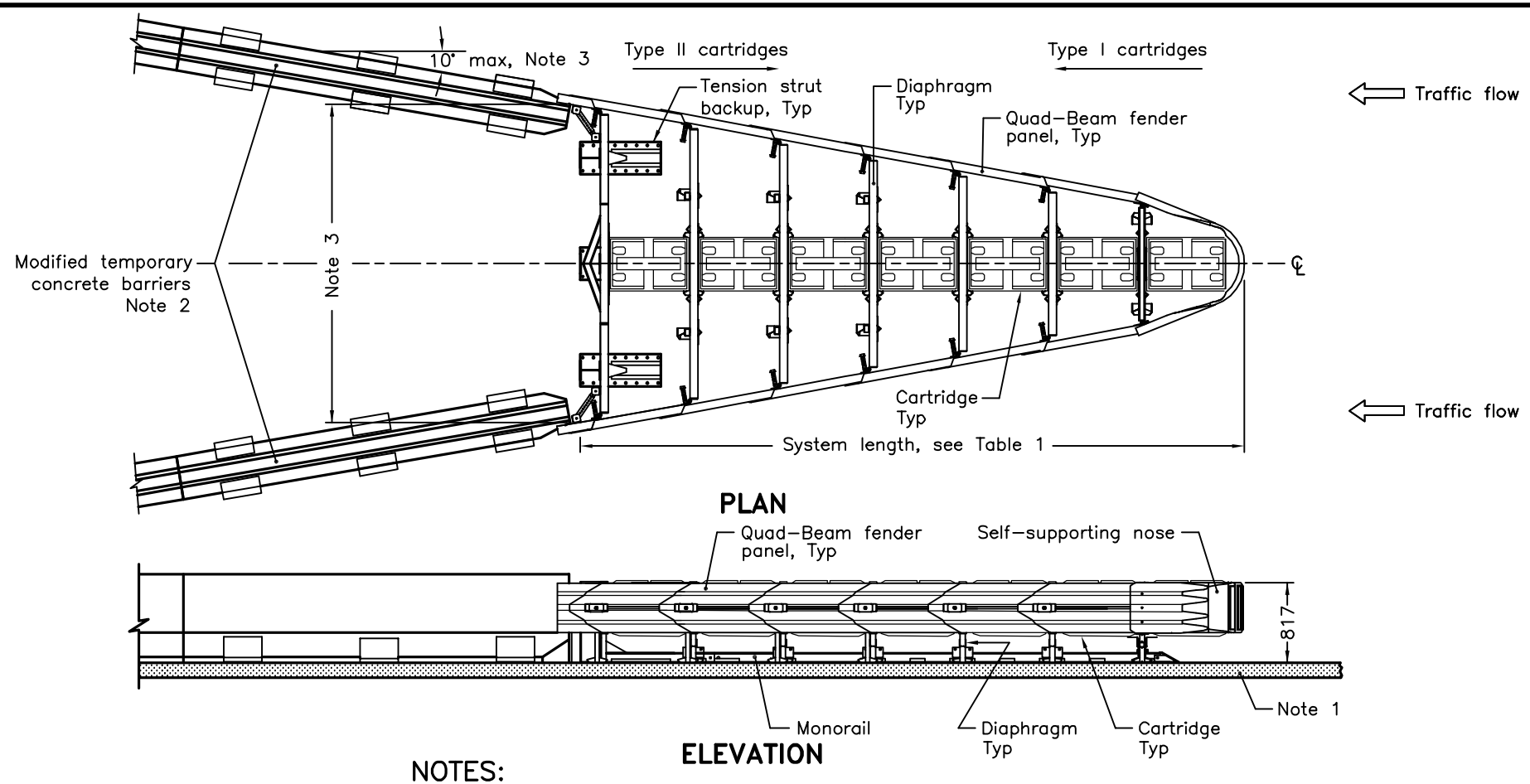
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD EXTRA WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

Nov 2011 | Rev 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 923.191




## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.006.
2 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 3200mm immediately behind the system. The sides of the objects shall taper rearward at a maximum 10° angle. Rear fender panels shall be able to slide rearward 762mm minimum.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | |
|---|---|
| SYSTEM CONFIGURATION | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 4 |
| TYPE II CARTRIDGES REAR REQ'D | 3 |
| SYSTEM LENGTH | 6740 |
| NOMINAL SYSTEM WIDTH | 3200 |

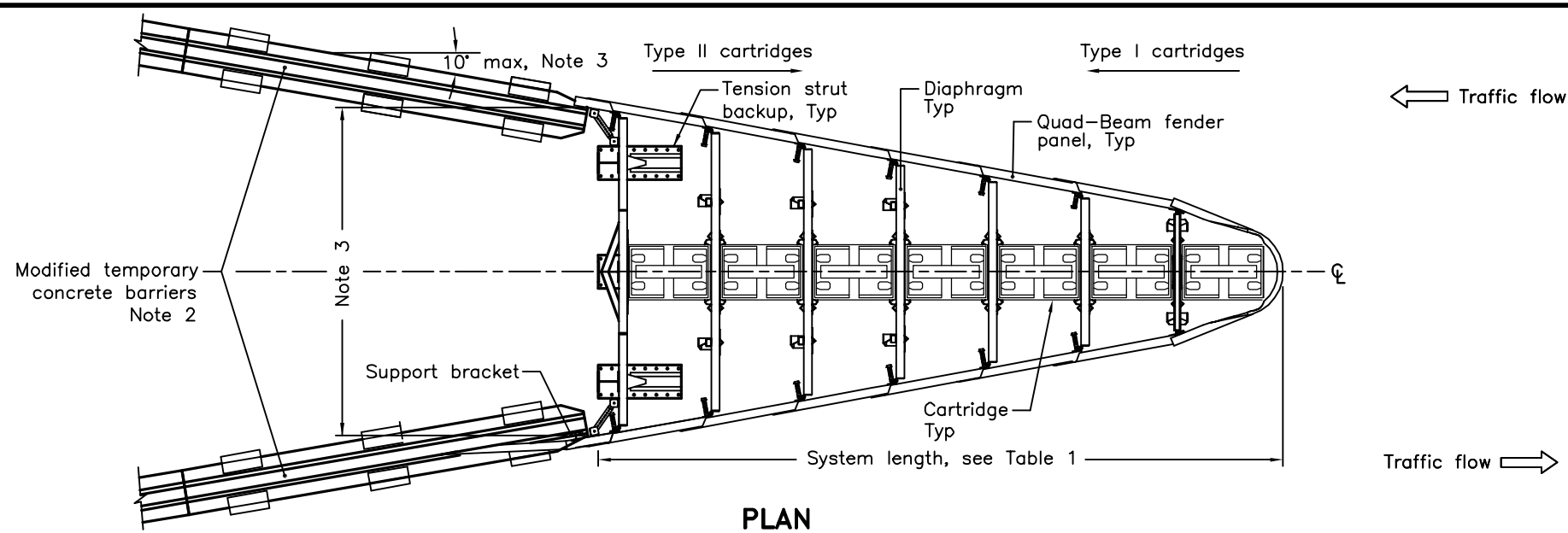
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

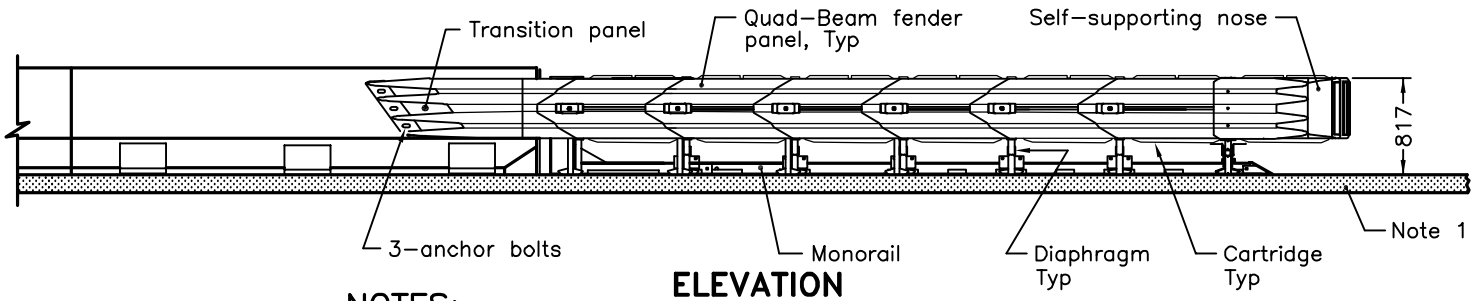
Nov 2015 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 923.192




**PLAN**




**ELEVATION**

## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.006.
2 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 3200mm immediately behind the system. The sides of the objects shall taper rearward at a maximum 10° angle. Rear fender panels shall be able to slide rearward 762mm minimum.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | |
|---|---|
| SYSTEM CONFIGURATION | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 4 |
| TYPE II CARTRIDGES REAR REQ'D | 3 |
| SYSTEM LENGTH | 6740 |
| NOMINAL SYSTEM WIDTH | 3200 |

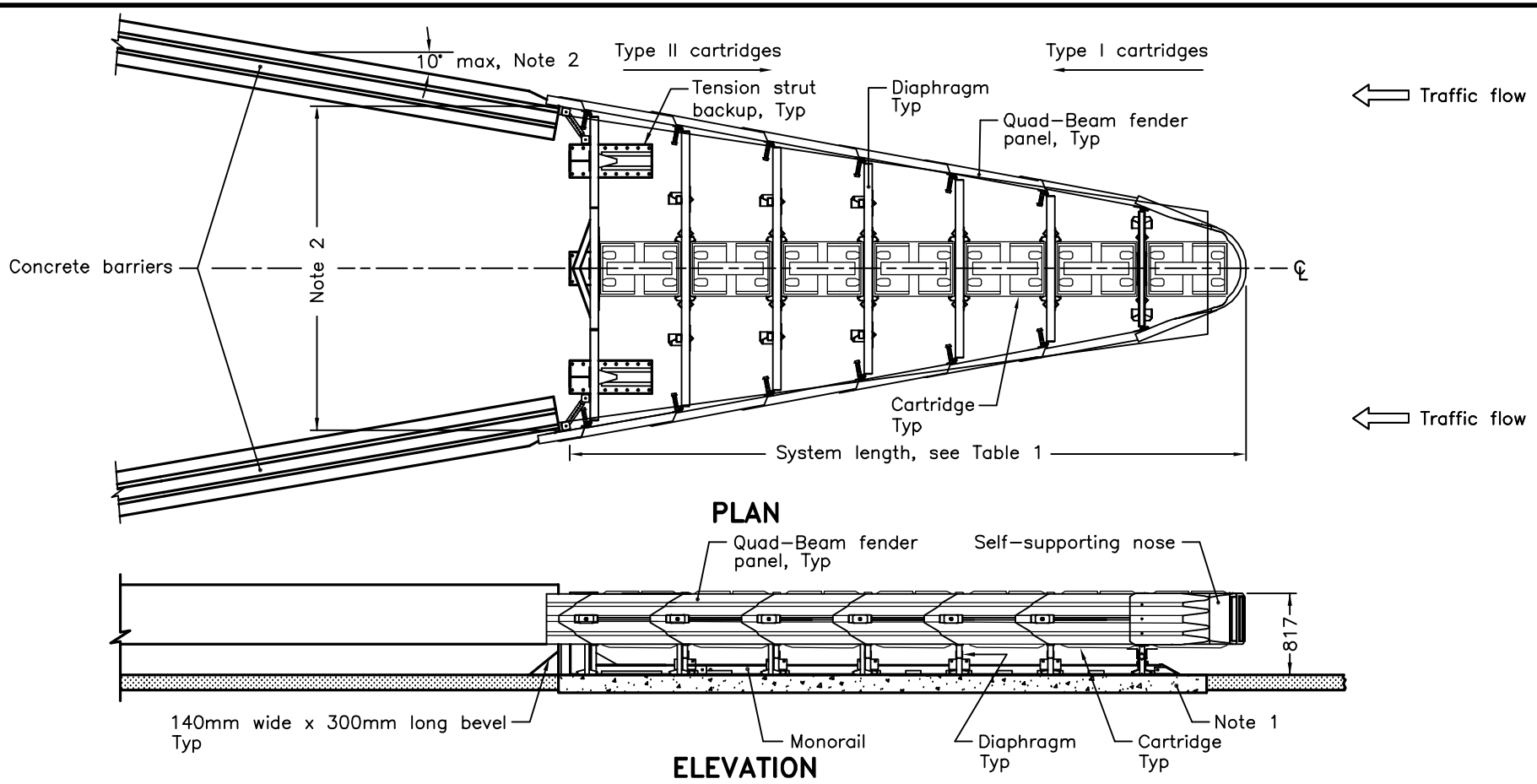
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

Nov 2015 | Rev 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 923.193




## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.006.

2 Maximum width of object shall be 3200mm immediately behind the system. The sides of the objects shall taper rearward at a maximum 10° angle. Rear fender panels shall be able to slide rearward 762mm minimum.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | |
|---|---|
| SYSTEM CONFIGURATION | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 4 |
| TYPE II CARTRIDGES REAR REQ'D | 3 |
| SYSTEM LENGTH | 6740 |
| NOMINAL SYSTEM WIDTH | 3200 |

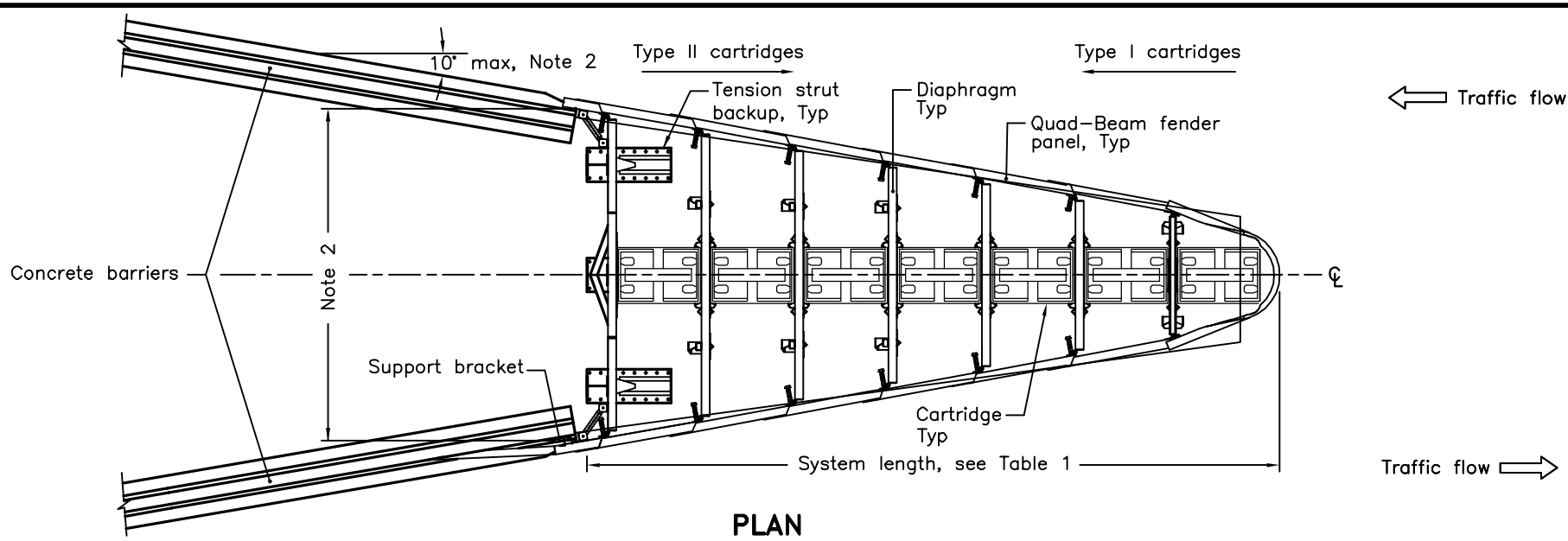
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

Nov 2015 | Rev | 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 923.194




## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.006.

2 Maximum width of object shall be 3200mm immediately behind the system. The sides of the objects shall taper rearward at a maximum 10° angle. Rear fender panels shall be able to slide rearward 762mm minimum.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | |
|---|---|
| SYSTEM CONFIGURATION | TL–3 |
| TYPE I CARTRIDGES FRONT REQ'D | 4 |
| TYPE II CARTRIDGES REAR REQ'D | 3 |
| SYSTEM LENGTH | 6740 |
| NOMINAL SYSTEM WIDTH | 3200 |

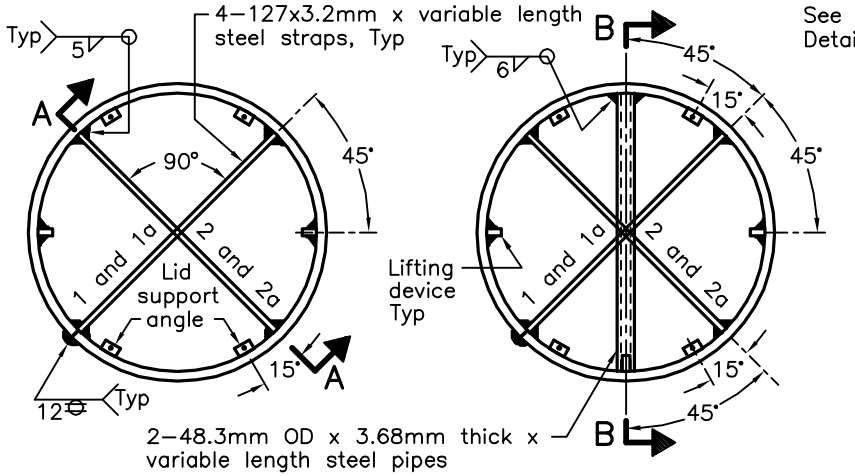
ONTARIO PROVINCIAL STANDARD DRAWING

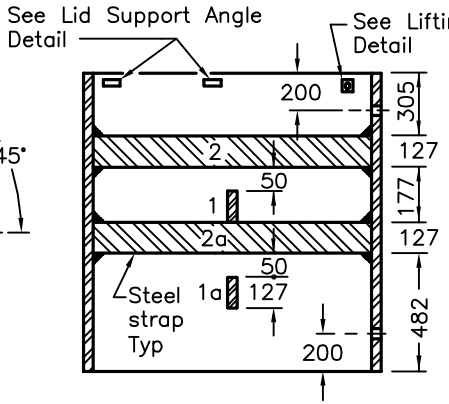
# ENERGY ATTENUATOR, CRASH CUSHION QUADGUARD SUPER WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

Nov 2015 | Rev | 0

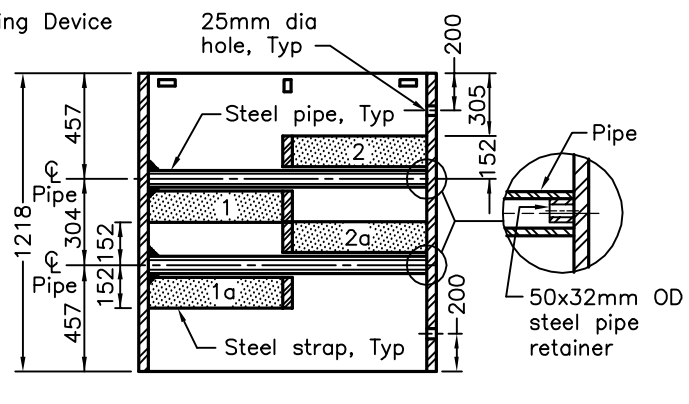
ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 923.195



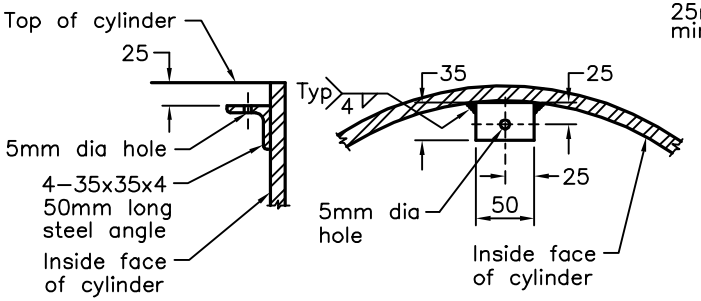

SECTION A–A




SECTION B–B

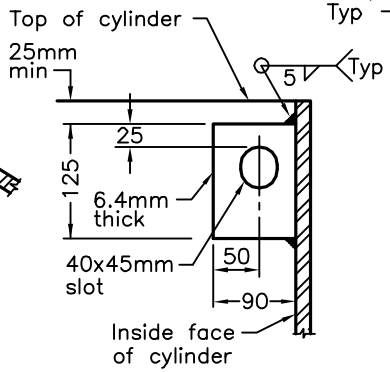
STEEL CYLINDERS: A,B,C STEEL CYLINDERS: D,E,F,G

TOP VIEWS

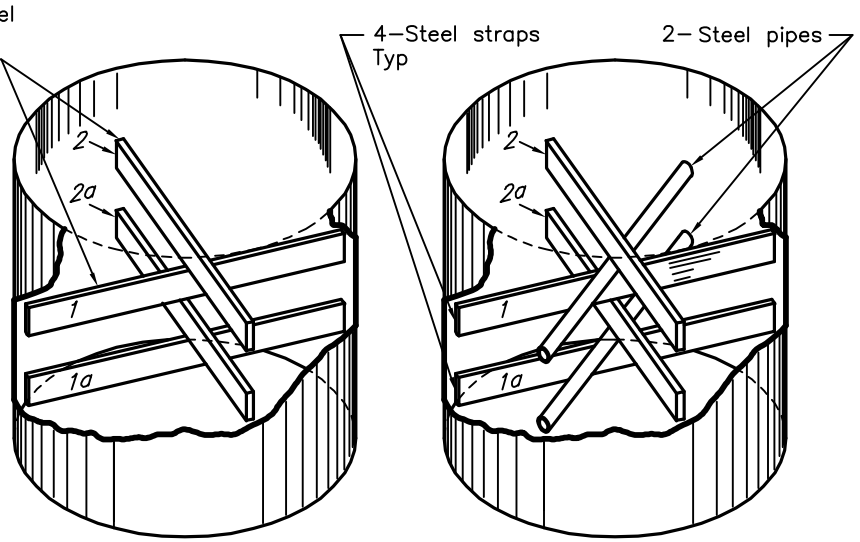



SIDE VIEW TOP VIEW

LID SUPPORT ANGLE DETAIL




LIFTING DEVICE DETAIL




STEEL CYLINDERS: A,B,C STEEL CYLINDERS: D,E,F,G

ISOMETRIC VIEWS

NOTE:

A No internal reinforcing in cylinder types H to N.

B All dimensions are in millimetres unless otherwise shown.

| STEEL CYLINDERS | | | |
|---|---|---|---|
| CYLINDERS | OD | HEIGHT | WALL THICKNESS |
| A,B,C | 1220 | 1218 | 6.4 |
| D,E | 1220 | 1218 | 7.9 |
| F,G,H I,J,K,N | 1220 | 1218 | 4.8 |
| L,M | 914 | 1218 | 4.2 |

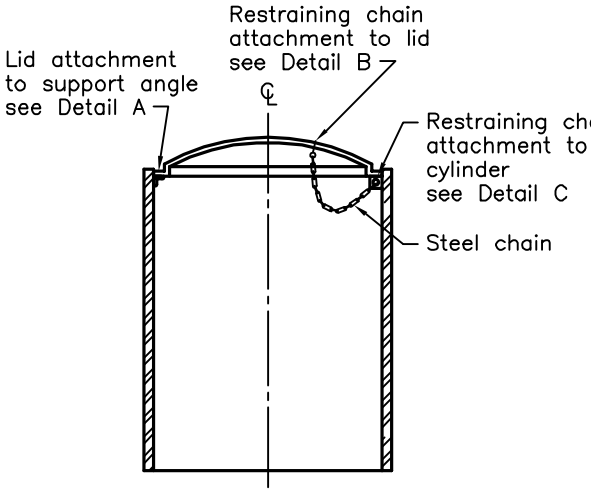
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

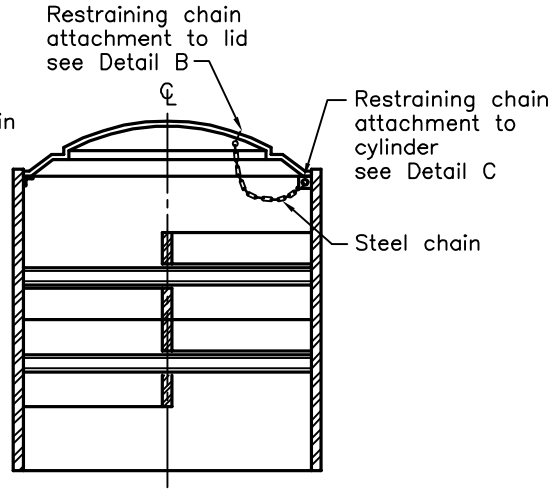
# ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM COMPONENT – STEEL CYLINDER

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · OPS

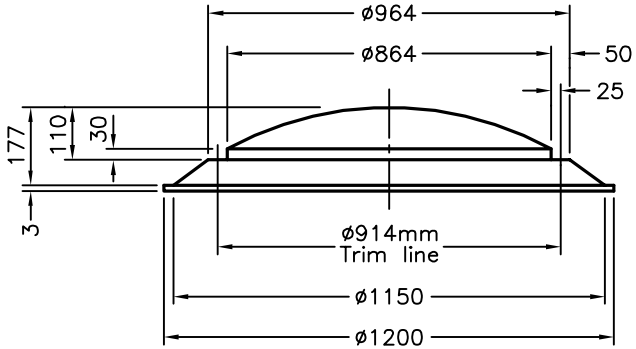
OPSD 923.201



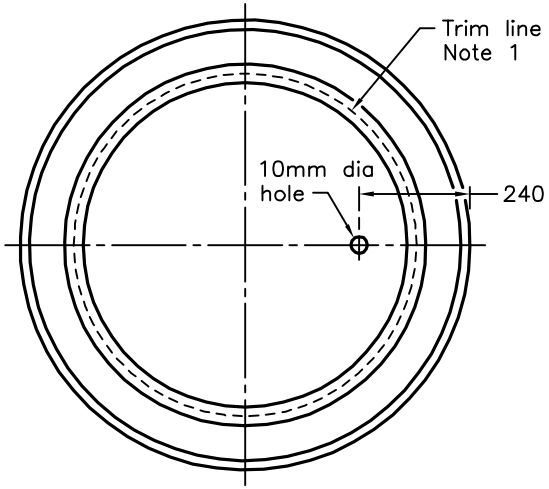

CYLINDERS–914mm DIA



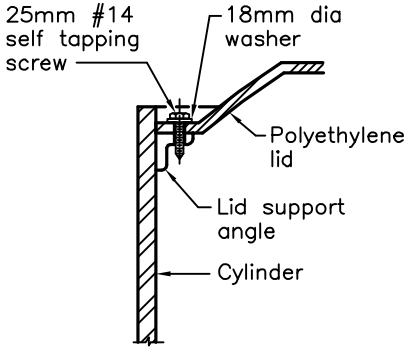

CYLINDERS–1220mm DIA



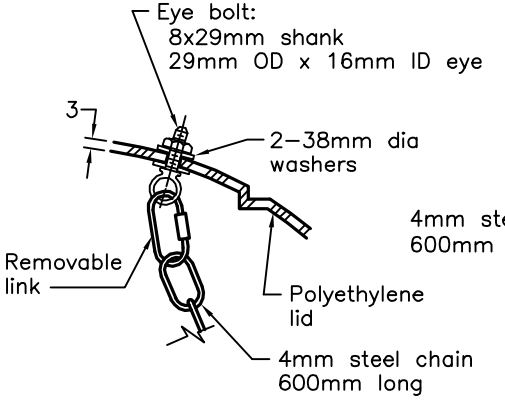

SIDE VIEW



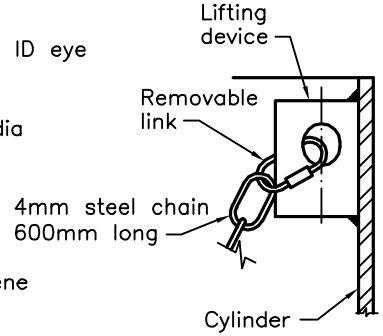

TOP VIEW




DETAIL A




DETAIL B




DETAIL C

POLYETHYLENE LID

NOTES:

1 For 914mm cylinder lid, cut along trim line as shown.

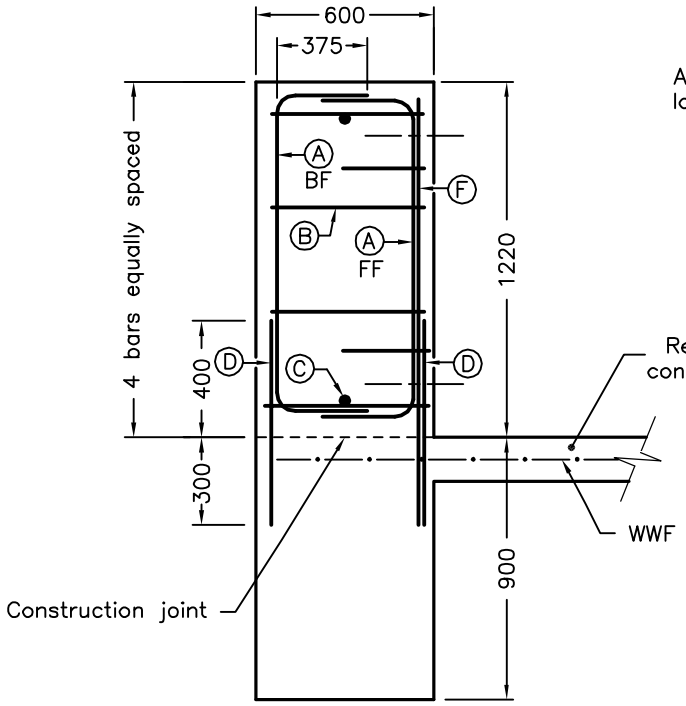
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

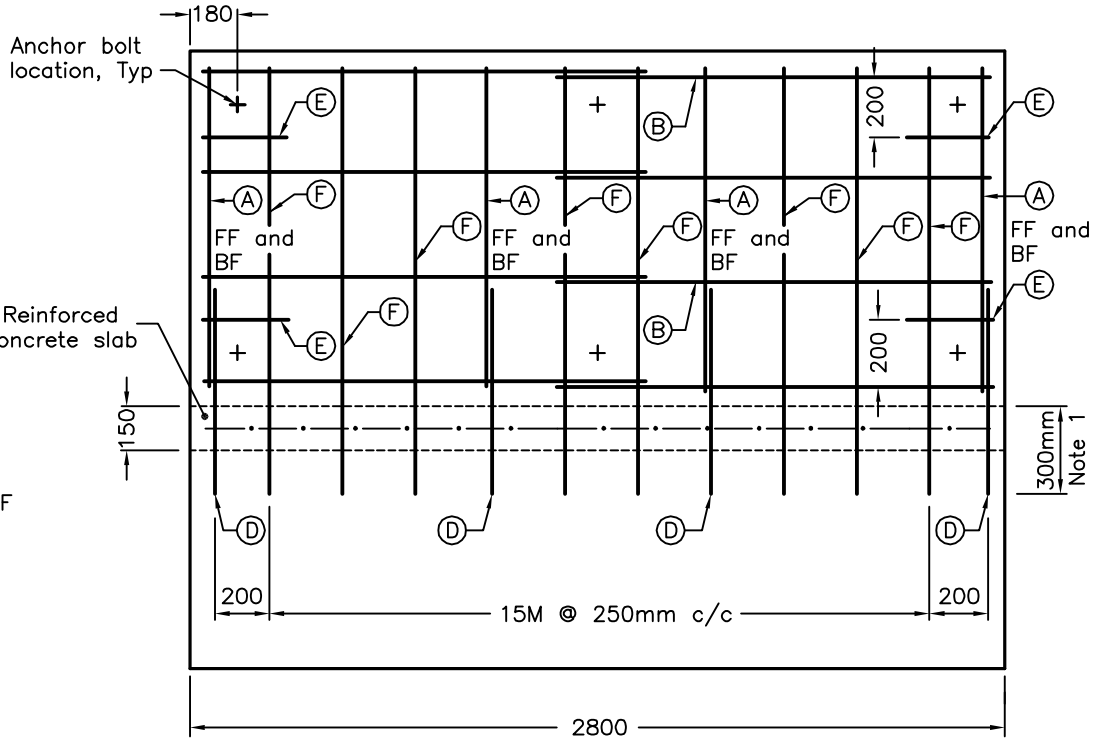
# ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM COMPONENT – POLYETHYLENE LID

Nov 2013 | Rev 2

OPSD 923.202




SIDE VIEW




FRONT VIEW

LEGEND:

BF – Back Face

FF – Front Face

NOTES:

1 Bars D and F shall extend a minimum of 300mm below grade.

A All reinforcing steel bar splices shall have a minimum overlap of 300mm.

B All reinforcing steel bars shall be size 15M. All right angle bends shall have a minimum radius of 80mm.

C All reinforcing steel bars shall have 70mm minimum cover.

D All dimensions are in millimetres unless otherwise shown.

| REINFORCEMENT OF CONCRETE BACKWALL | | | |
|---|---|---|---|
| BAR | LENGTH | SHAPE | NO. REQ'D |
| A | 1820 | 1070, 375 | 8 |
| B | 3400 | 450, 1475 | 8 |
| C | 2670 | 2670 | 2 |
| D | 700 | 700 | 8 |
| E | 500 | 250, 250 | 4 |
| F | 1450 | 1450 | 8 |

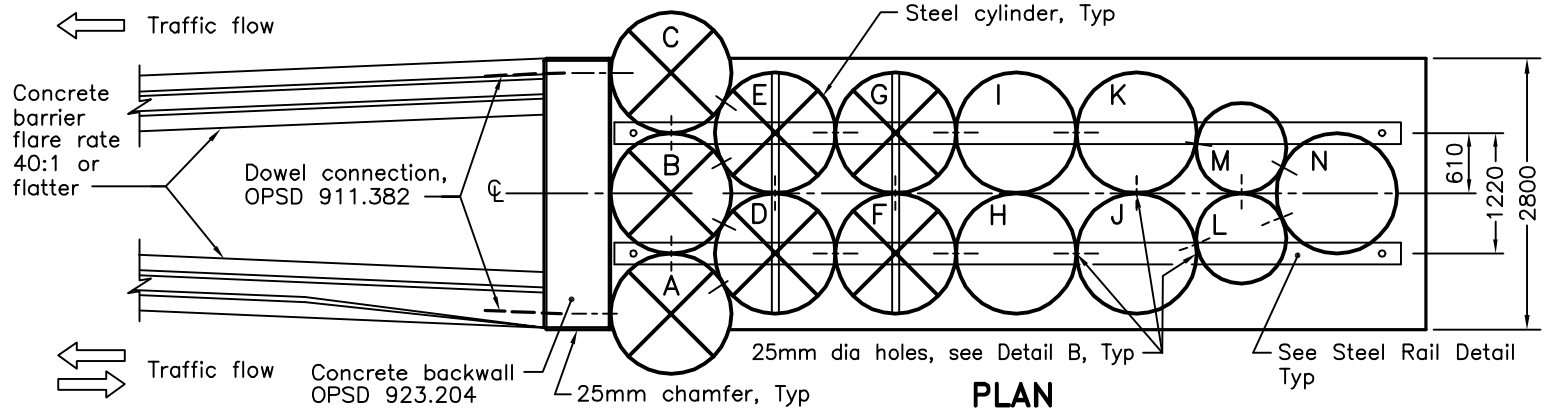
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2013 | Rev 2

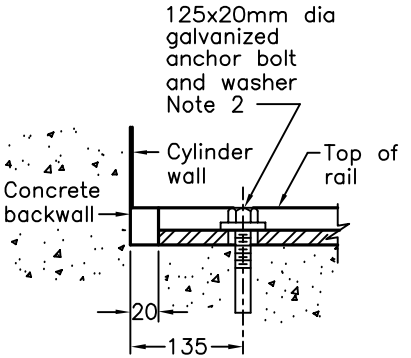
# ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM COMPONENT – CONCRETE BACKWALL

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

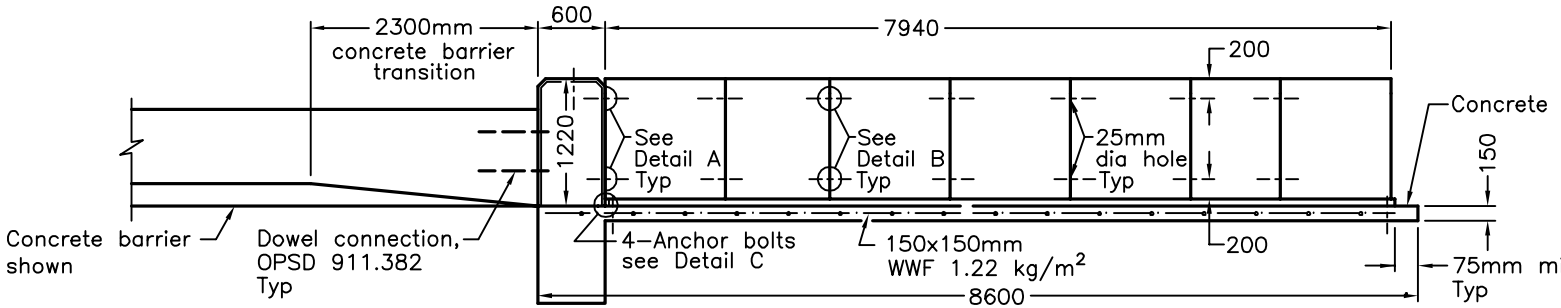
OPSD 923.204



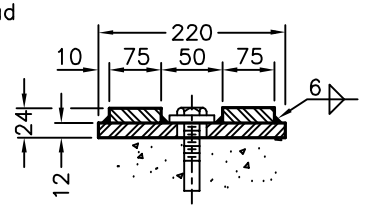

PLAN



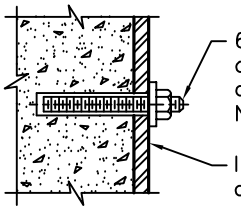

DETAIL C



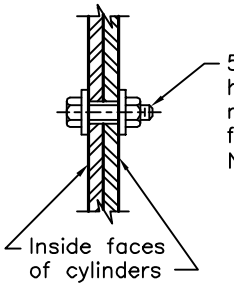

ELEVATION




SECTION A–A



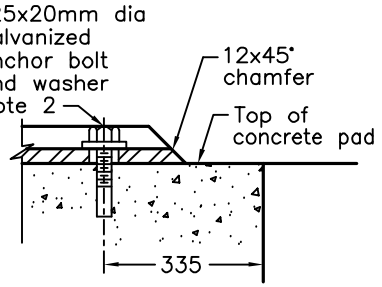

DETAIL A




DETAIL B




STEEL RAIL DETAIL




SECTION B–B

NOTES:

1 Stud shall extend beyond nut by not more than 10mm.

2 Bolt head shall be flush or below top of rail.

A Delineation shall be according to OPSD 984.205.

B System configuration meets NCHRP Report 350 TL–3.

C For SBGR connection to concrete backwall refer to OPSD 923.245.

D This OPSD shall be read in conjunction with OPSD 923.201, 923.202, and 923.204.

E All dimensions are in millimetres unless otherwise shown.

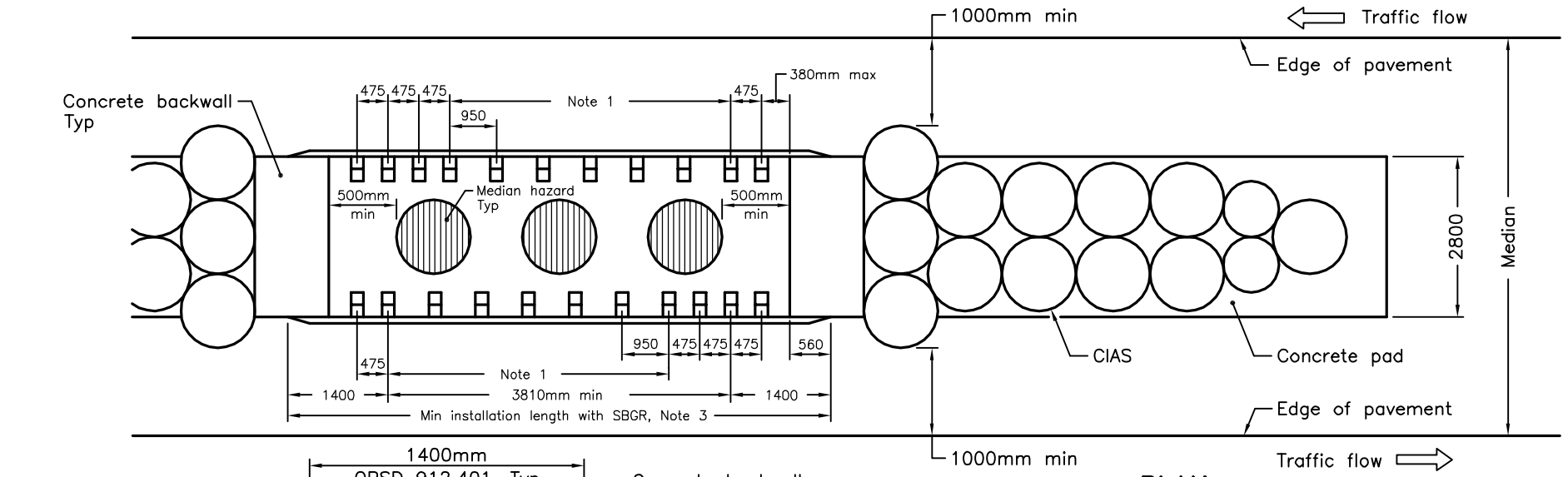
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM INSTALLATION

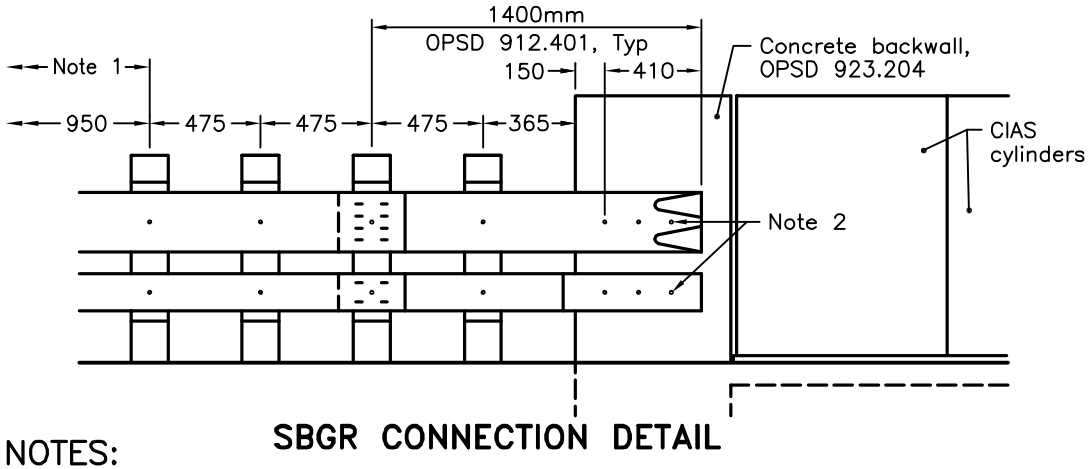
Nov 2013 | Rev 2

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

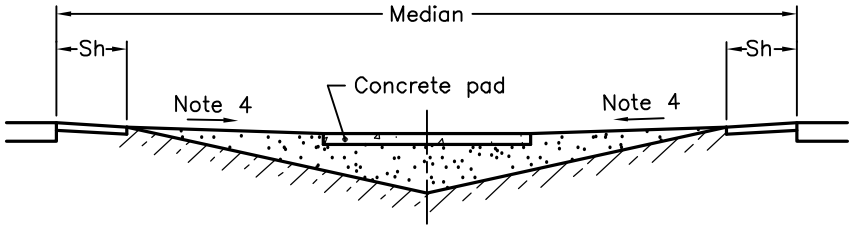
OPSD 923.242




PLAN




SBGR CONNECTION DETAIL




MEDIAN

NOTES:

1 Where additional SBGR panels are required, post spacing shall be 950mm as shown.

2 Six 3/4" diameter ISO 898–1 Class 5.8 threaded rods with washer and nut into Hilti Hit–RE 500 adhesive anchoring system with a minimum 125mm embedment depth. Nuts shall not be torqued until epoxy has cured. Anchoring system shall be installed according to the manufacturer's specifications by an installer trained by the manufacturer's direct representative.

3 For shorter installations, concrete barrier shall be used between the concrete backwalls.

4 Cross slopes shall be 10H:1V or flatter.

A This OPSD shall be read in conjunction with OPSD 923.242.

B All dimensions are in millimetres unless otherwise shown.

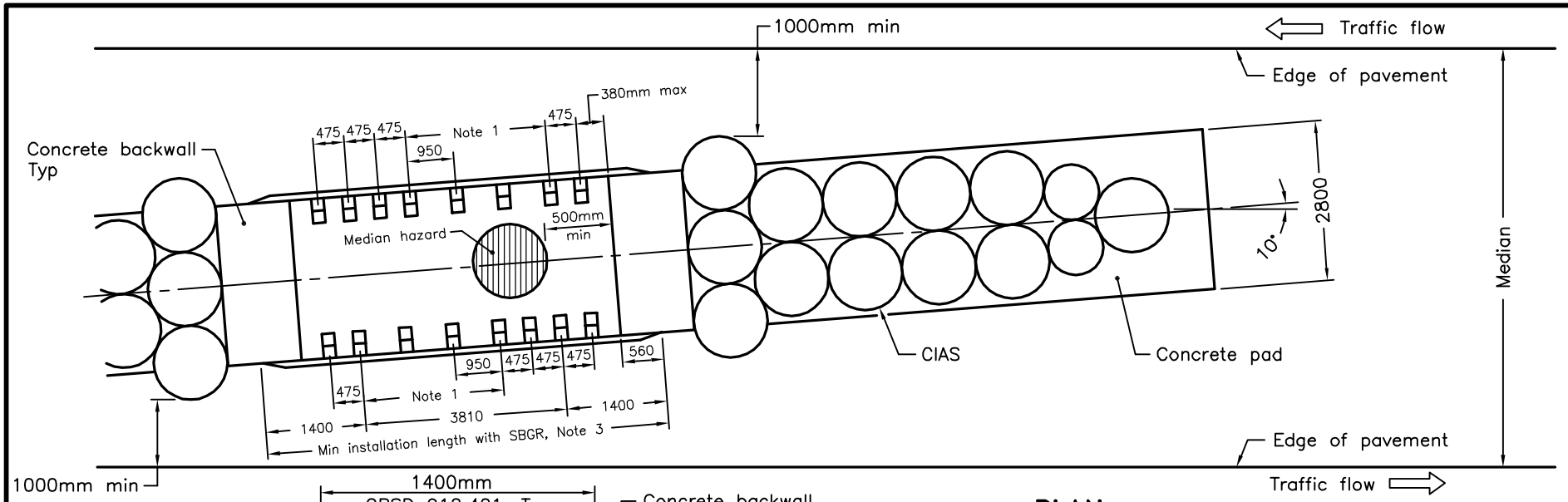
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM INSTALLATION – LONG MEDIAN HAZARD

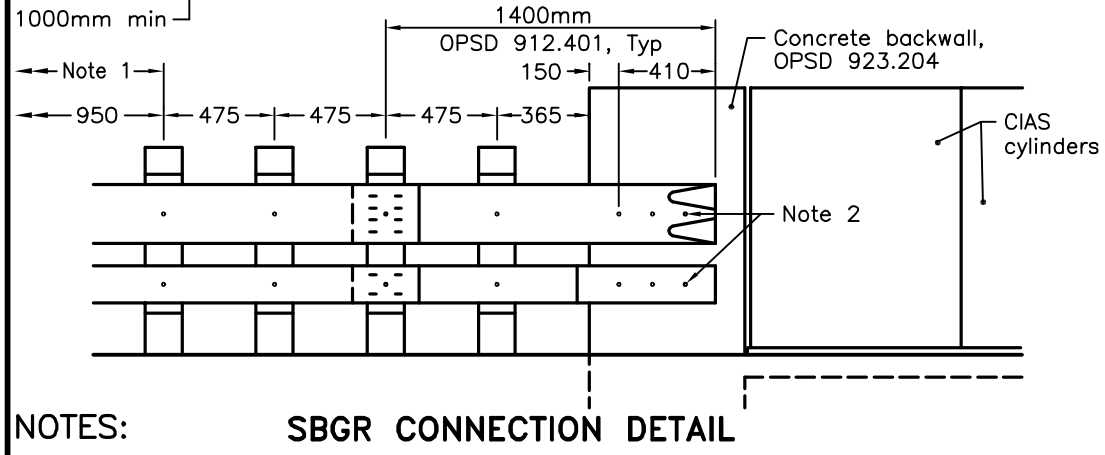
Nov 2013 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

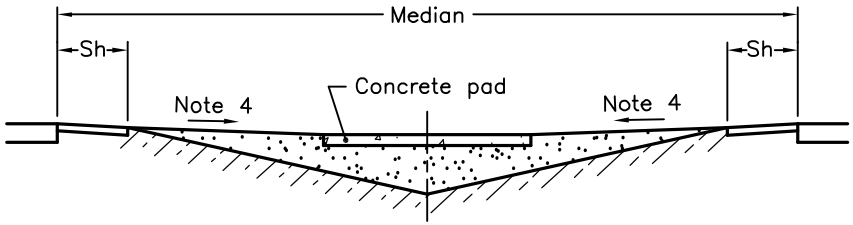
OPSD 923.244




**PLAN**




**SBGR CONNECTION DETAIL**




**MEDIAN**

NOTES:

1 Where additional SBGR panels are required, post spacing shall be 950mm as shown.

2 Six 3/4" diameter ISO 898–1 Class 5.8 threaded rods with washer and nut into Hilti Hit–RE 500 adhesive anchoring system with a minimum 125mm embedment depth. Nuts shall not be torqued until epoxy has cured. Anchoring system shall be installed according to the manufacturer's specifications by an installer trained by the manufacturer's direct representative.

3 For shorter installations, concrete barrier shall be used between the concrete backwalls.

4 Cross slopes shall be 10H:1V or flatter.

A This OPSD shall be read in conjunction with OPSD 923.242.

B All dimensions are in millimetres unless otherwise shown.

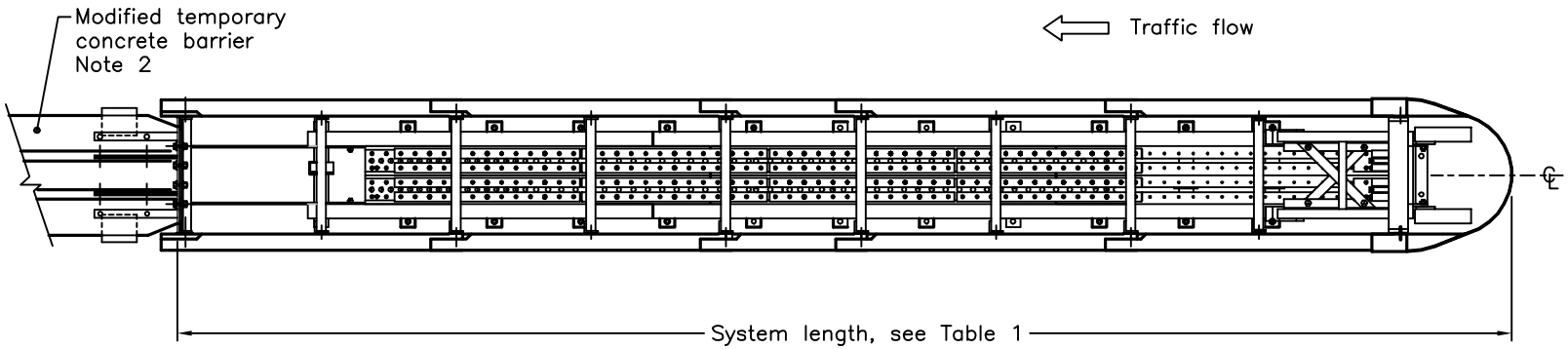
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION CONNECTICUT IMPACT ATTENUATION SYSTEM INSTALLATION – SHORT MEDIAN HAZARD

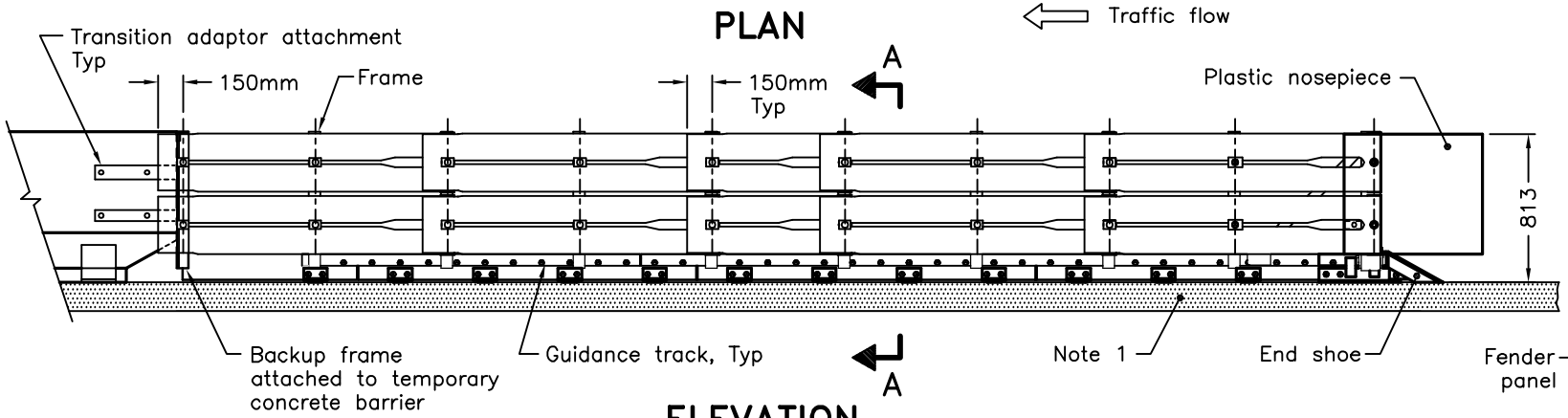
Nov 2013 | Rev 2

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

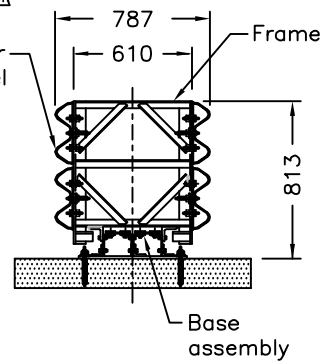
OPSD 923.245




PLAN




ELEVATION




SECTION A–A

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4750 | 6857 |

NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.

2 Adjacent temporary concrete barrier shall be modified and anchored according to OPSD 923.002.

A Delineation shall be according to OPSD 984.203.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

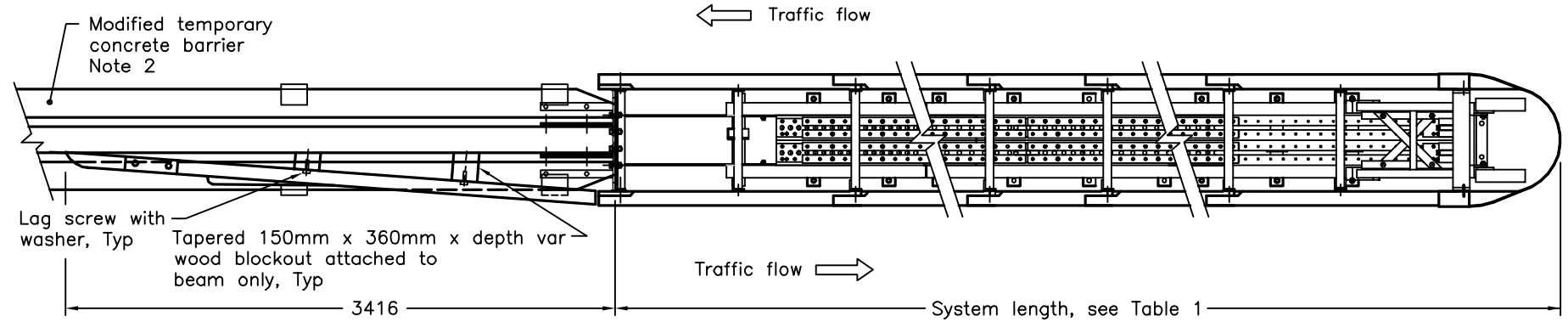
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

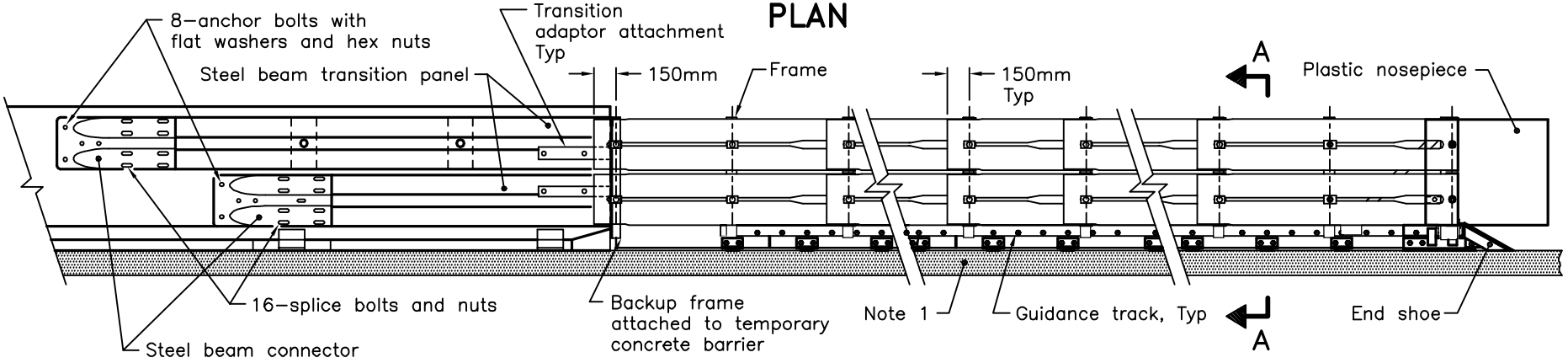
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 923.280

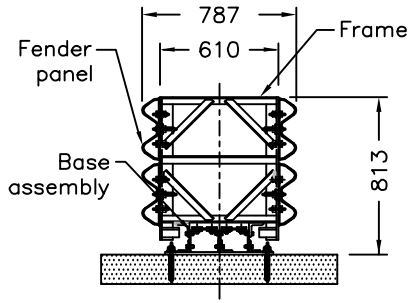



PLAN




ELEVATION

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4750 | 6857 |




SECTION A–A

NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.

2 Adjacent temporary concrete barrier shall be modified and anchored according to OPSD 923.002.

A Delineation shall be according to OPSD 984.203.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

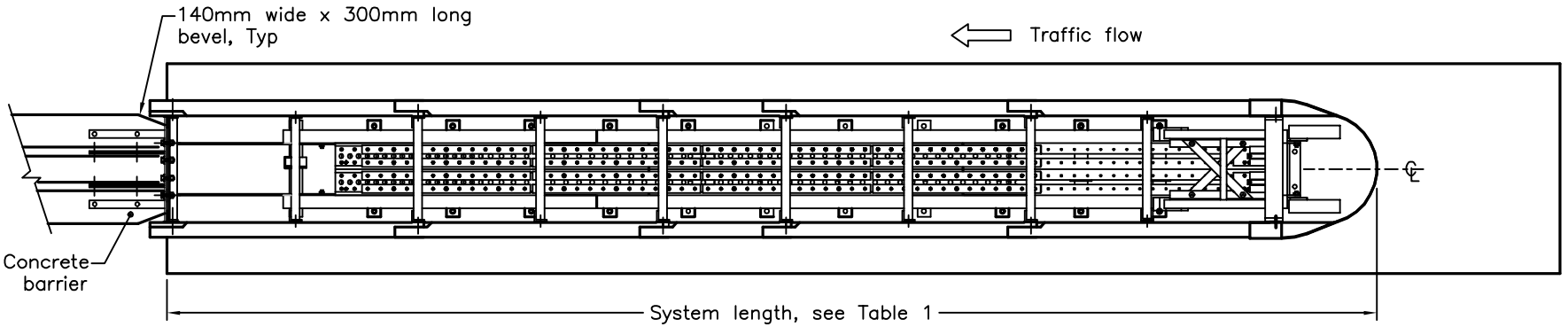
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

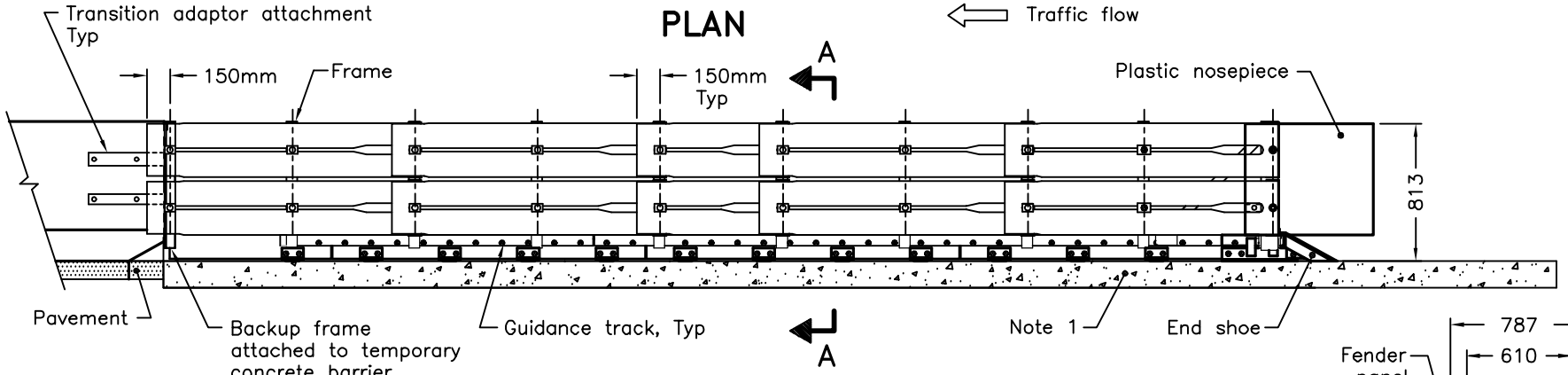
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

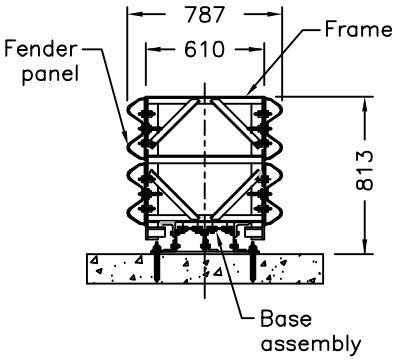
OPSD 923.281




PLAN




ELEVATION




SECTION A–A

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4750 | 6857 |

NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.001.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

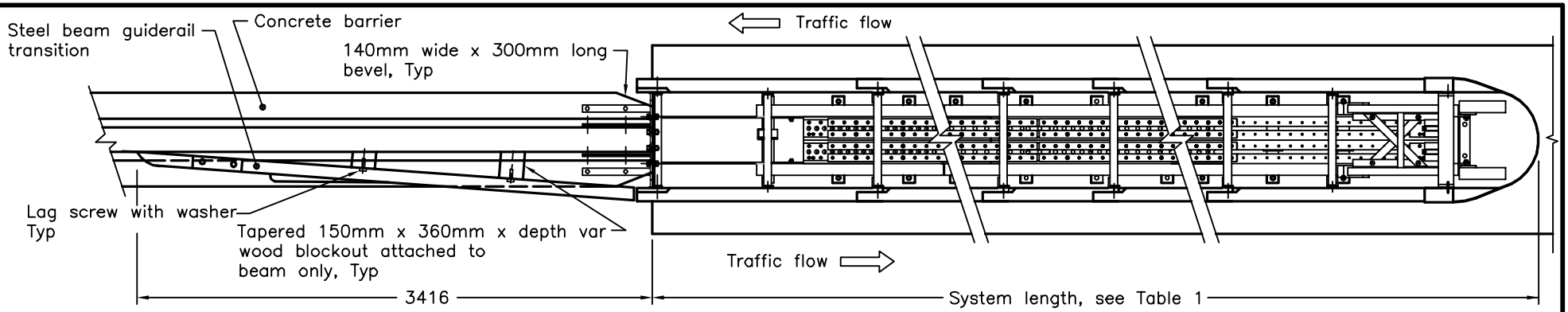
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

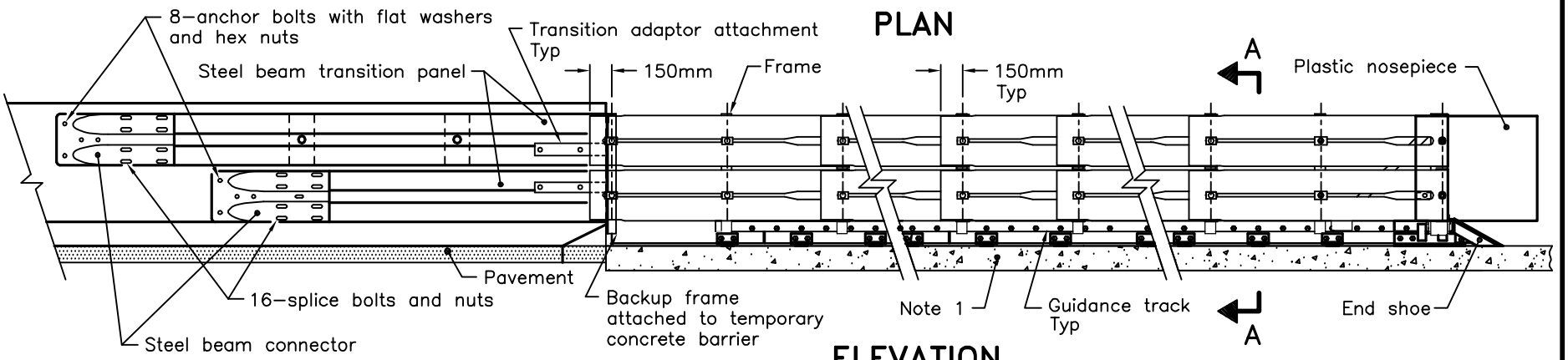
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 923.282

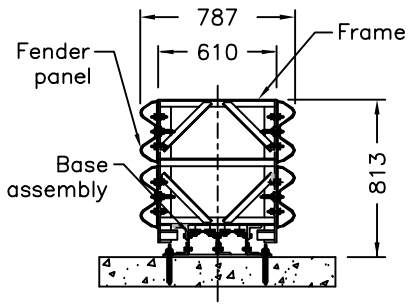



PLAN




ELEVATION

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4750 | 6857 |




SECTION A–A

NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.001.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

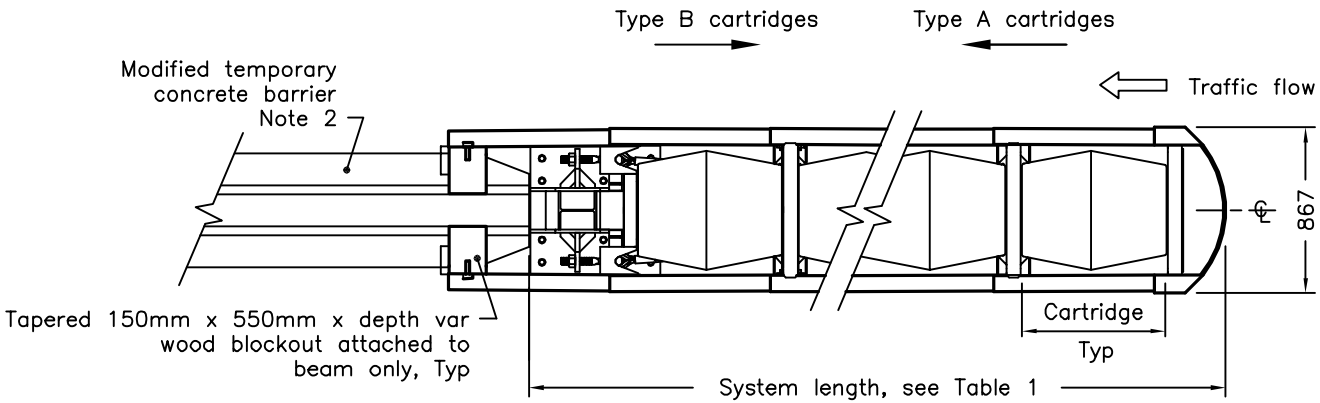
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TRACC SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

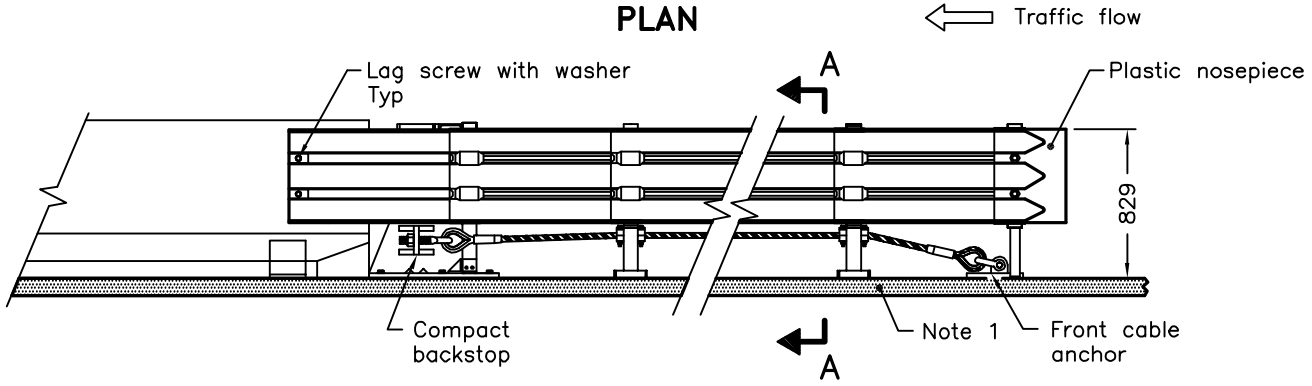
Nov 2011 | Rev 1

ONTARIO STANDARDS MUNICIPAL – PROVINCIAL

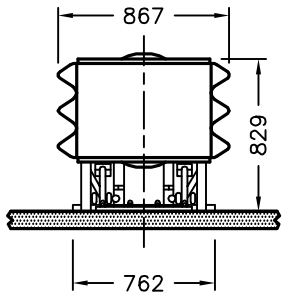
OPSD 923.283




**PLAN**




**ELEVATION**




**SECTION A–A**

NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.
2 Adjacent temporary concrete barrier shall be modified and anchored according to OPSD 923.002.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 3780 | 7250 |

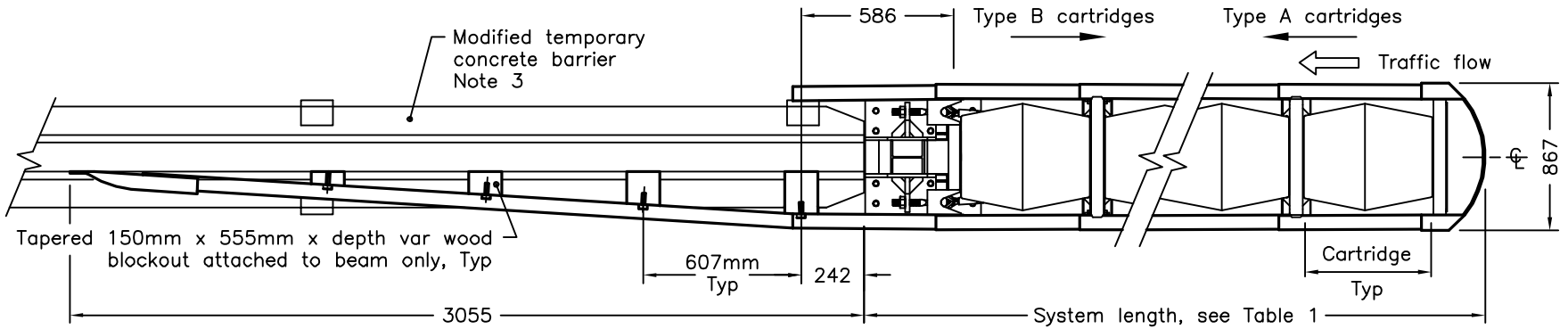
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

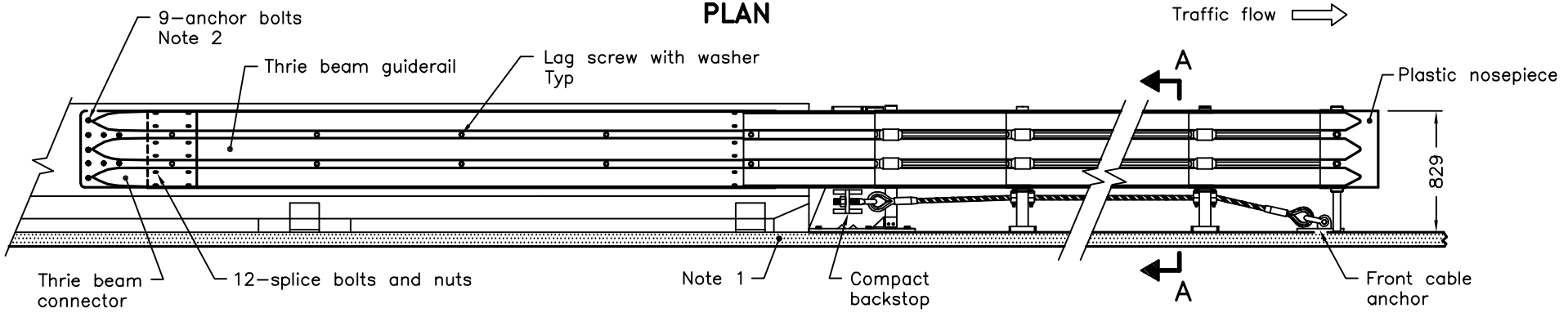
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 923.380




**PLAN**



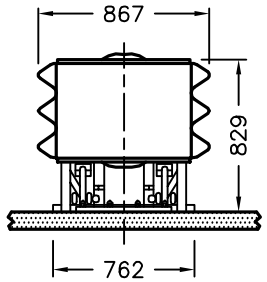

**ELEVATION**

NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.
2 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.
3 Adjacent temporary concrete barrier shall be modified and anchored according to OPSD 923.002.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 3780 | 7250 |



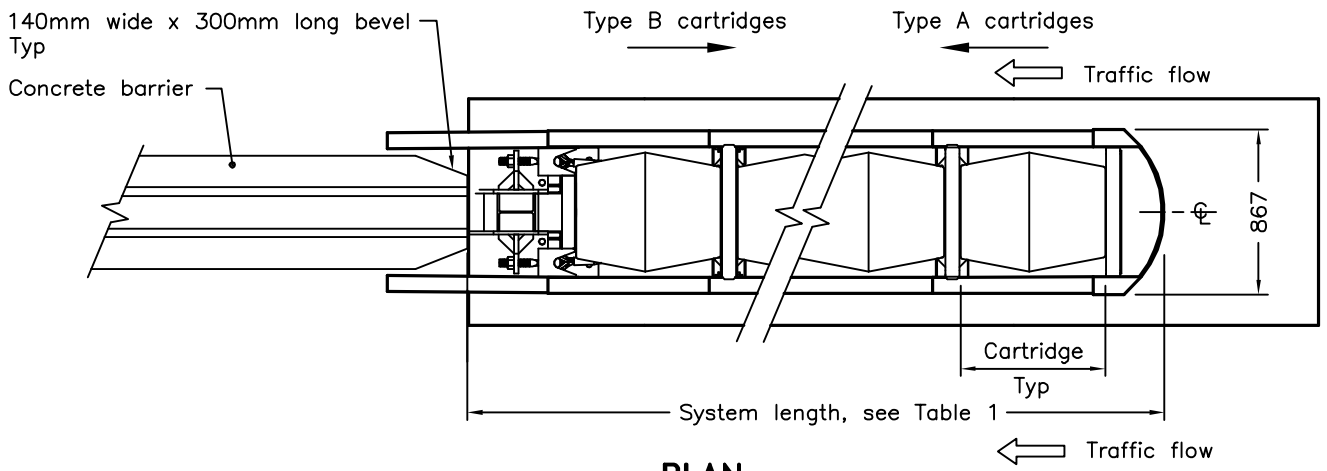

**SECTION A–A**

ONTARIO PROVINCIAL STANDARD DRAWING

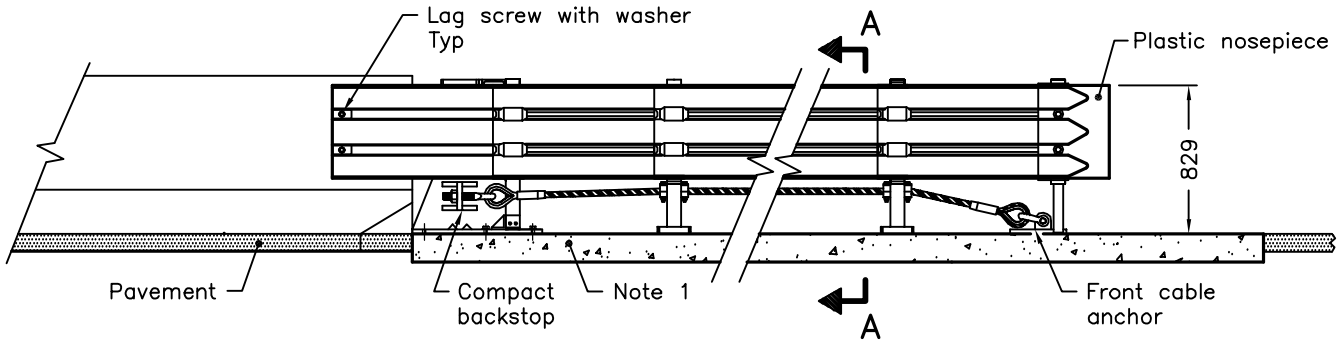
# ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

Nov 2011 | Rev 1

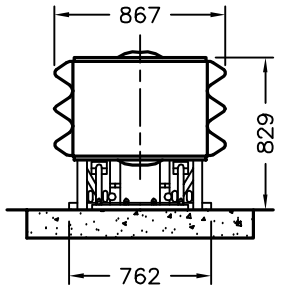
OPSD 923.381




**PLAN**




**ELEVATION**




**SECTION A–A**

NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.001.

A Delineation shall be according to OPSD 984.204.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

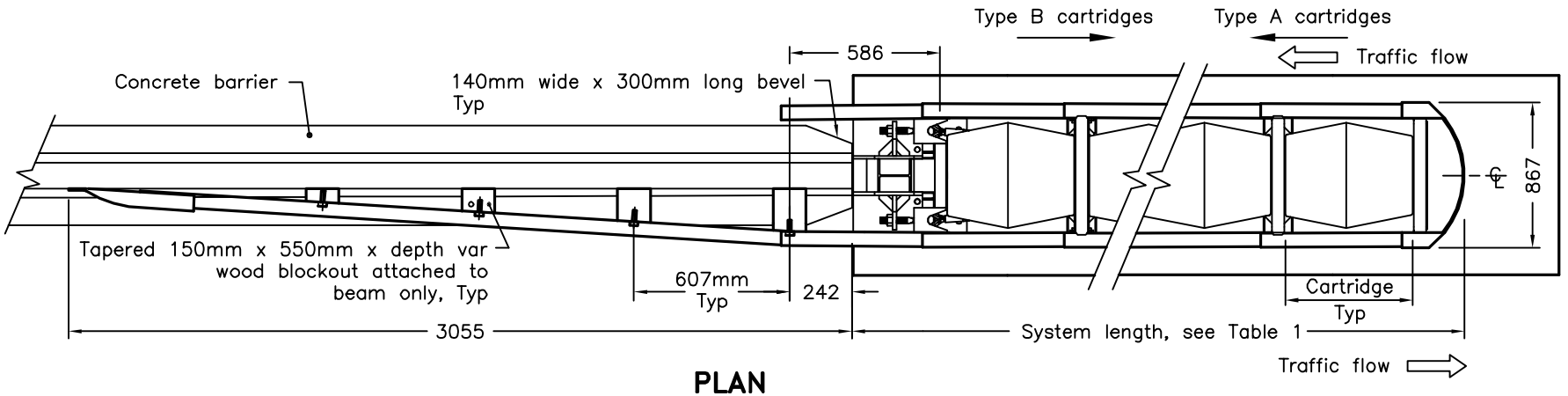
| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 3780 | 7250 |

ONTARIO PROVINCIAL STANDARD DRAWING

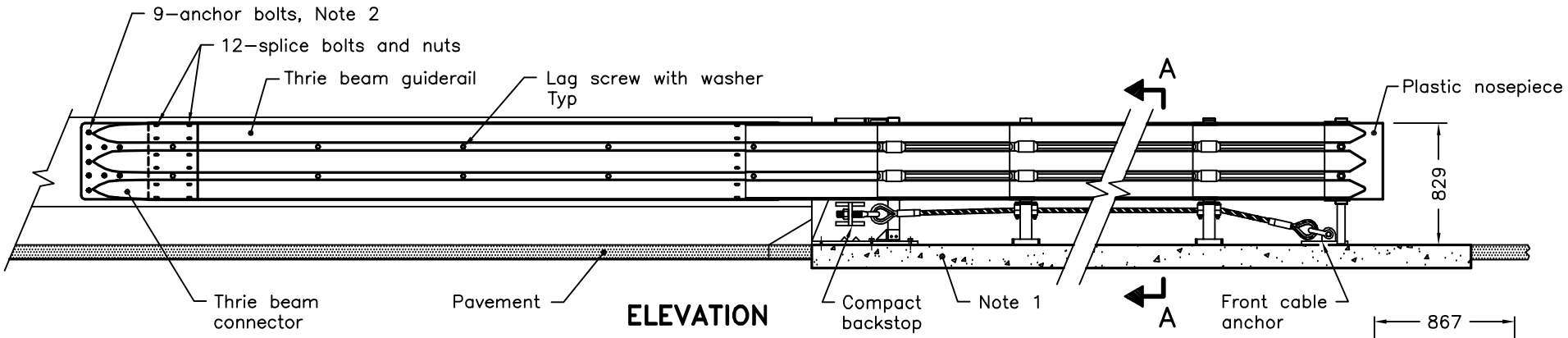
# ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

Nov 2011 | Rev 1

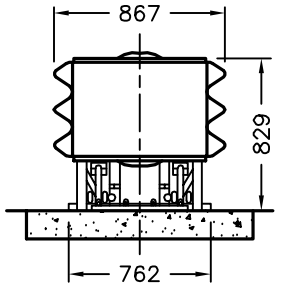
OPSD 923.382




**PLAN**




**ELEVATION**




**SECTION A–A**

NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.001.

2 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 3780 | 7250 |

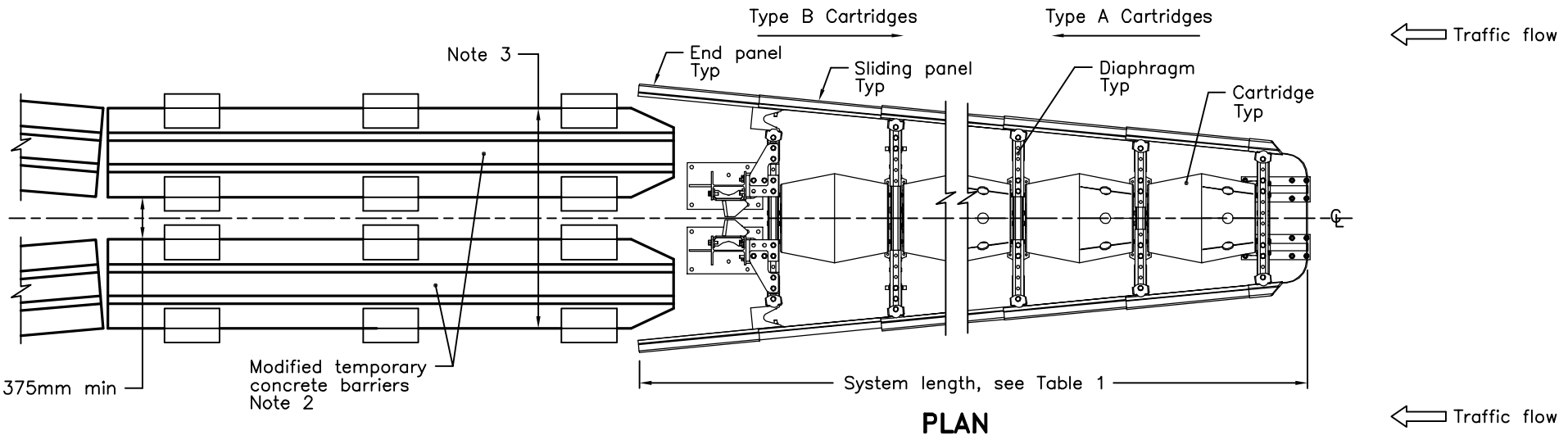
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

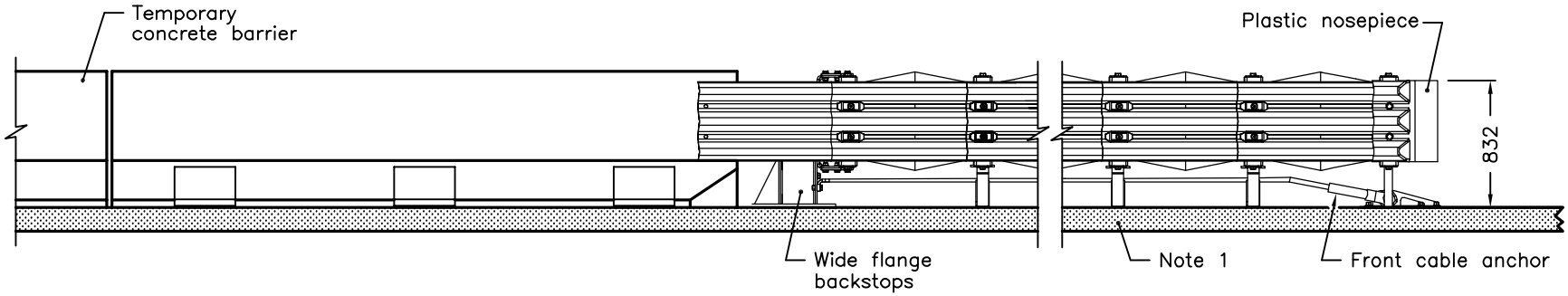
Nov 2011 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL ·

OPSD 923.383




**PLAN**




**ELEVATION**

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 4722 | 8084 |
| NOMINAL SYSTEM WIDTH | 1520 | 1520 |

## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.004.
2 Adjacent temporary concrete barriers shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

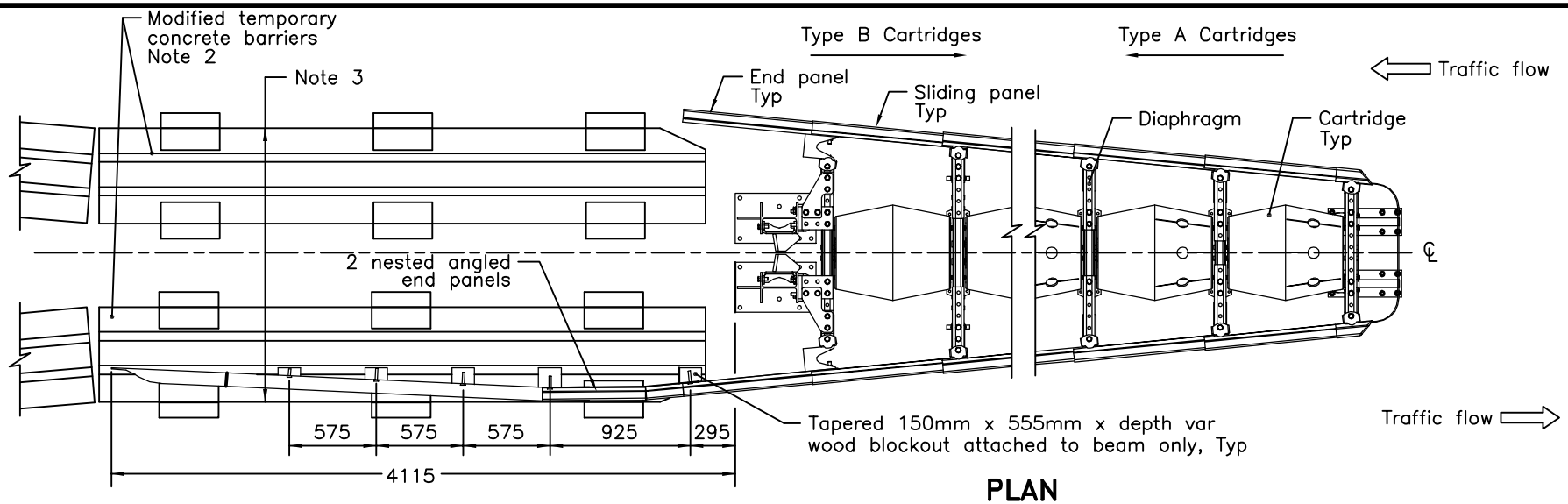
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – TEMPORARY UNIDIRECTIONAL

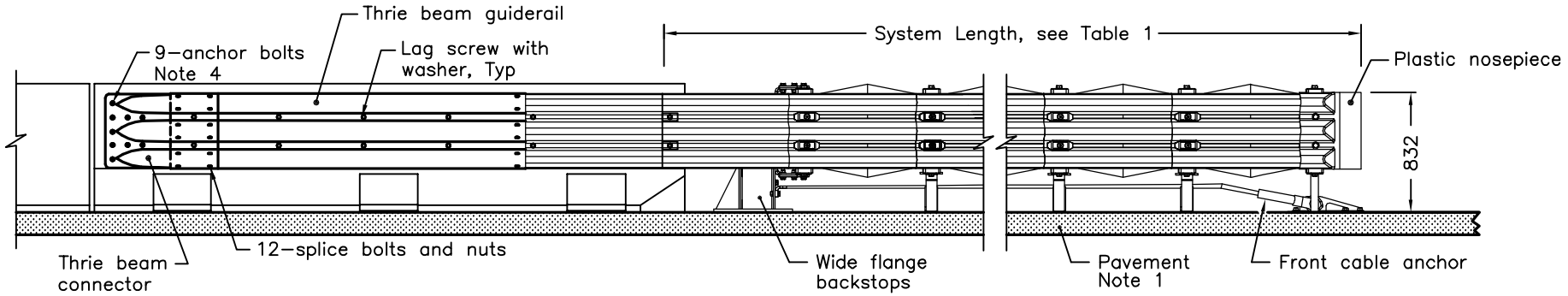
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.384




## PLAN




## ELEVATION

NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.004.
2 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
3 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.
4 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

A Delineation shall be according to OPSD 984.203.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 4722 | 8084 |
| NOMINAL SYSTEM WIDTH | 1520 | 1520 |

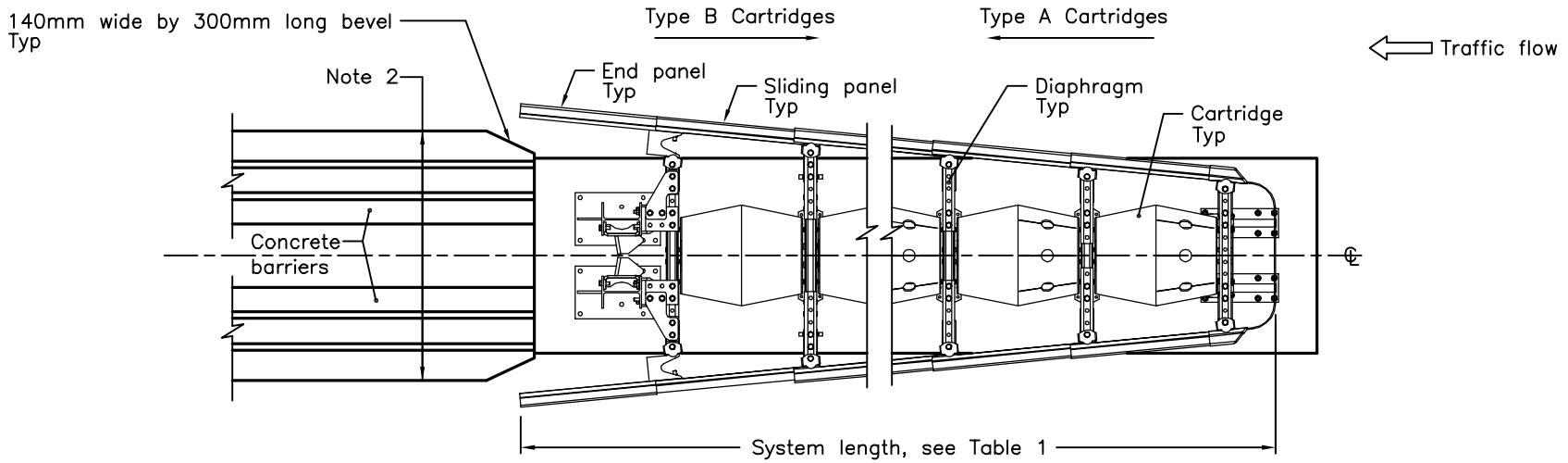
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – TEMPORARY BIDIRECTIONAL

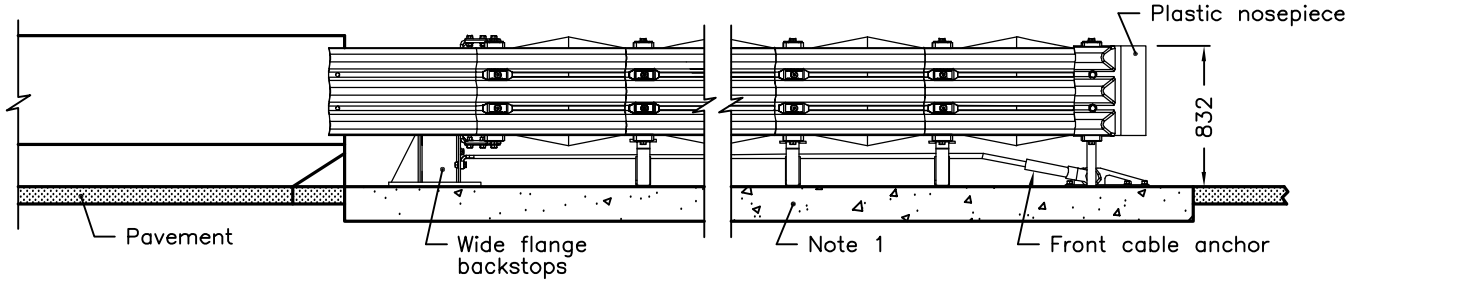
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

OPSD 923.385




**PLAN**




**ELEVATION**

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 4722 | 8084 |
| NOMINAL SYSTEM WIDTH | 1520 | 1520 |

## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.004.
2 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.204.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

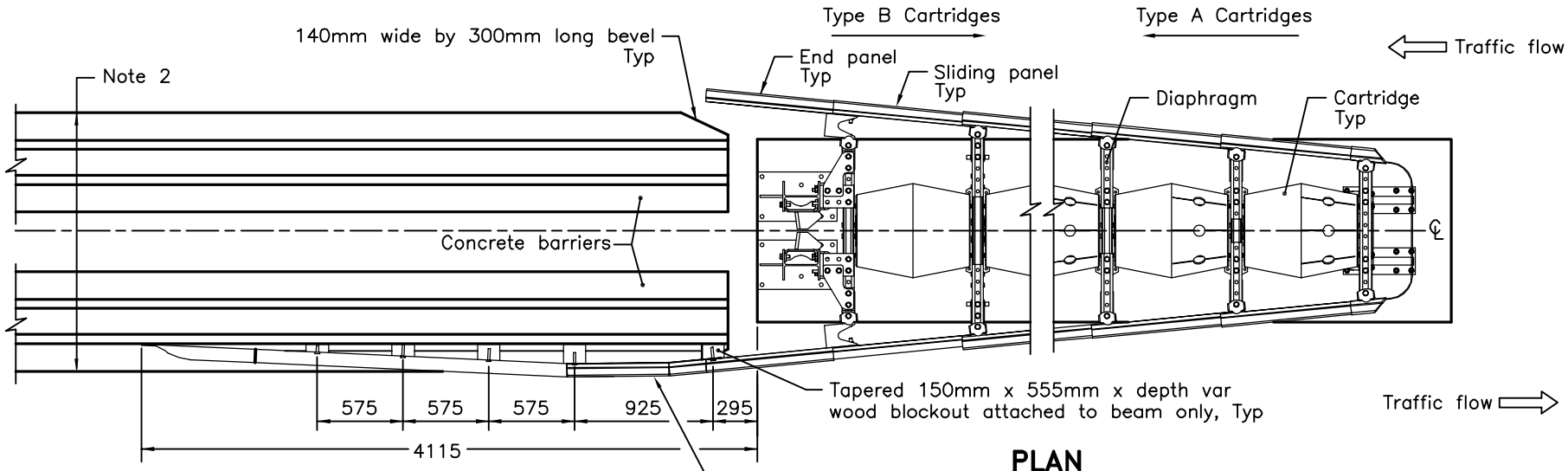
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – PERMANENT UNIDIRECTIONAL

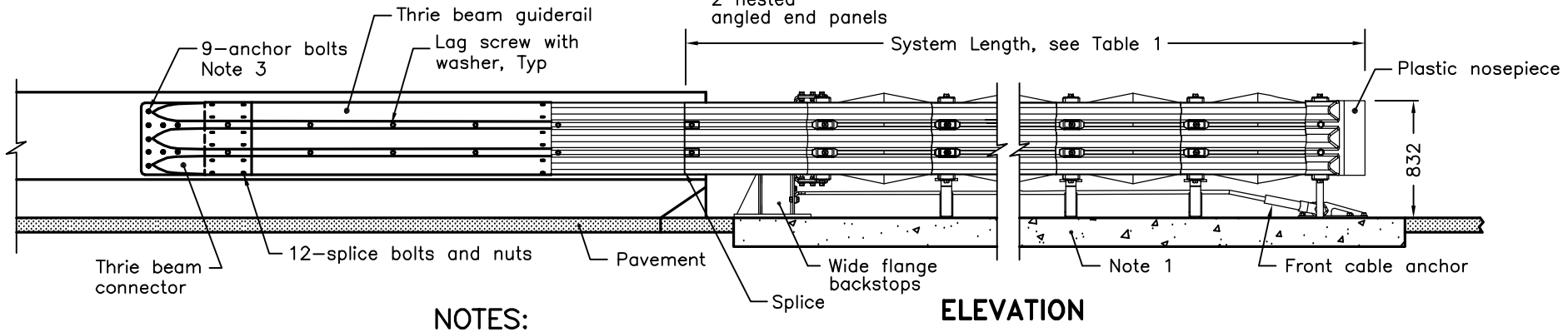
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPSS

OPSD 923.386




## PLAN




## ELEVATION

## NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.004.
2 Maximum width of object shall be 1658mm for the first 762mm behind the rear fender panels.
3 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

A Delineation shall be according to OPSD 984.204.
B The system depicted here is a proprietary product.
C System configuration meets NCHRP Report 350 test level.
D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| TYPE A CARTRIDGES FRONT REQ'D | 1 | 3 |
| TYPE B CARTRIDGES REAR REQ'D | 3 | 5 |
| SYSTEM LENGTH | 4722 | 8084 |
| NOMINAL SYSTEM WIDTH | 1520 | 1520 |

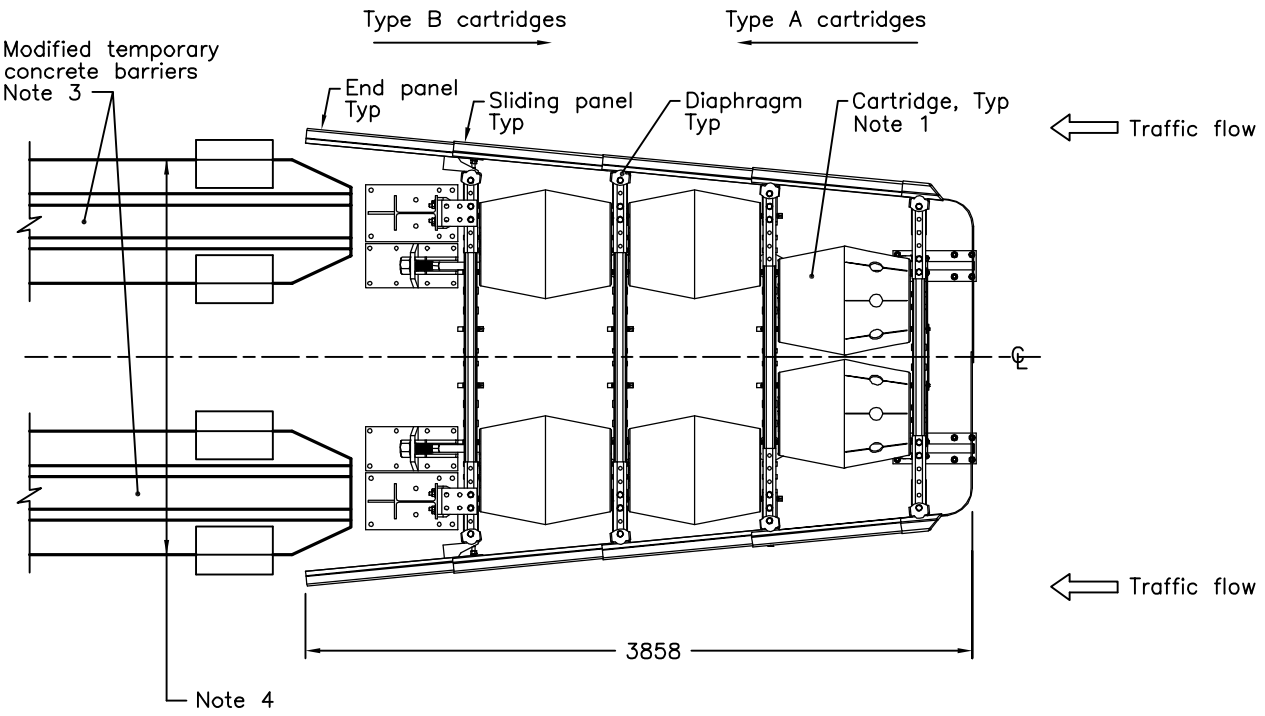
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II WIDE SYSTEM INSTALLATION – PERMANENT BIDIRECTIONAL

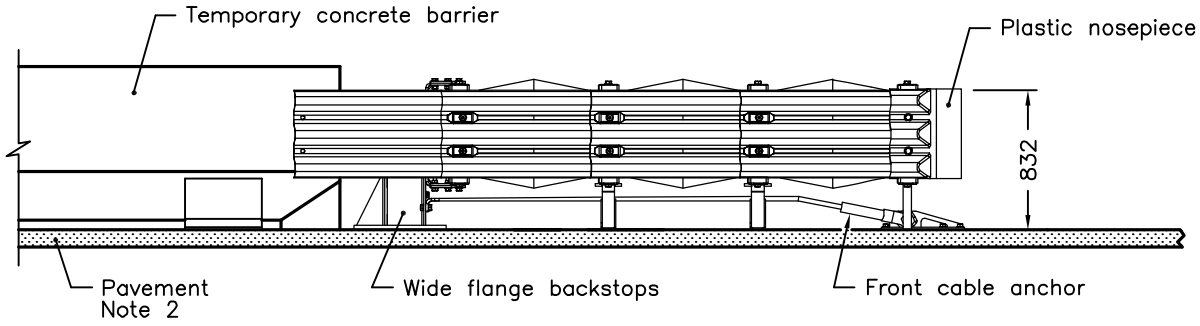
Nov 2011 | Rev 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

OPSD 923.387




**PLAN**



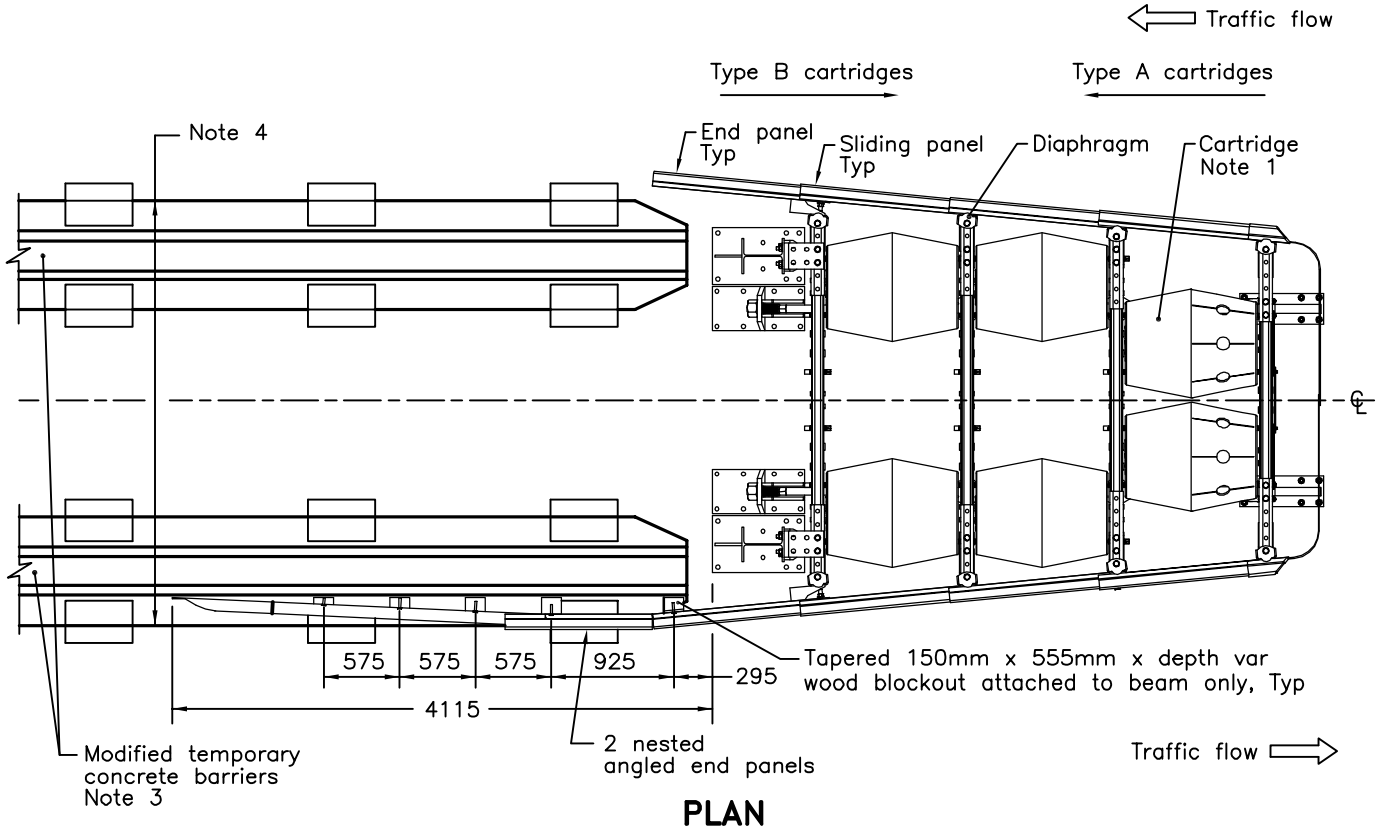

**ELEVATION**

## NOTES:

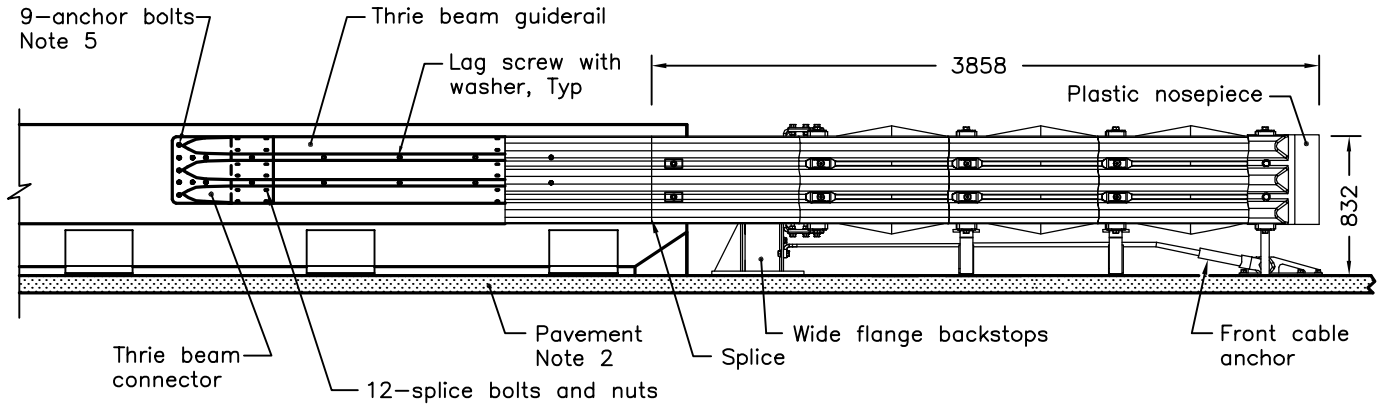
1 2 Type A and 4 Type B cartridges.
2 When system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
3 Adjacent temporary concrete barriers shall be modified and anchored according to OPSD 923.002.
4 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.203.
B Nominal system width is 2290mm.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION TAU-II EXTRA WIDE SYSTEM – TL-2 INSTALLATION – TEMPORARY UNIDIRECTIONAL | | | |
| | OPSD 923.388 | | |




**PLAN**



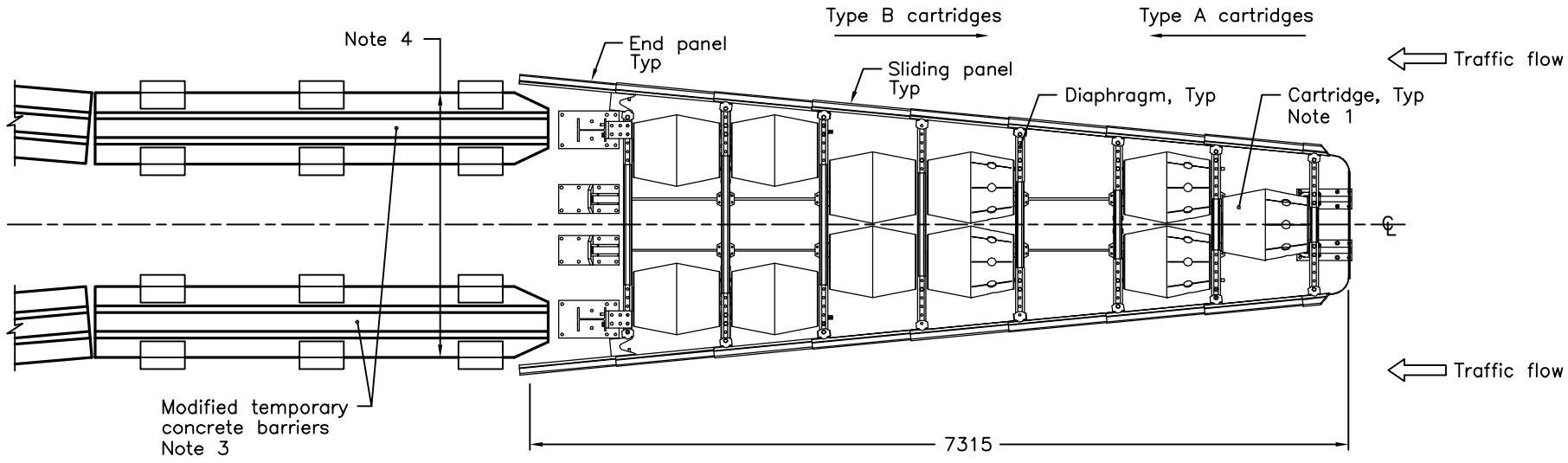

**ELEVATION**

## NOTES:

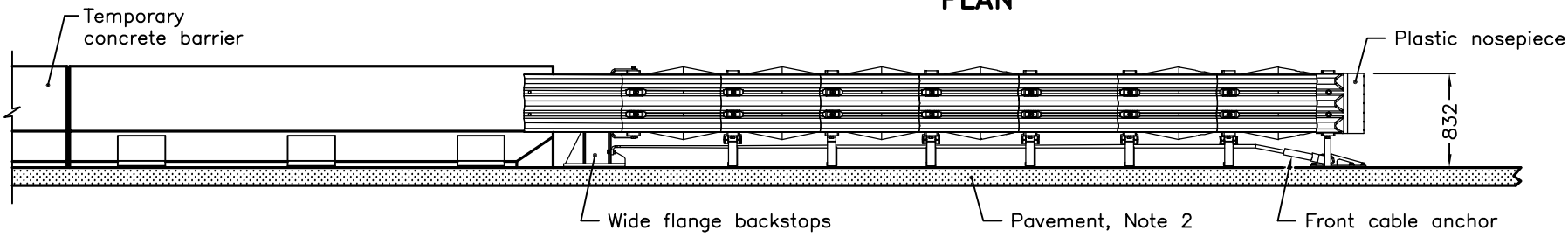
1 2 Type A and 4 Type B cartridges.
2 When the system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
3 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
4 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.
5 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

A Nominal system width is 2290mm.
B Delineation shall be according to OPSD 984.203.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–2 INSTALLATION – TEMPORARY BIDIRECTIONAL | | | |
| | | | OPSD 923.389 |




**PLAN**




**ELEVATION**

NOTES:

1 5 Type A and 6 Type B cartridges.
2 When system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
3 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
4 Maximum object width shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.203.
B Nominal system width is 2290mm.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

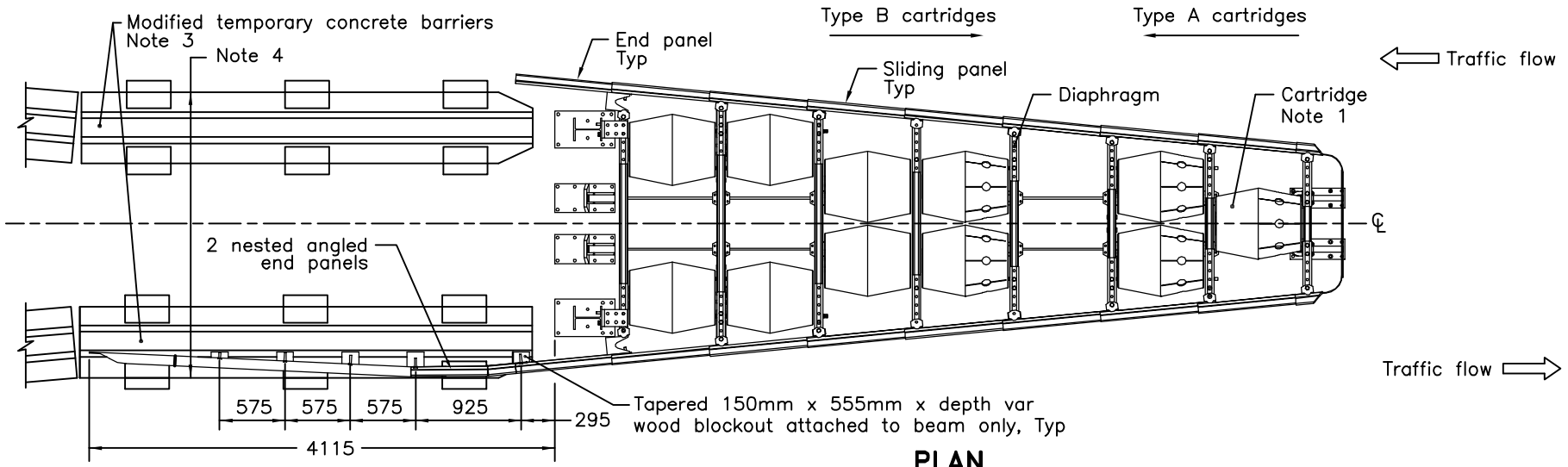
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–3 INSTALLATION – TEMPORARY UNIDIRECTIONAL

Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.390




NOTES:

1 5 Type A and 6 Type B cartridges.
2 When the system is placed on a concrete pad, the pad shall be according to OPSD 923.005.
3 Adjacent temporary concrete barrier units shall be modified and anchored according to OPSD 923.002.
4 Maximum object width shall be 2200mm for the first 762mm behind the rear fender panels.
5 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

A Nominal system width is 2290mm.
B Delineation shall be according to OPSD 984.203.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

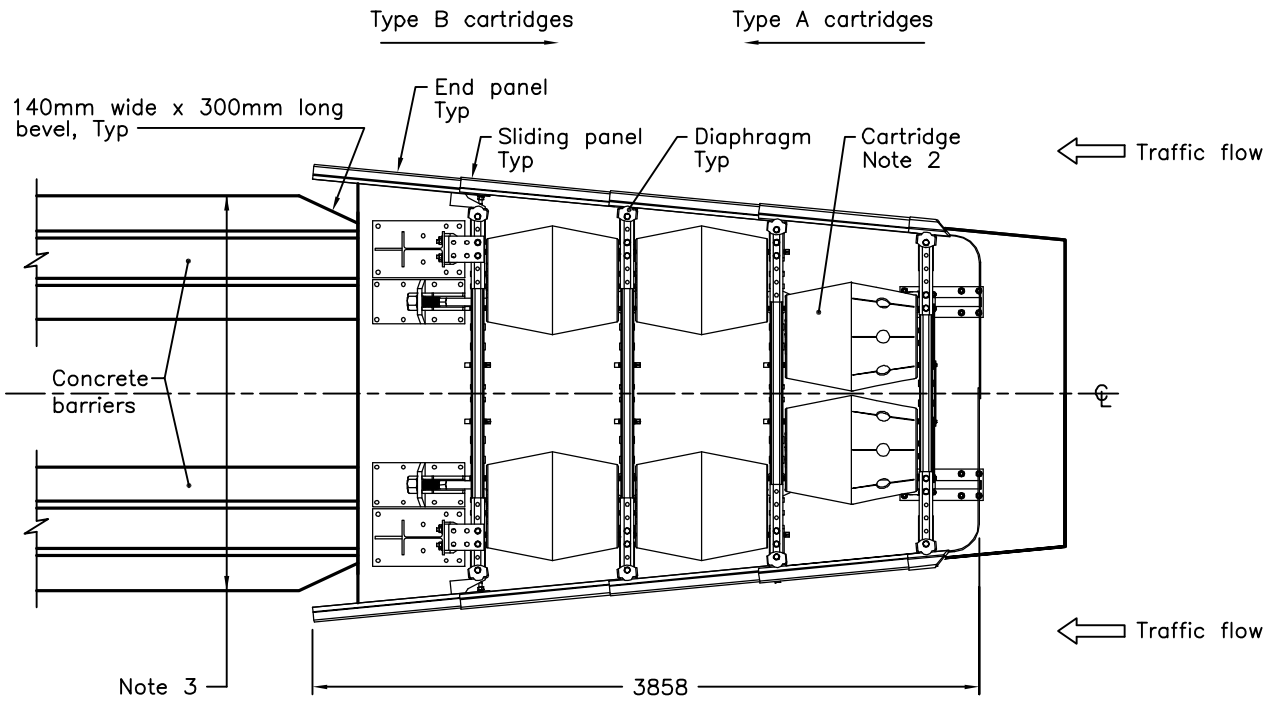
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–3 INSTALLATION – TEMPORARY BIDIRECTIONAL

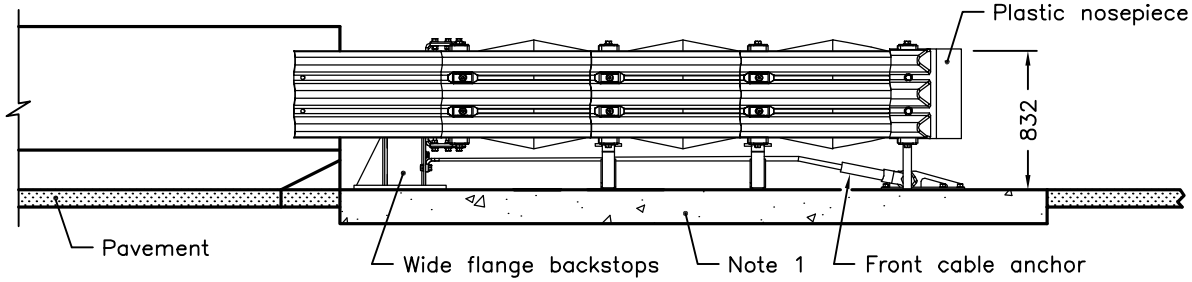
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 923.391




**PLAN**



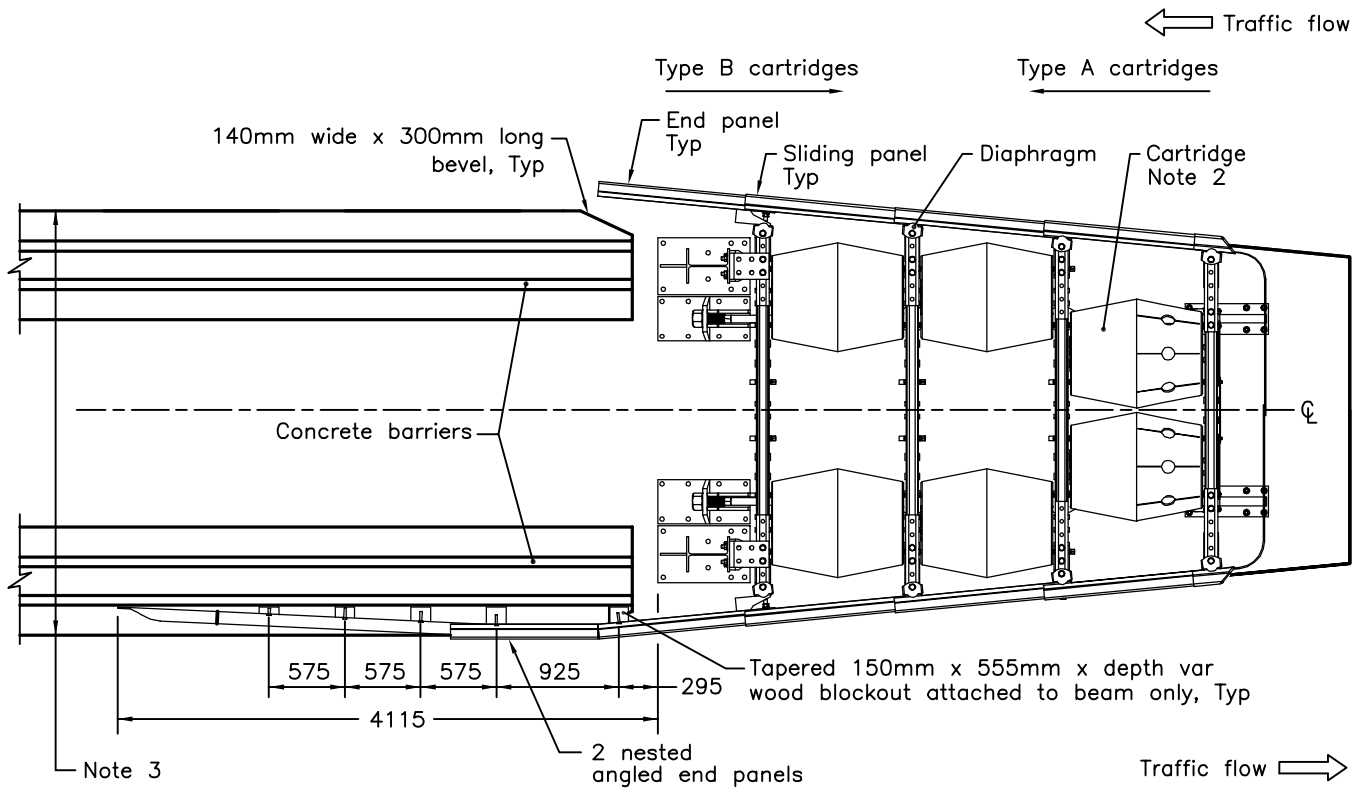

**ELEVATION**

## NOTES:

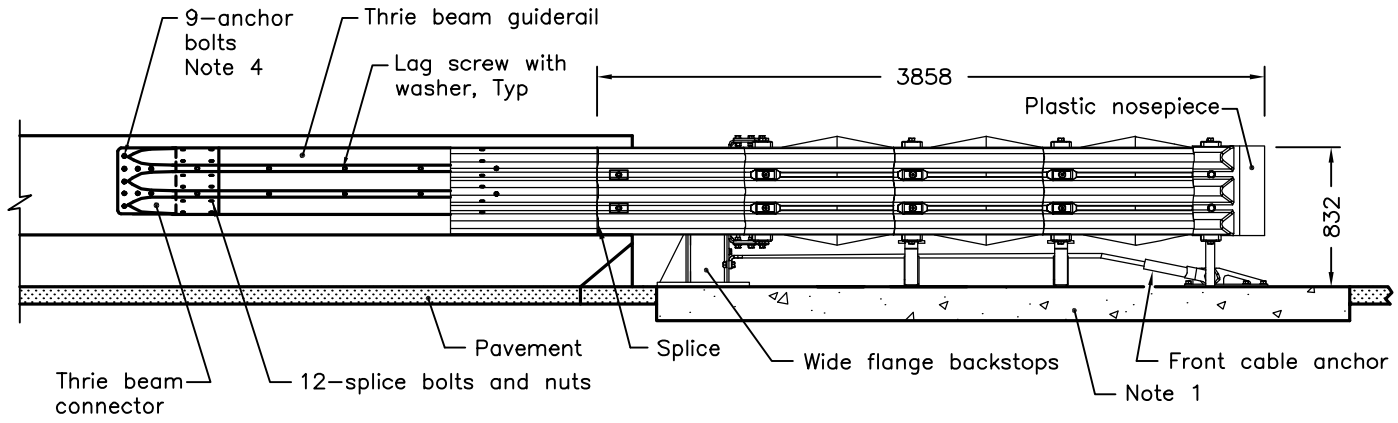
1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 2 Type A and 4 Type B cartridges.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.204.
B Nominal system width is 2290mm.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION TAU-II EXTRA WIDE SYSTEM – TL-2 INSTALLATION – PERMANENT UNIDIRECTIONAL | | | |
| | | | OPSD 923.392 |




## PLAN



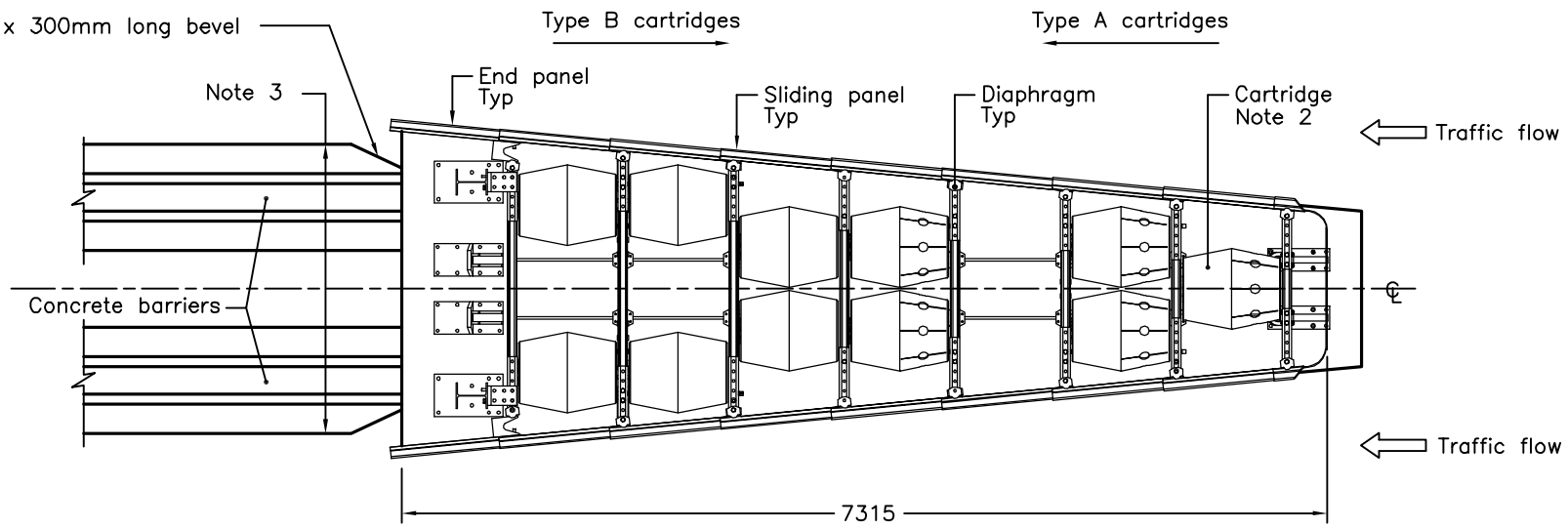

## ELEVATION

## NOTES:

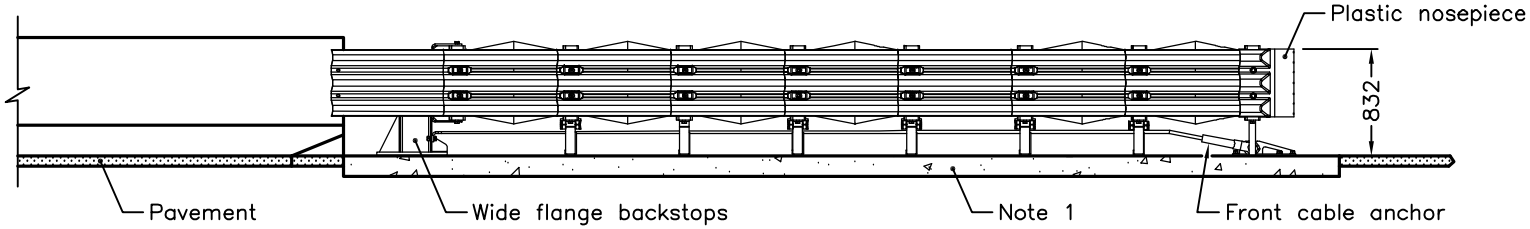
1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 2 Type A and 4 Type B cartridges.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.
4 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

A Nominal system width is 2290mm.
B Delineation shall be according to OPSD 984.204.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–2 INSTALLATION – PERMANENT BIDIRECTIONAL | | | |
| | | | OPSD 923.393 |




**PLAN**




**ELEVATION**

NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 5 Type A and 6 Type B cartridges.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.

A Delineation shall be according to OPSD 984.204.
B Nominal system width is 2290mm.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

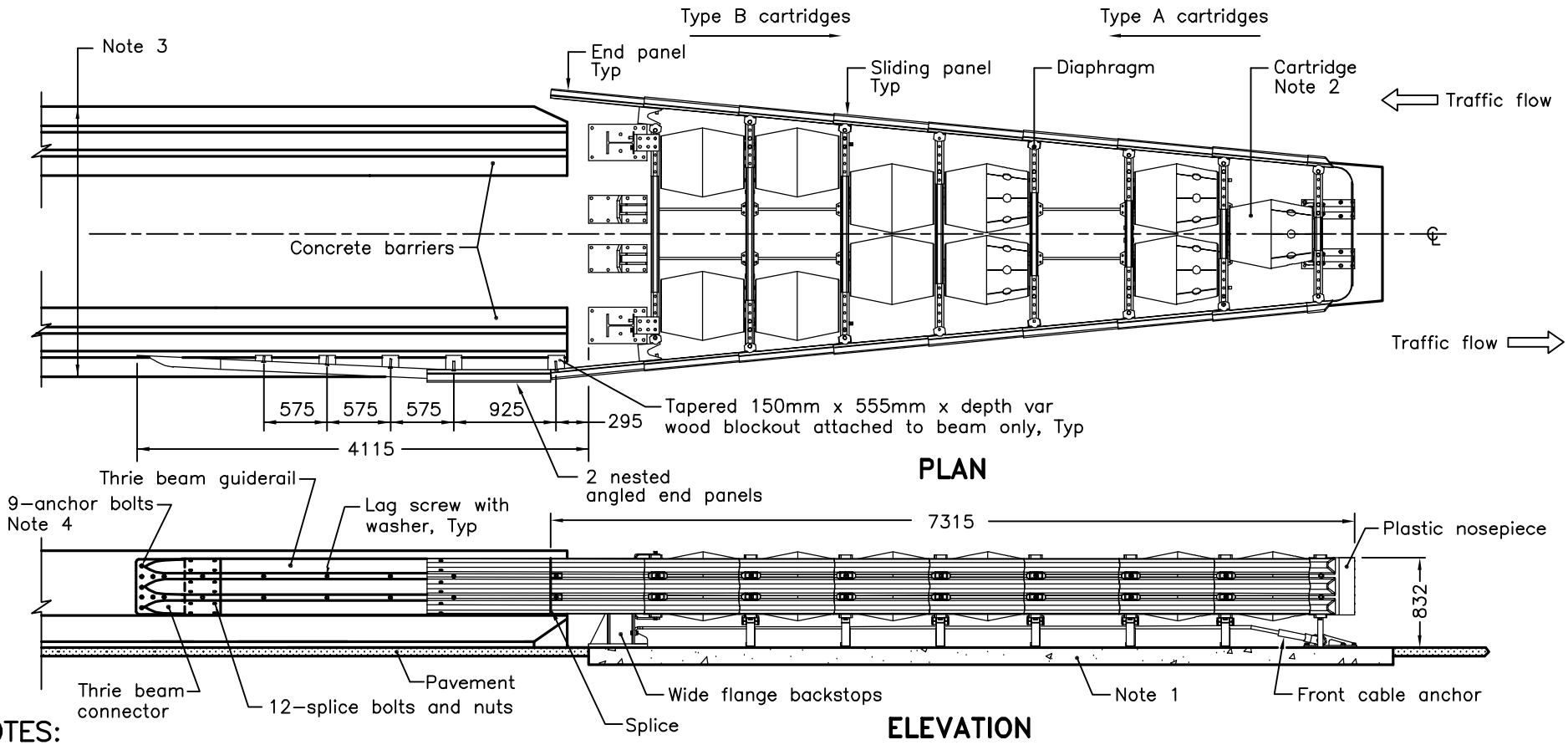
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–3 INSTALLATION – PERMANENT UNIDIRECTIONAL

Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 923.394




NOTES:

1 The system shall be anchored to concrete pad detailed in OPSD 923.005.
2 5 Type A and 6 Type B cartridges.
3 Maximum width of object shall be 2200mm for the first 762mm behind the rear fender panels.
4 Removable 20mm dia anchor bolts, each with an ultimate pullout strength of 100kN in 30MPa concrete.

A Nominal system width is 2290mm.
B Delineation shall be according to OPSD 984.204.
C The system depicted here is a proprietary product.
D System configuration meets NCHRP Report 350 test level.
E All dimensions are in millimetres unless otherwise shown.

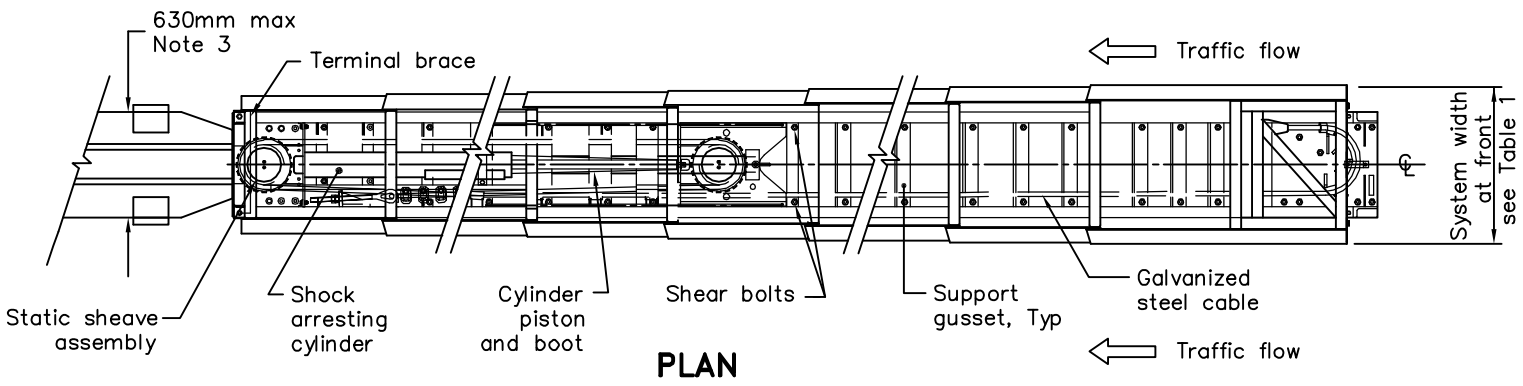
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION TAU–II EXTRA WIDE SYSTEM – TL–3 INSTALLATION – PERMANENT BIDIRECTIONAL

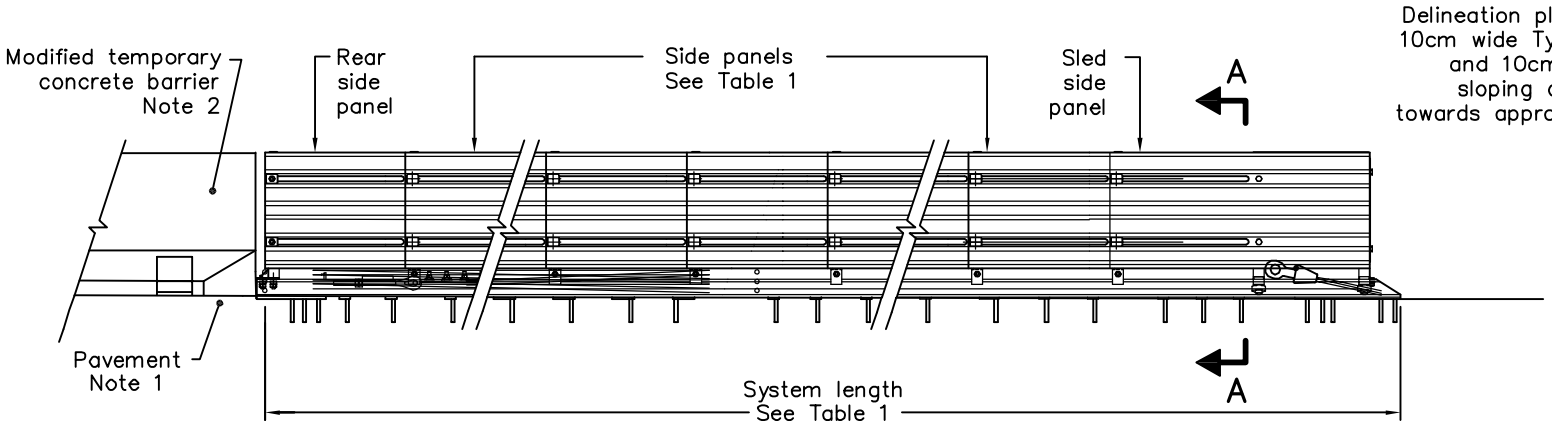
Nov 2011 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

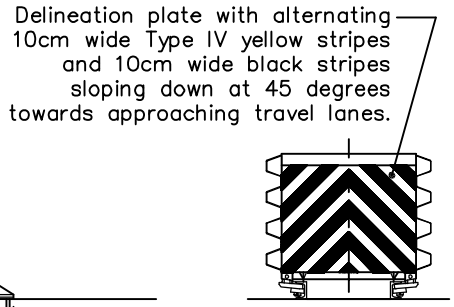
OPSD 923.395



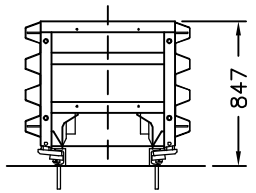

**PLAN**




**ELEVATION**




**FRONT VIEW**




**SECTION A–A**

NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.

2 Adjacent temporary concrete barrier shall be modified and anchored according to OPSD 923.002.

3 Measured at toe of safety shape barrier.

A Delineation shall be according to OPSD 984.203.

B The system depicted here is a proprietary product.

C System configuration based on NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

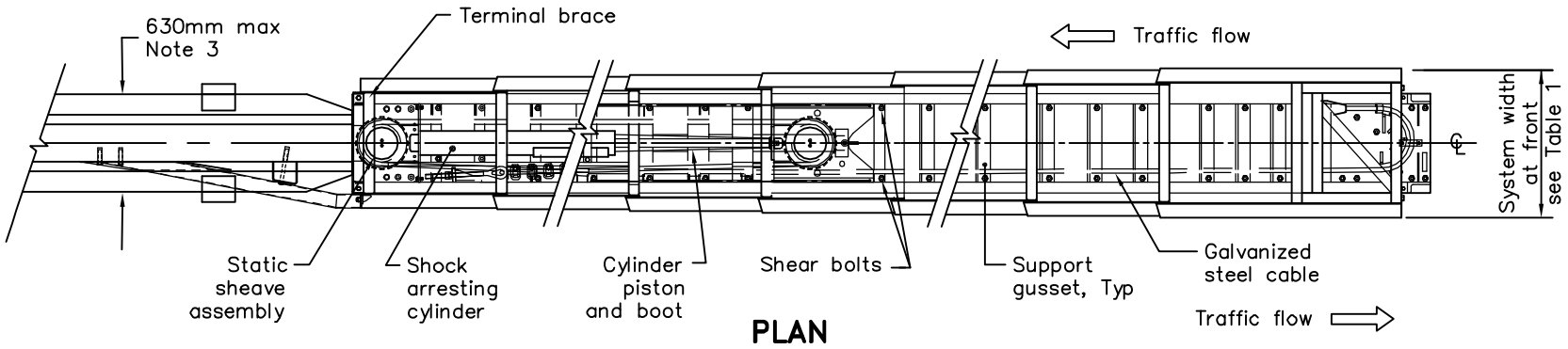
| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4118 | 6556 |
| SIDE PANELS PER SIDE | 2 | 5 |
| SYSTEM WIDTH | 879 | 951 |

ONTARIO PROVINCIAL STANDARD DRAWING

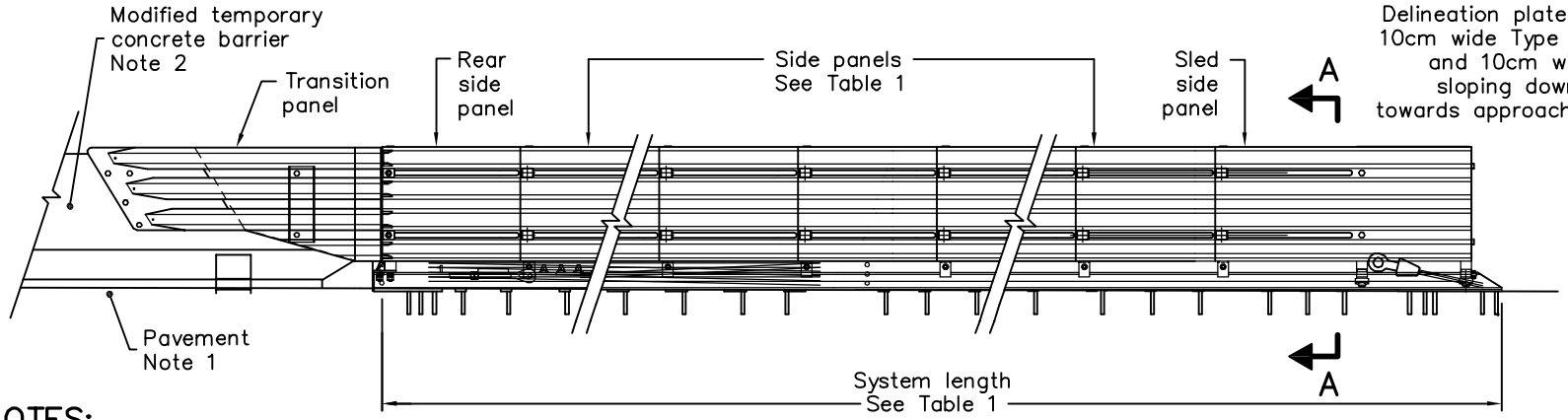
# ENERGY ATTENUATOR, CRASH CUSHION SMART SYSTEM INSTALLATION–TEMPORARY UNIDIRECTIONAL

Nov 2010 | Rev | 0

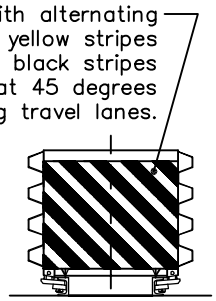
OPSD 923.480



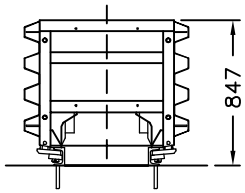

**PLAN**




**ELEVATION**




**FRONT VIEW**




**SECTION A–A**

## NOTES:

1 When system is placed on a concrete pad, the pad shall be according to OPSD 923.001.

2 Adjacent temporary concrete barrier shall be modified and anchored according to OPSD 923.002.

3 Measured at toe of safety shape barrier.

A Delineation shall be according to OPSD 984.203.

B The system depicted here is a proprietary product.

C System configuration based on NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4118 | 6556 |
| SIDE PANELS PER SIDE | 2 | 5 |
| SYSTEM WIDTH | 879 | 951 |

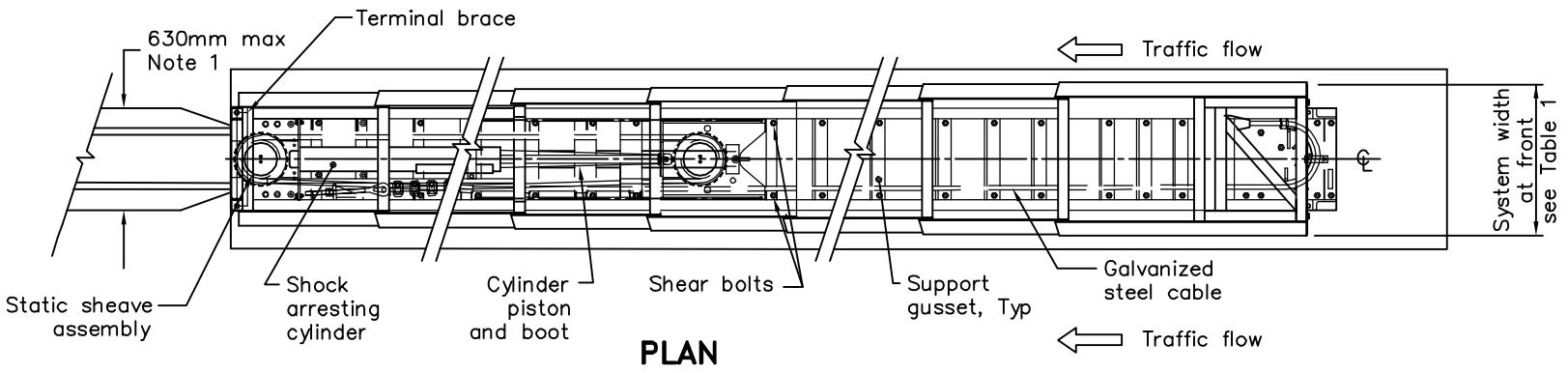
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION SMART SYSTEM INSTALLATION–TEMPORARY BIDIRECTIONAL

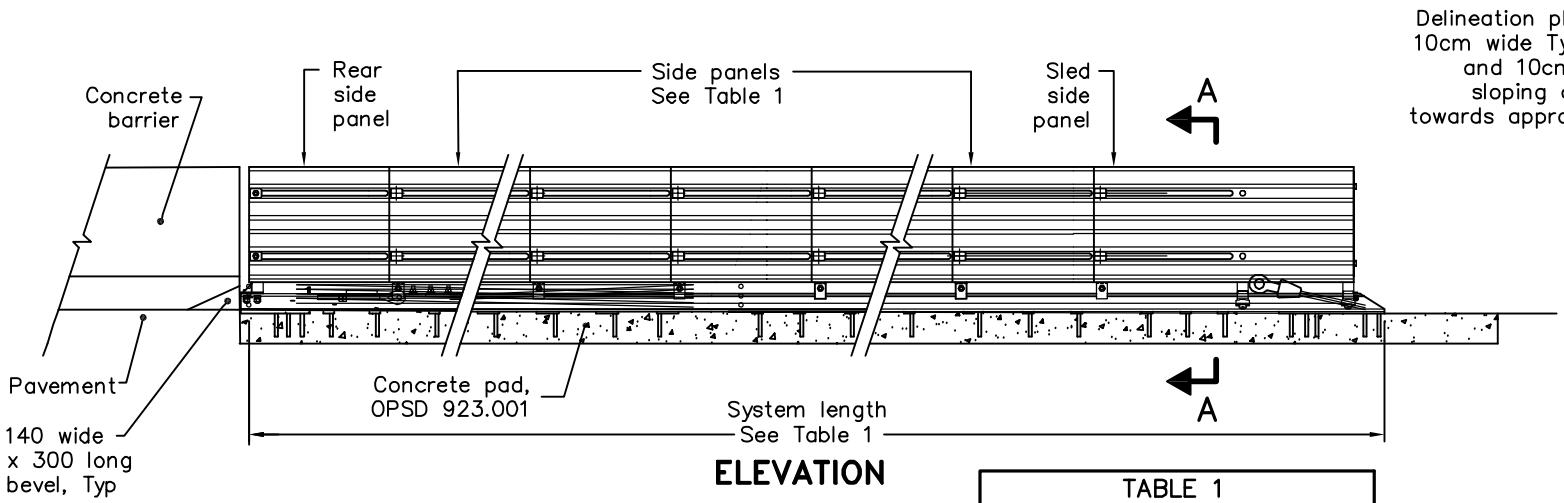
Nov 2010 | Rev | 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

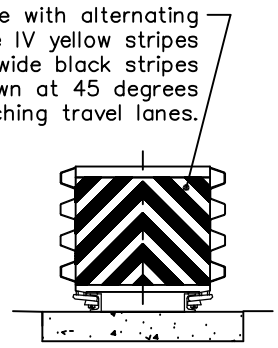
OPSD 923.481



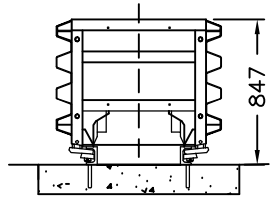

**PLAN**




**ELEVATION**




**FRONT VIEW**




**SECTION A–A**

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4118 | 6556 |
| SIDE PANELS PER SIDE | 2 | 5 |
| SYSTEM WIDTH | 879 | 951 |

NOTES:

1 Measured at toe of safety shape barrier.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration based on NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

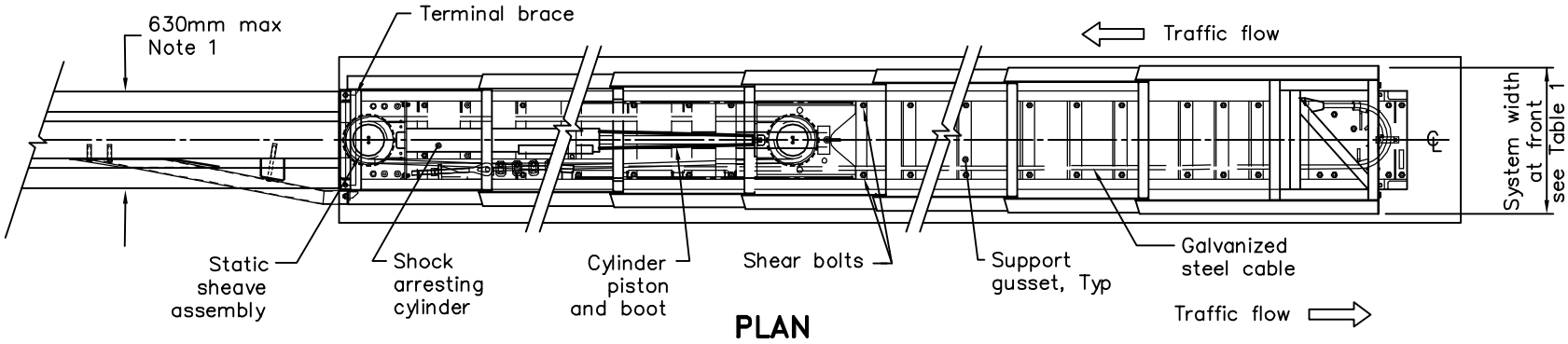
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION SMART SYSTEM INSTALLATION–PERMANENT UNIDIRECTIONAL

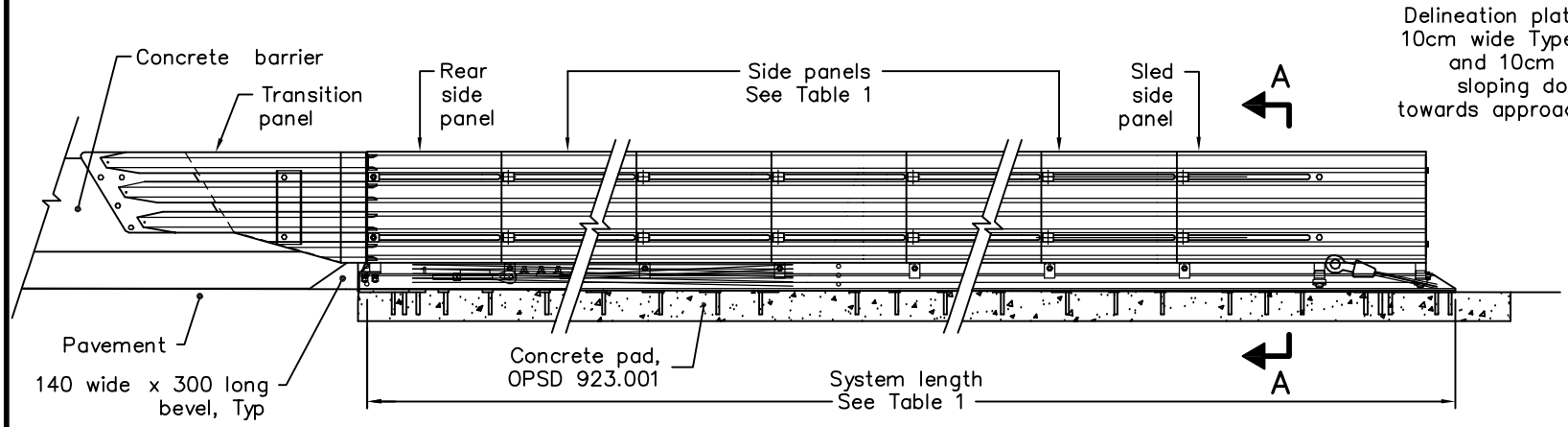
Nov 2010 | Rev | 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

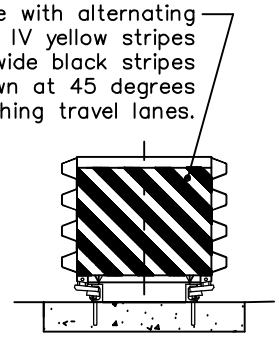
OPSD 923.482



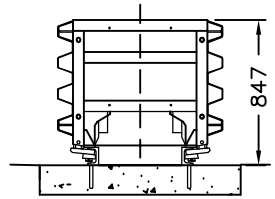

**PLAN**




**ELEVATION**




**FRONT VIEW**




**SECTION A–A**

| TABLE 1 | | |
|---|---|---|
| SYSTEM CONFIGURATION | TL–2 | TL–3 |
| SYSTEM LENGTH | 4118 | 6556 |
| SIDE PANELS PER SIDE | 2 | 5 |
| SYSTEM WIDTH | 879 | 951 |

NOTES:

1 Measured at toe of safety shape barrier.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration based on NCHRP Report 350 test level.

D All dimensions are in millimetres unless otherwise shown.

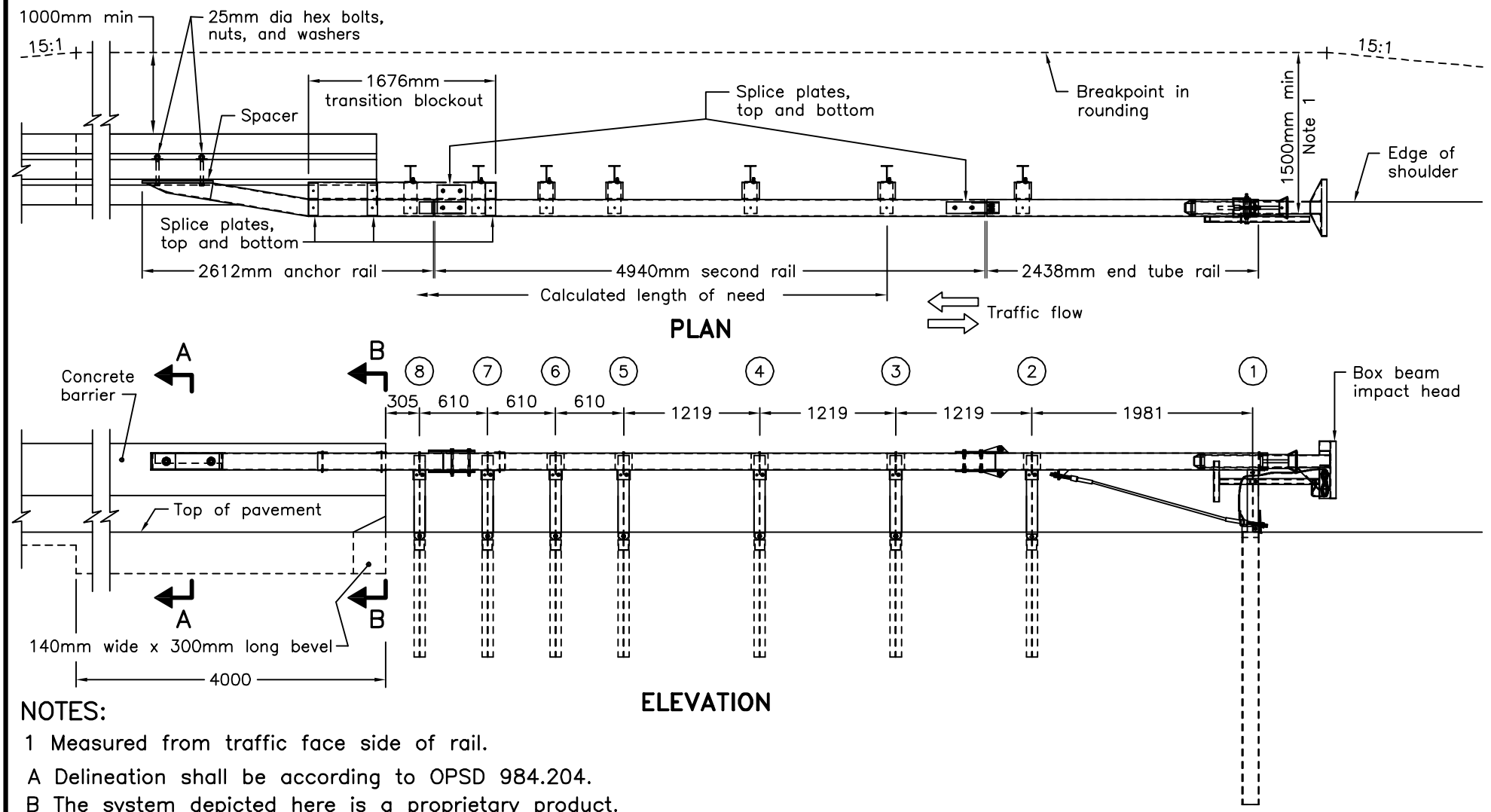
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION SMART SYSTEM INSTALLATION–PERMANENT BIDIRECTIONAL

Nov 2010 | Rev 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

OPSD 923.483




## NOTES:

1 Measured from traffic face side of rail.

A Delineation shall be according to OPSD 984.204.

B The system depicted here is a proprietary product.

C System configuration meets NCHRP Report 350 TL–3.

D This OPSD shall be read in conjuction with OPSD 923.531 and 202.033.

E Sections A–A and B–B shown on OPSD 923.531.

F All dimensions are in millimetres unless otherwise shown.

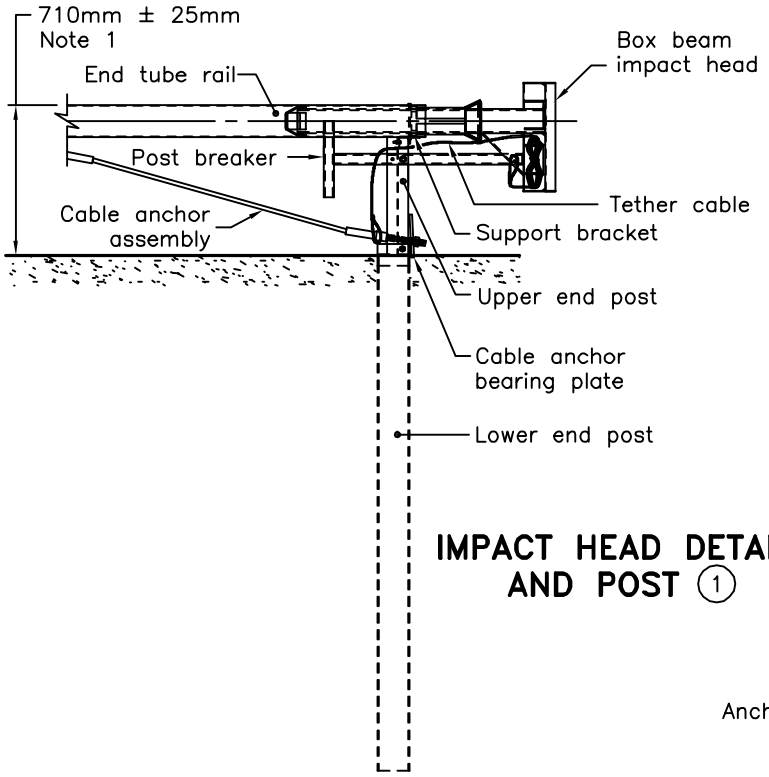
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION BOX BEAM BURSTING ENERGY ABSORBING TERMINAL INSTALLATION – LAYOUT

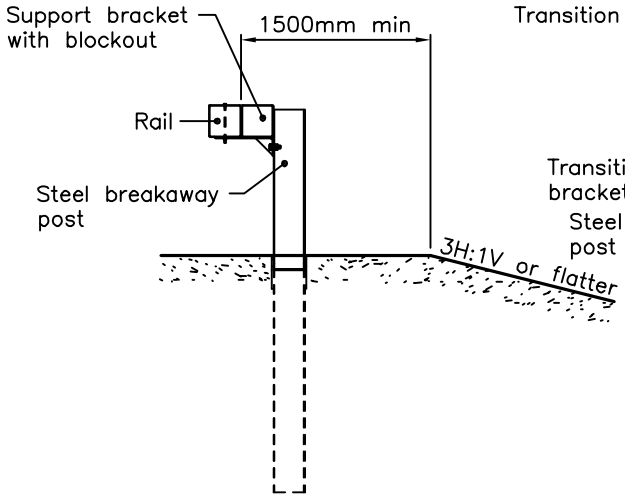
Nov 2011 | Rev 1

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

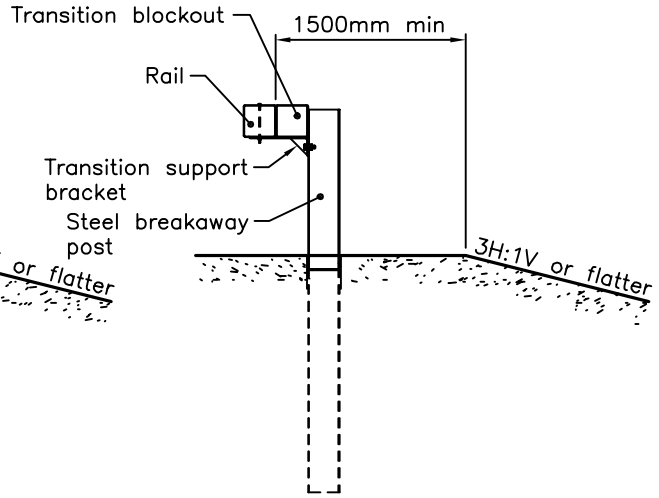
OPSD 923.530



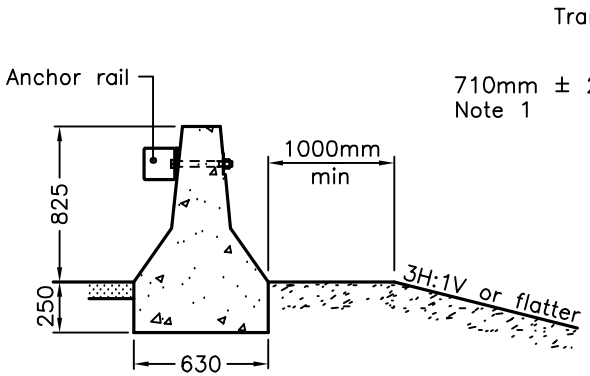

**IMPACT HEAD DETAIL AND POST (1)**



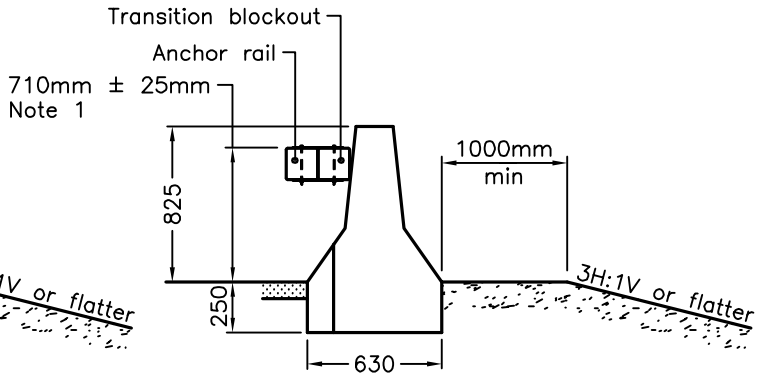

**POSTS (2)(3)(4)(5)(6)**




**POSTS (7)(8)**




**SECTION A–A**




**SECTION B–B**

NOTES:

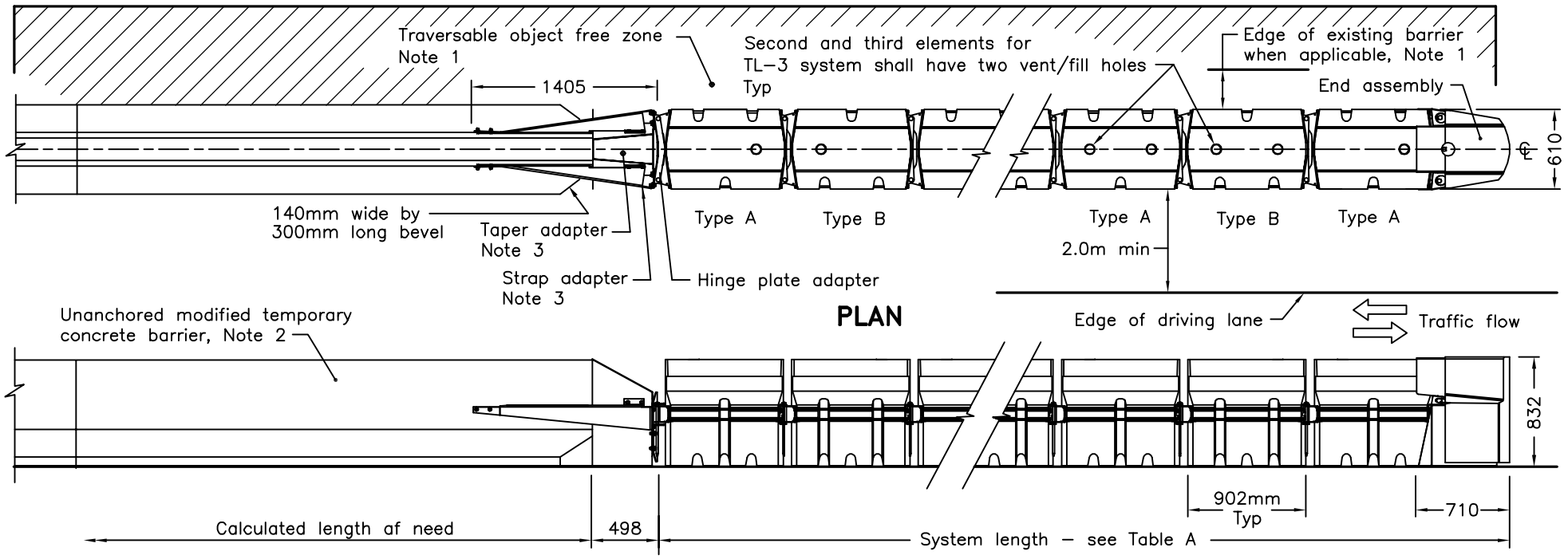
1 Mounting height measured vertically to top of box beam rails.

A This OPSD shall be read in conjunction with OPSD 923.530.

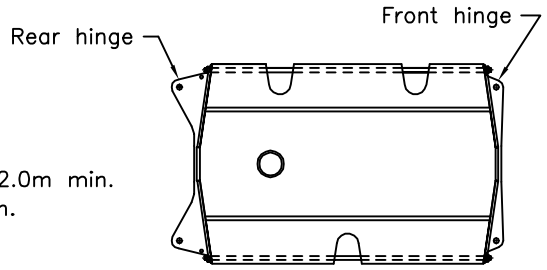
B The system depicted here is a proprietary product.

C All dimensions are in millimetres unless otherwise shown.

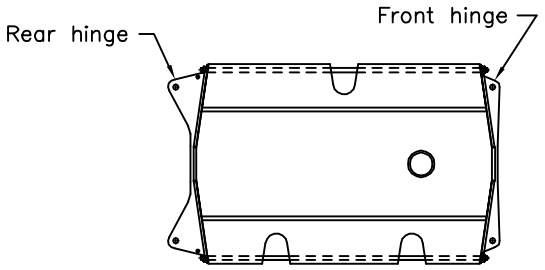
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| **ENERGY ATTENUATOR, CRASH CUSHION BOX BEAM BURSTING ENERGY ABSORBING TERMINAL INSTALLATION – IMPACT HEAD AND POST** | | | |
| | | | **OPSD 923.531** |




| TABLE A | | |
|---|---|---|
| System Configuration | TL-2 | TL-3 |
| Elements | 5 | 9 |
| Configuration | A-B-A-B-A | A-B-A-B-A-B-A-B-A |
| System Length | 4740 | 9379 |




TYPE A ELEMENT




TYPE B ELEMENT

## NOTES:

1 When placed adjacent to concrete barrier or steel beam guide rail, clearance shall be ≤ 0.3m or ≥ 3.0m, otherwise minimum 6.0m wide traversable object free zone shall extend from end assembly for 22.0m min.
2 First 16m of TCB shall be placed tangential to ABSORB 350 system.
3 Taper and strap adapters shall be according to manufacturer's specifications for temporary concrete barrier type used.

A Delineation shall be according to OPSD 984.203.
B System configuration meets NCHRP Report 350 test level.
C The device depicted here is a proprietary product.
D All elements except the first element adjacent to end assembly shall be filled with water. When temperature is predicted to fall below freezing, antifreeze agents according to manufacturer recommendations shall be used.
E All dimensions are in millimetres unless otherwise shown.

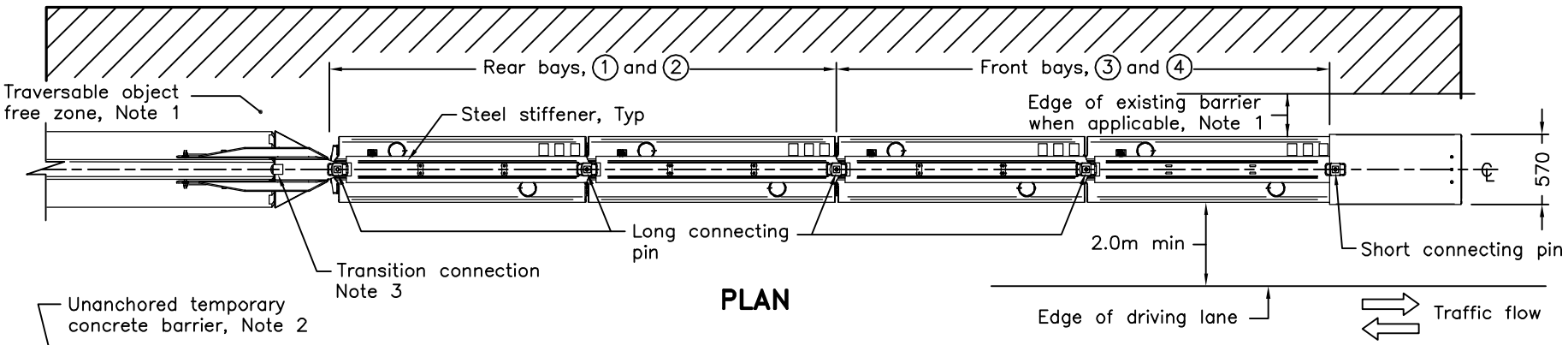
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION ABSORB 350 SYSTEM INSTALLATION–TEMPORARY CONCRETE BARRIER

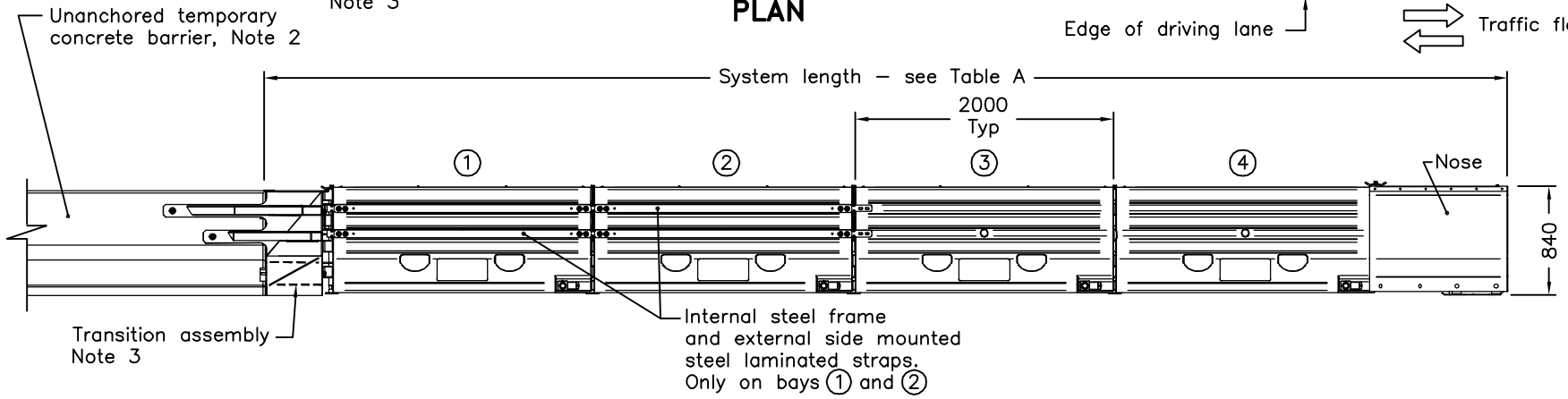
Nov 2011 | Rev 0

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · OPS

OPSD 924.131




**PLAN**




**ELEVATION**

| TABLE A | | |
|---|---|---|
| System Configuration | TL–2 | TL–3 |
| Bays | ①② | ①②③④ |
| System Length | 5620 | 9620 |

## NOTES:

1 When placed adjacent to concrete barrier or steel beam guide rail, clearance shall be ≤ 0.3m or ≥ 3.0m, otherwise minimum 6.0m wide traversable object free zone shall extend from nose for 22.0m minimum.

2 First 16m of TCB shall be placed tangential to ACZ–350 system.

3 Transition assembly and method of connection shall be according to manufacturer's specifications for temporary concrete barrier type used.

A Delineation shall be according to OPSD 984.203.

B System configuration meets NCHRP Report 350 test level, TL–2 and TL–3.

C The system depicted here is a proprietary product.

D All elements shall be filled with water. When temperature is predicted to fall below freezing, antifreeze agents according to manufacturer recommendations shall be used.

E All dimensions are in millimetres unless otherwise shown.

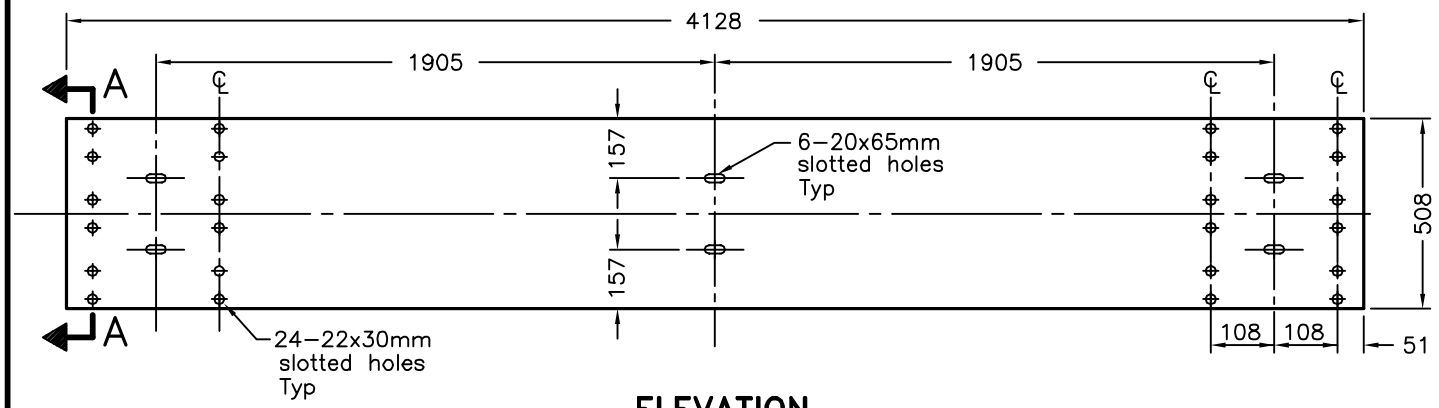
ONTARIO PROVINCIAL STANDARD DRAWING

# ENERGY ATTENUATOR, CRASH CUSHION ACZ–350 SYSTEM INSTALLATION–TEMPORARY CONCRETE BARRIER

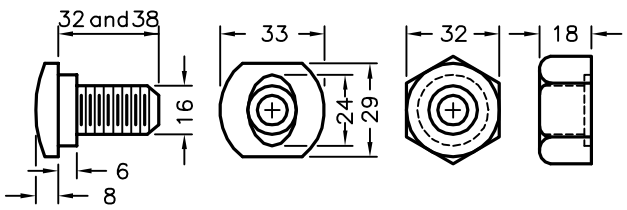
Nov 2015 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

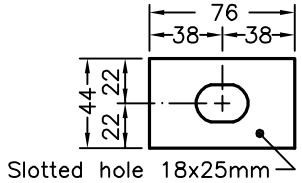
OPSD 924.135



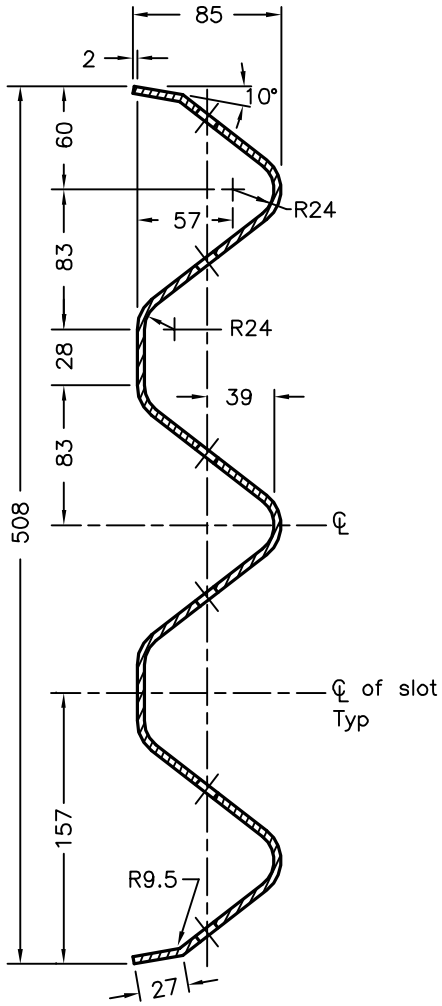

**ELEVATION**




**SPLICE BOLT AND NUT**




**RECTANGULAR WASHER**
Note 1



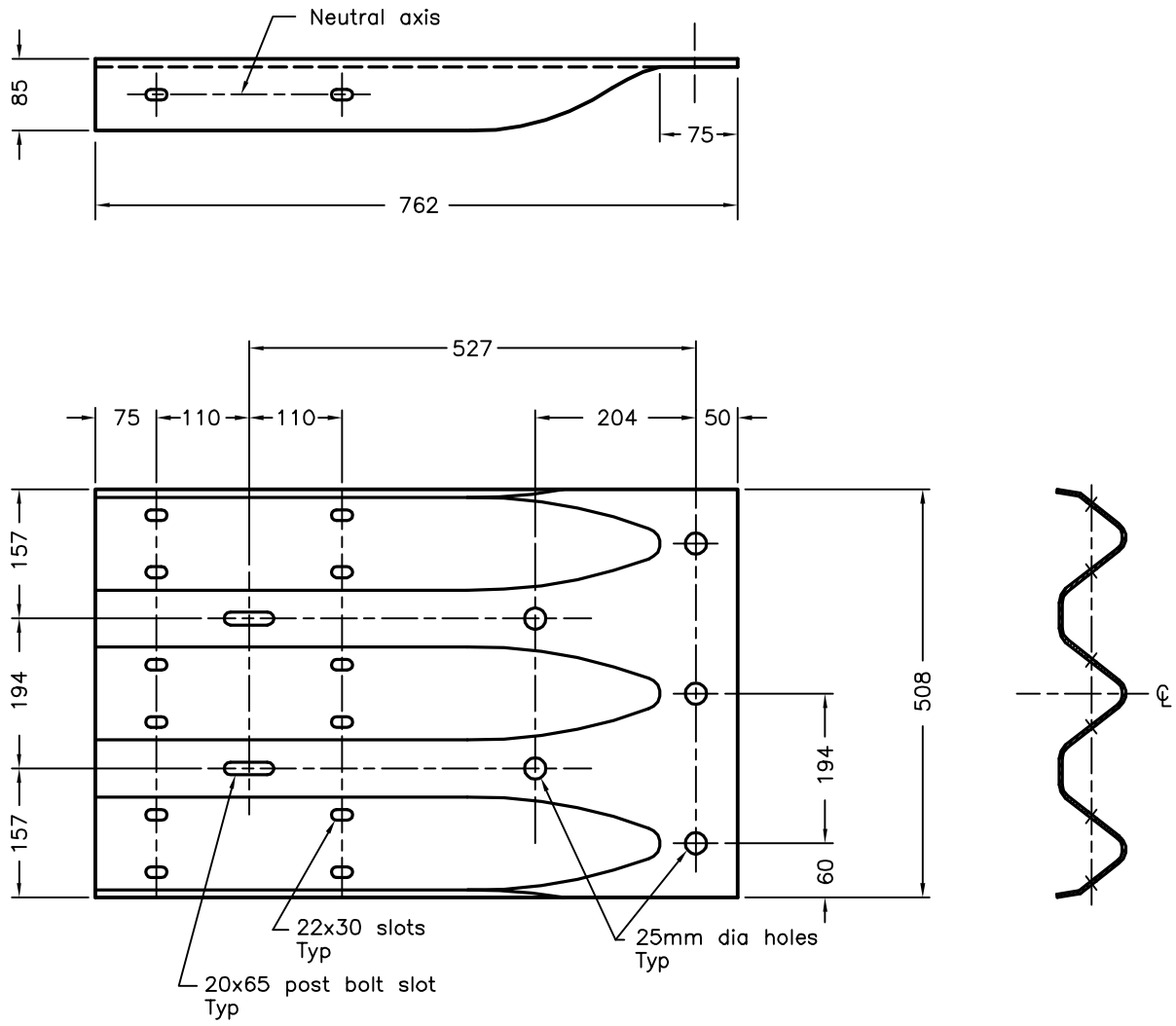

**ENLARGED SECTION A–A**

NOTES:

1 Base metal thickness of rail shall be 2.67mm nominal and 2.44mm minimum.

A All dimensions are in millimetres.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, THRIE BEAM<br>COMPONENT – RAIL | | | |
| | OPSD 925.010 | | |



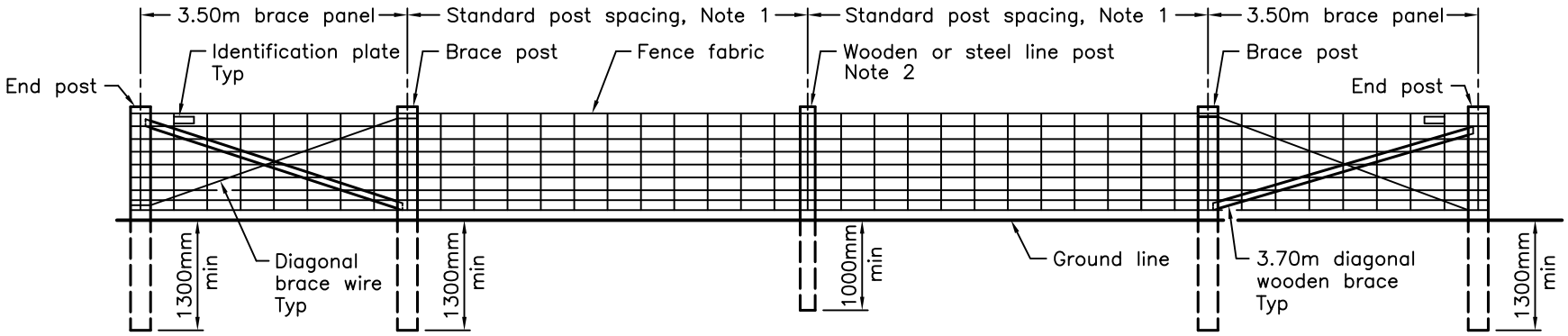

**ELEVATION**

NOTES:

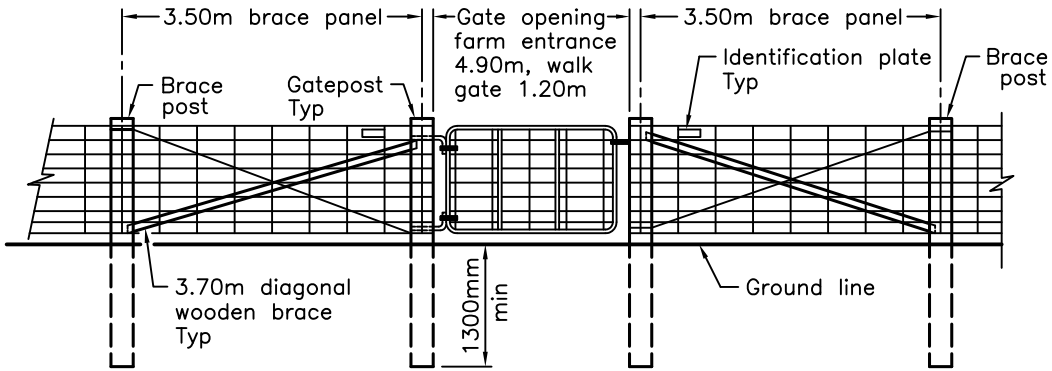
A Base metal thickness of terminal connector shall be 3.43mm nominal and 3.18mm minimum.

B All dimensions are in millimetres unless otherwise shown.

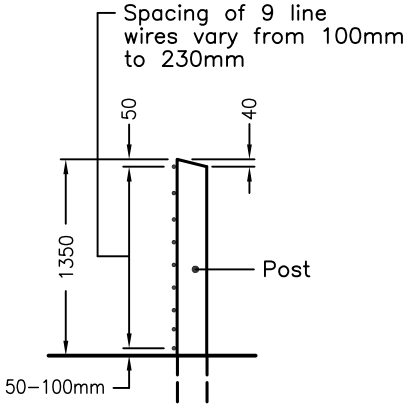
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| GUIDE RAIL SYSTEM, THRIE BEAM<br>COMPONENT – TERMINAL CONNECTOR | | | |
| | OPSD 925.030 | | |



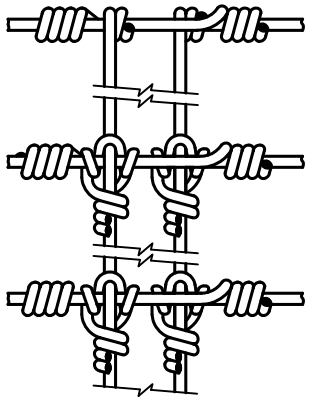

## HIGHWAY FENCE
## IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK




## GATE DETAIL




## WIRE SPACING DETAIL



## SPLICING DETAIL

NOTES:

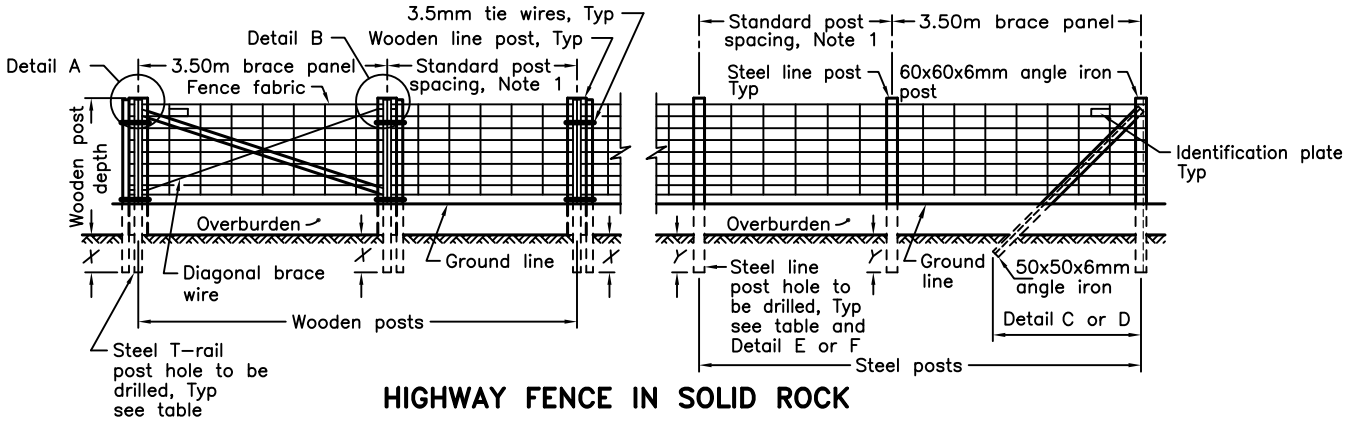
1 Standard post spacing shall be 6.0m for wooden post to wooden post and 5.0m for steel post to steel or wooden post.

2 Ratio of steel posts to wooden posts shall be 3:1.

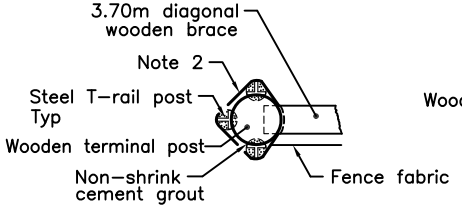
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 3 |
|---|---|---|---|
| **FENCE, HIGHWAY**<br>**IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK**<br>**INSTALLATION** | | | |
| | | | **OPSD 971.101** |

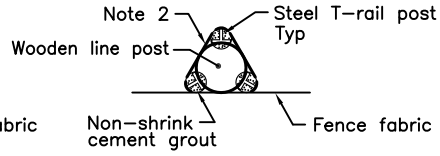
| STEEL POST DEPTH IN ROCK | | |
|---|---|---|
| EARTH OVERBURDEN DEPTH | POST DEPTH Min | |
| | T–RAIL POST X | LINE POST Y |
| 0–600 | 380 | 380 |
| 600–1000 | 230 | 230 |
| 1000–1200 | 230 | 0 |



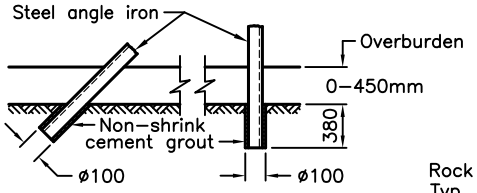

## HIGHWAY FENCE IN SOLID ROCK




## DETAIL A

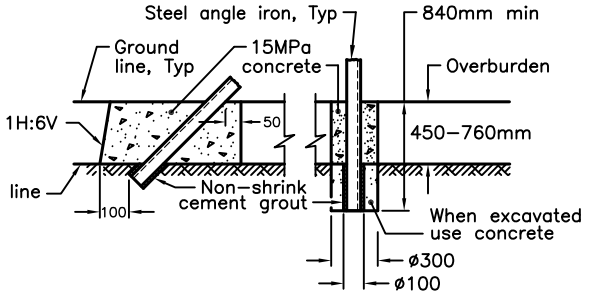



## DETAIL B



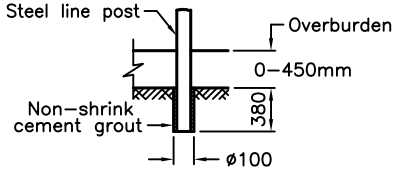

## DETAIL C

BRACE PANEL IN OVERBURDEN LESS THAN 450mm



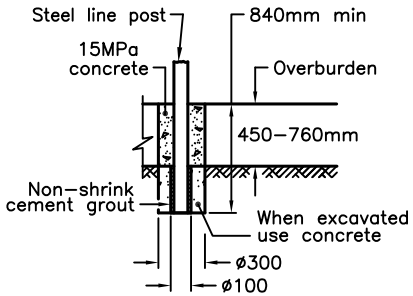

## DETAIL D

BRACE PANEL IN OVERBURDEN BETWEEN 450 – 760mm



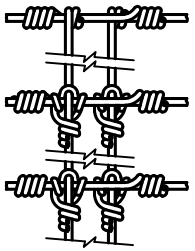

## DETAIL E

STEEL LINE POST IN OVERBURDEN LESS THAN 450mm




## DETAIL F

STEEL LINE POST IN OVERBURDEN BETWEEN 450 – 760mm



## SPLICING DETAIL

NOTES:

1 Standard post spacing shall be 6.0m for wooden post to wooden post and 5.0m for steel post to steel or wooden post.

2 Steel posts and wooden post shall be tied together at the top and bottom using 3.5mm tie wire.

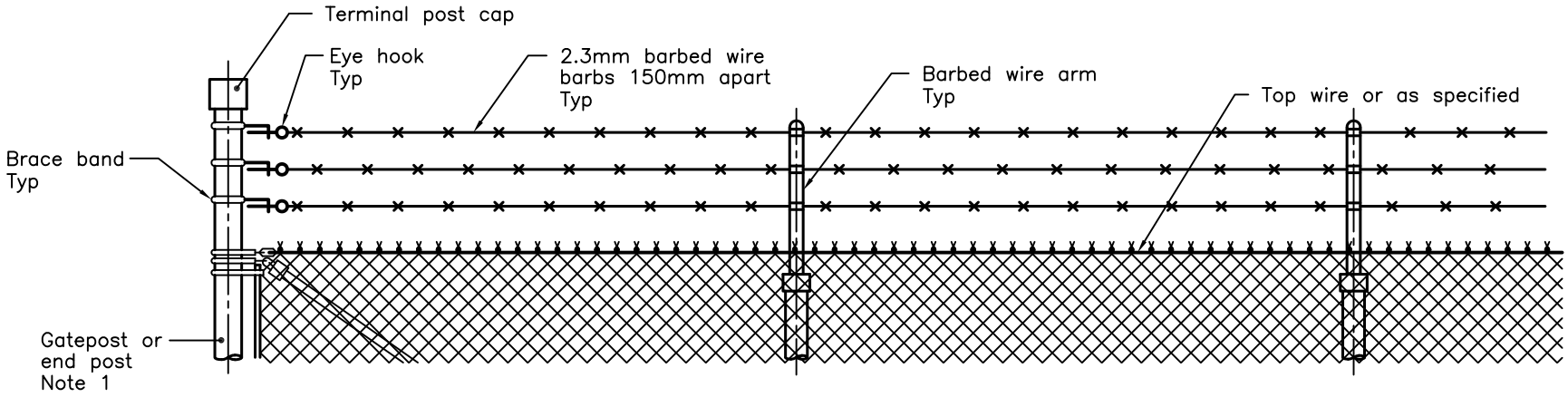
A All dimensions are in millimetres unless otherwise shown.

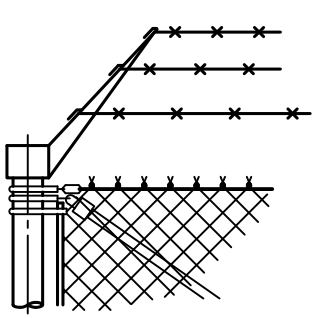
ONTARIO PROVINCIAL STANDARD DRAWING

# FENCE, HIGHWAY IN SOLID ROCK INSTALLATION

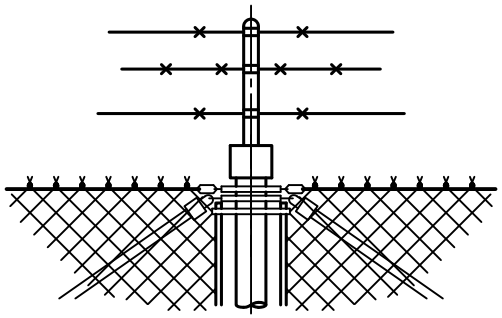
Nov 2012 | Rev 1

OPSD 971.102

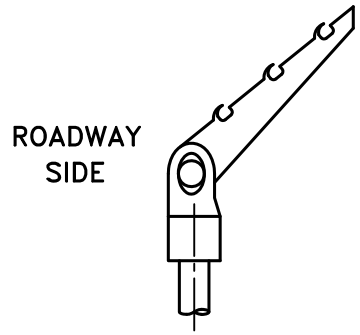


CORNER POST
WITH BARBED WIRE ARM



STRAINING POST
WITH BARBED WIRE ARM




LINE POST WITH
BARBED WIRE ARM

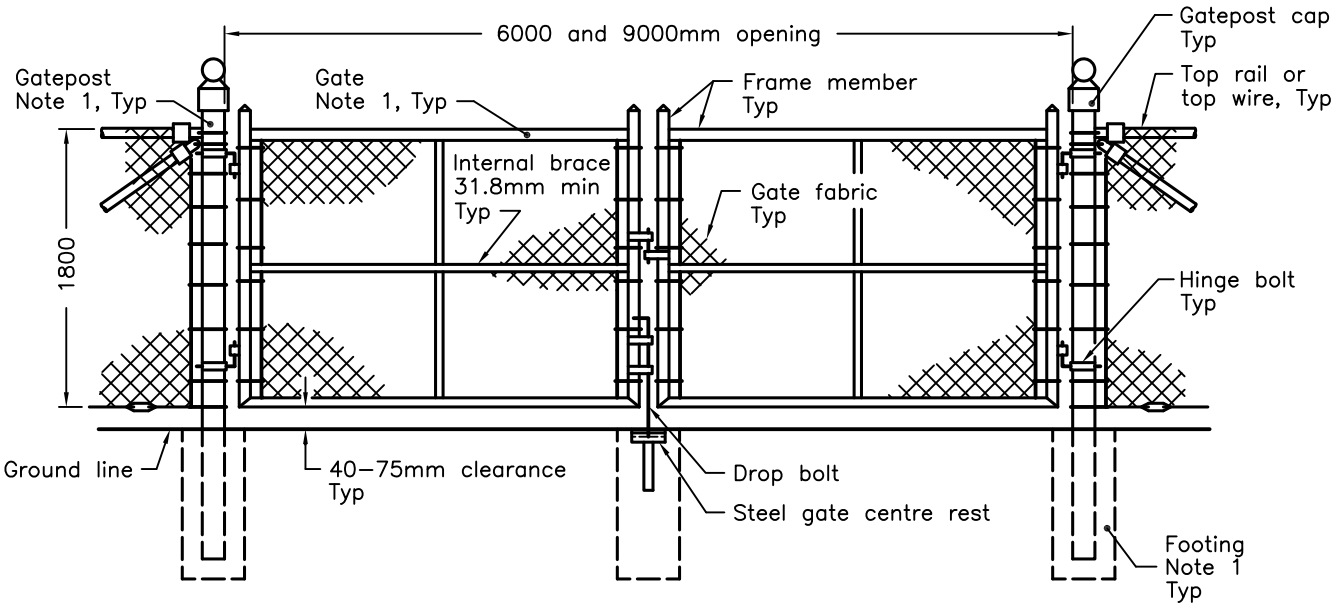
NOTES:

1 Terminal post shall be lengthened when barbed wire is specified, except when barbed wire arms are used.

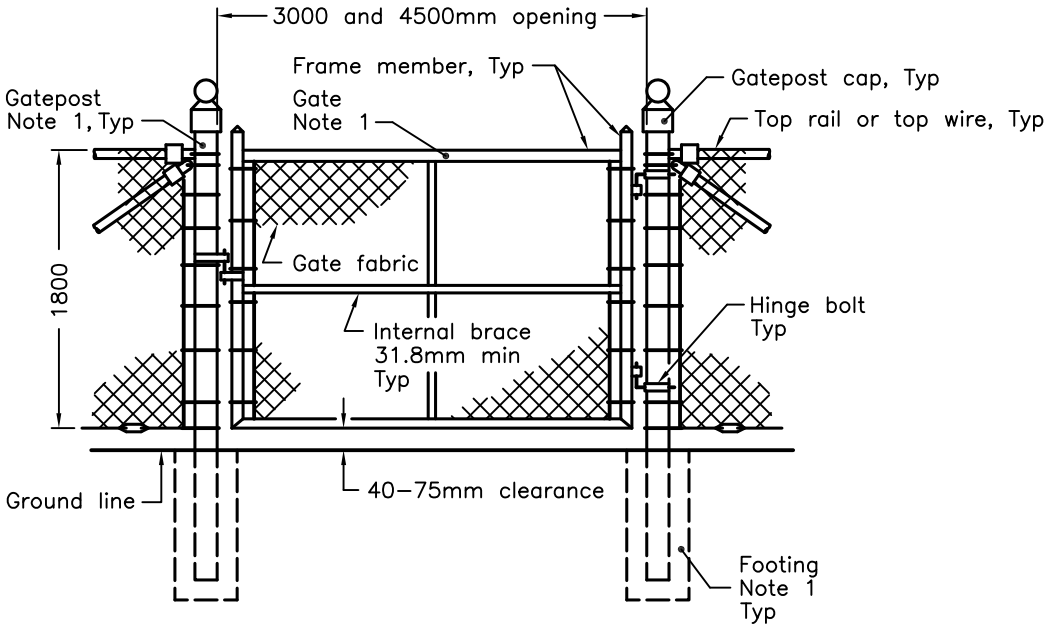
A Installation as viewed from the roadway.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| FENCE, CHAIN–LINK<br>COMPONENT – BARBED WIRE | | | |
| | OPSD 972.101 | | |




## DOUBLE SWING GATE OPENING




## SINGLE SWING GATE OPENING

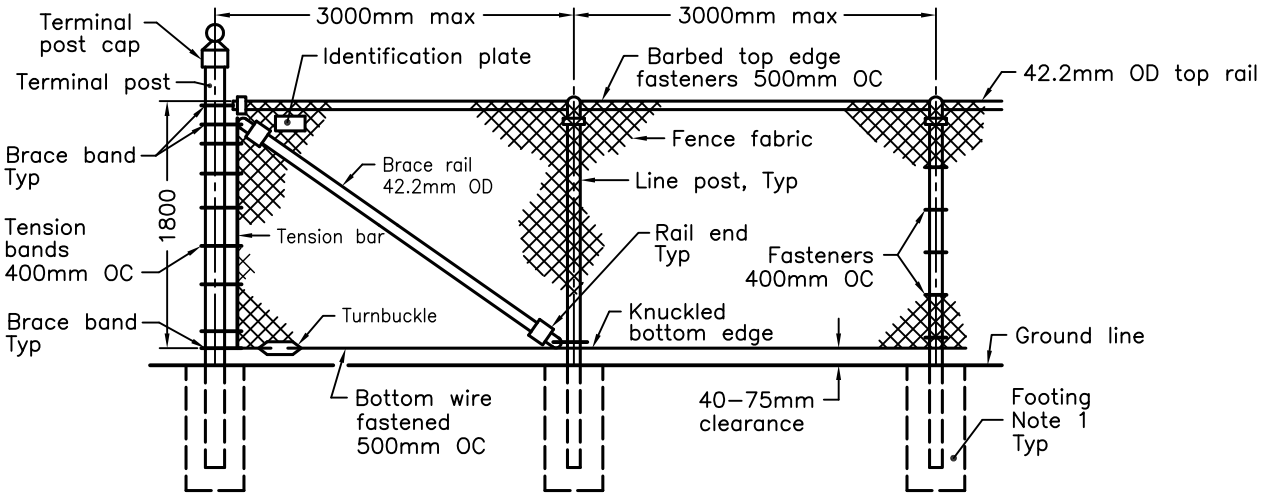
NOTES:

1 For footing details and Gate and Gatepost Details Table refer to OPSD 972.132.

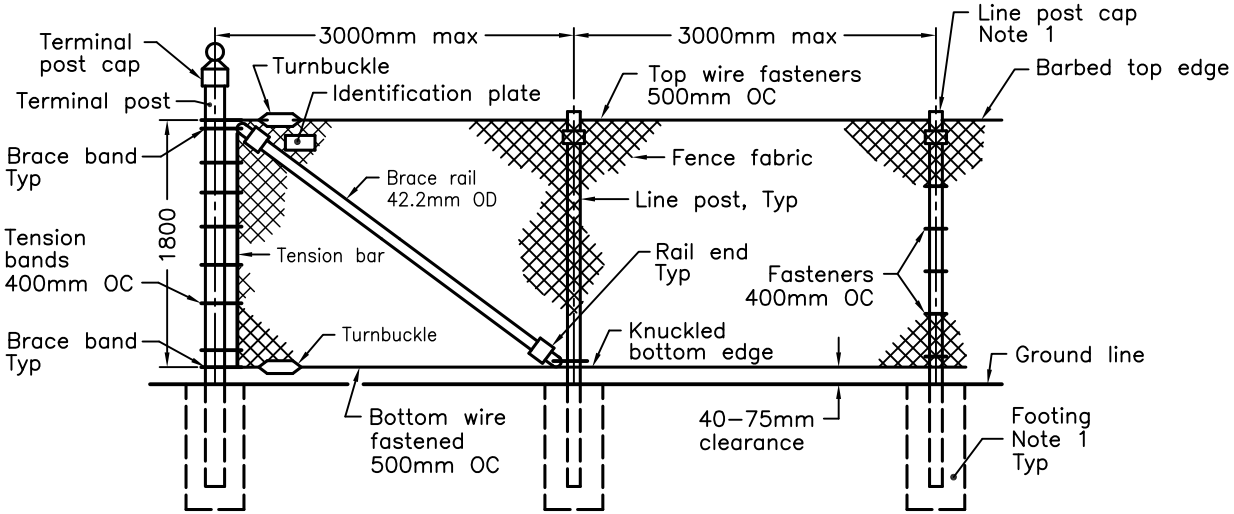
A Gates as viewed from the roadway.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| FENCE, CHAIN–LINK<br>COMPONENT – GATE | | | |
| | OPSD 972.102 | | |




## CHAIN–LINK FENCE WITH TOP RAIL




## CHAIN–LINK FENCE WITH TOP WIRE

NOTES:

1 For footing details and line post cap detail refer to OPSD 972.132.

A Fence as viewed from the roadway.

B All dimensions are in millimetres unless otherwise shown.

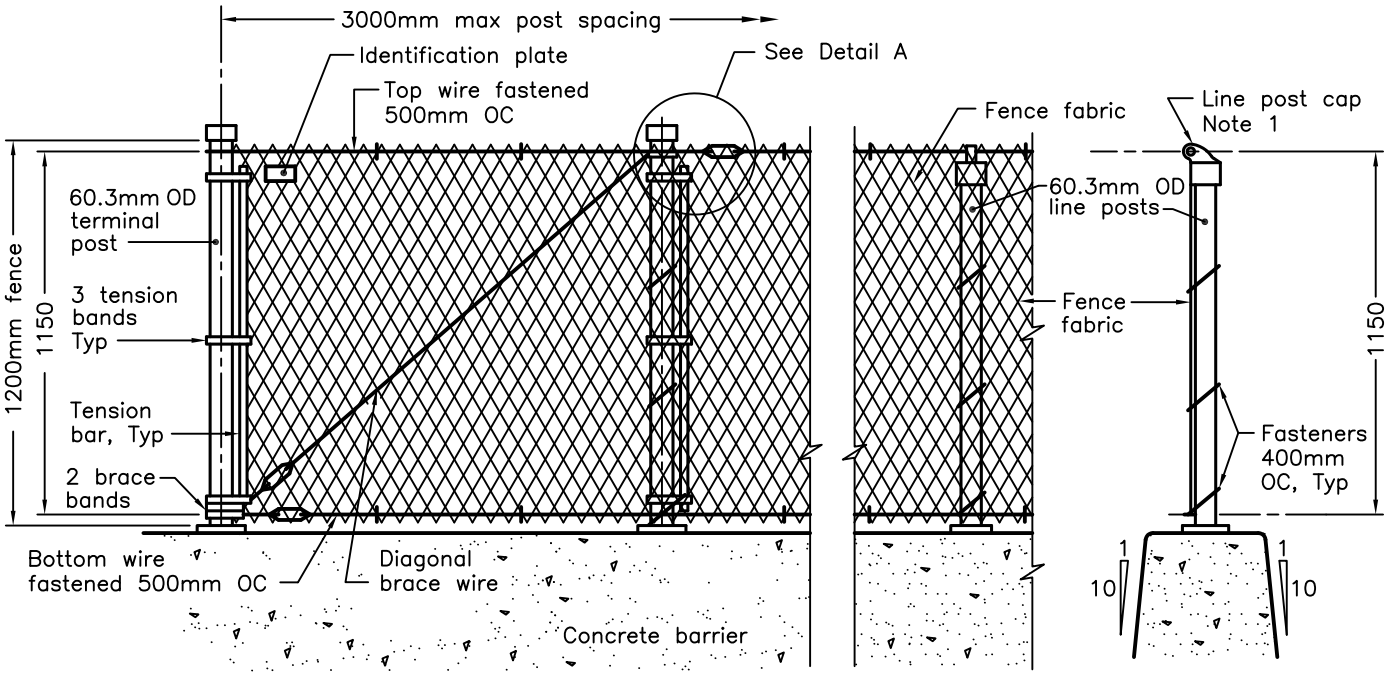
ONTARIO PROVINCIAL STANDARD DRAWING

# FENCE, CHAIN–LINK
# INSTALLATION – ROADWAY

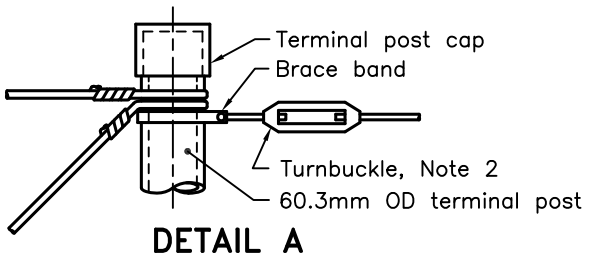
Nov 2012 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

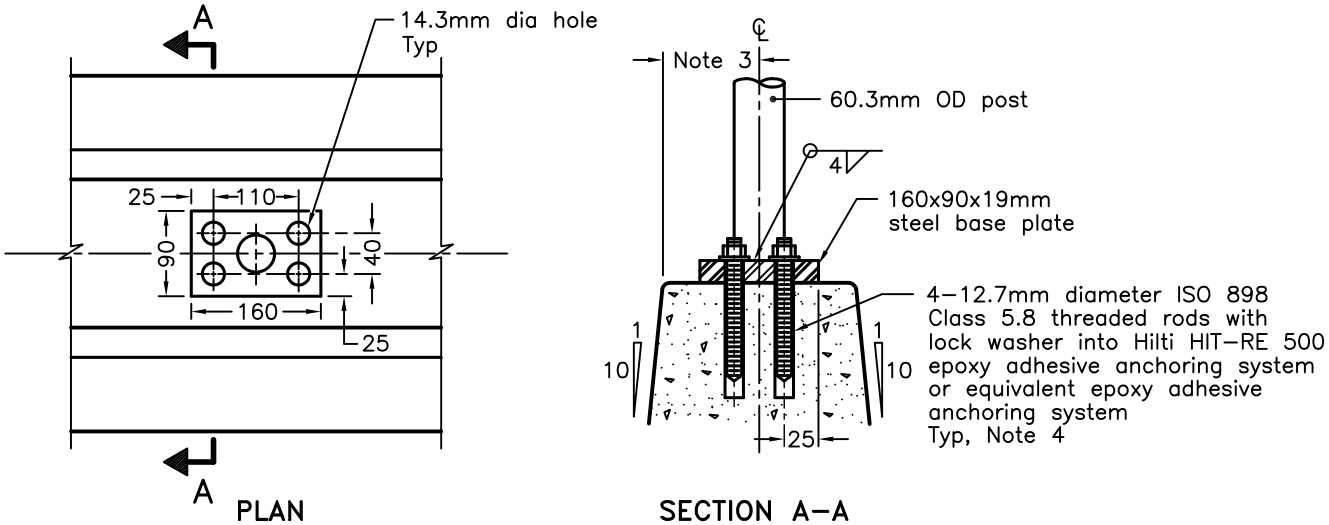
OPSD 972.130




**END SECTION DETAIL** **LINE POST DETAIL**




**DETAIL A**




PLAN SECTION A–A

**ANCHORAGE DETAIL**

NOTES:

1 For line post cap detail refer to OPSD 972.132.

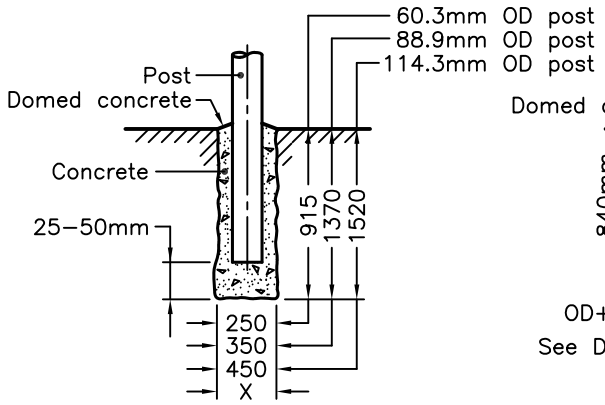
2 Turnbuckles shall be installed on diagonal brace wires and top and bottom wires, at intervals of 150m max and at terminal posts.

3 Chain–link fence posts shall be located on centreline of concrete barrier.

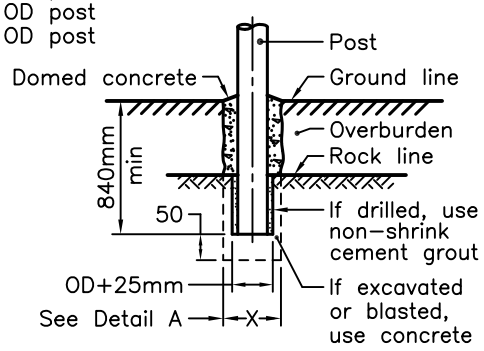
4 Anchors shall be installed according to manufacturer's specifications.

A All dimensions are in millimetres unless otherwise shown.

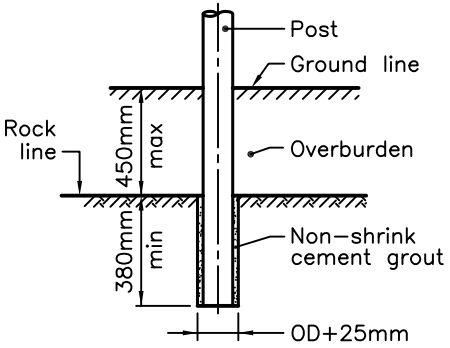
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| FENCE, CHAIN–LINK INSTALLATION – CONCRETE BARRIER | | | |
| | | | OPSD 972.131 |



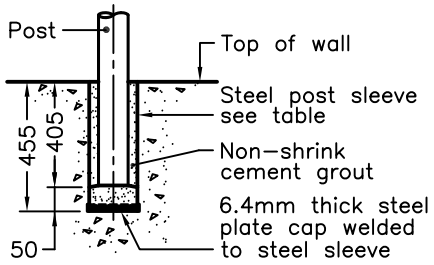

**DETAIL A**
**FOOTING IN EARTH**



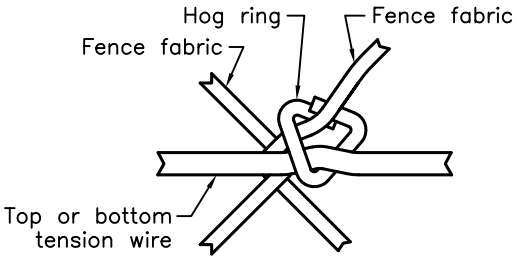

**DETAIL B**
**FOOTING IN SHALE, LOOSE OR FRIABLE ROCK, OR SOLID ROCK WITH MORE THAN 450mm OVERBURDEN**



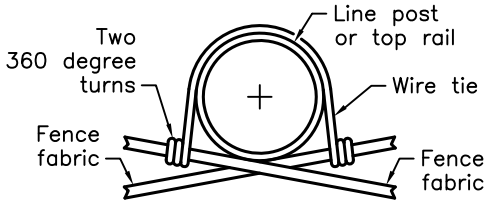

**DETAIL C**
**FOOTING IN SOLID ROCK LESS THAN 450mm OVERBURDEN**



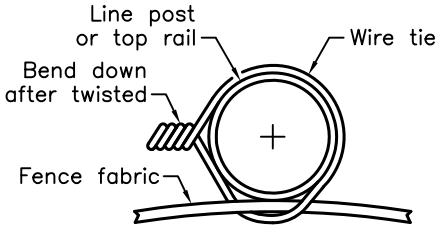

**DETAIL D**
**FOOTING IN RETAINING WALL**



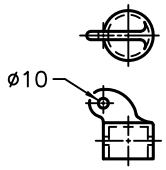

**HOG RING TIE DETAIL**




**MANUALLY FASTENED WIRE TIE DETAIL**




**POWER FASTENED WIRE TIE DETAIL**




**62mm ID LINE POST CAP DETAIL**

| POST DETAILS TABLE (Note 1) | | | | | | |
|---|---|---|---|---|---|---|
| Post/Frame Member Type | | OD | Post Length | | Wall Thickness | Nominal Weight kg/m (Note 2) |
| | | | Standard m | Retaining Walls m | | |
| Line post | | 60.3 | 2.6 | 2.0 | 3.91 | 5.4 |
| Terminal Post | | 88.9 | 2.9 | 2.3 | 5.49 | 11.3 |
| Gates (Single 3.0m, Double 6.0m) | Gatepost | 88.9 | 2.6 | n/a | 5.49 | 11.3 |
| | Frame Members | 42.2 | n/a | n/a | 3.56 | 3.4 |
| Gates (Single 4.5m, Double 9.0m) | Gatepost | 114.3 | 2.9 | n/a | 6.02 | 16.1 |
| | Frame Members | 48.3 | n/a | n/a | 3.68 | 4.0 |
| Post Sleeves | Line Post | 88.9 | n/a | 0.455 | 5.49 | 11.3 |
| | Terminal Post | 114.3 | n/a | 0.455 | 6.02 | 16.1 |

NOTES:

1 All posts and frame members are Schedule 40, Regular Grade, steel pipe.

2 The actual weight shall not vary by more than 10% of the nominal weight.

A All dimensions are in millimetres unless otherwise shown.

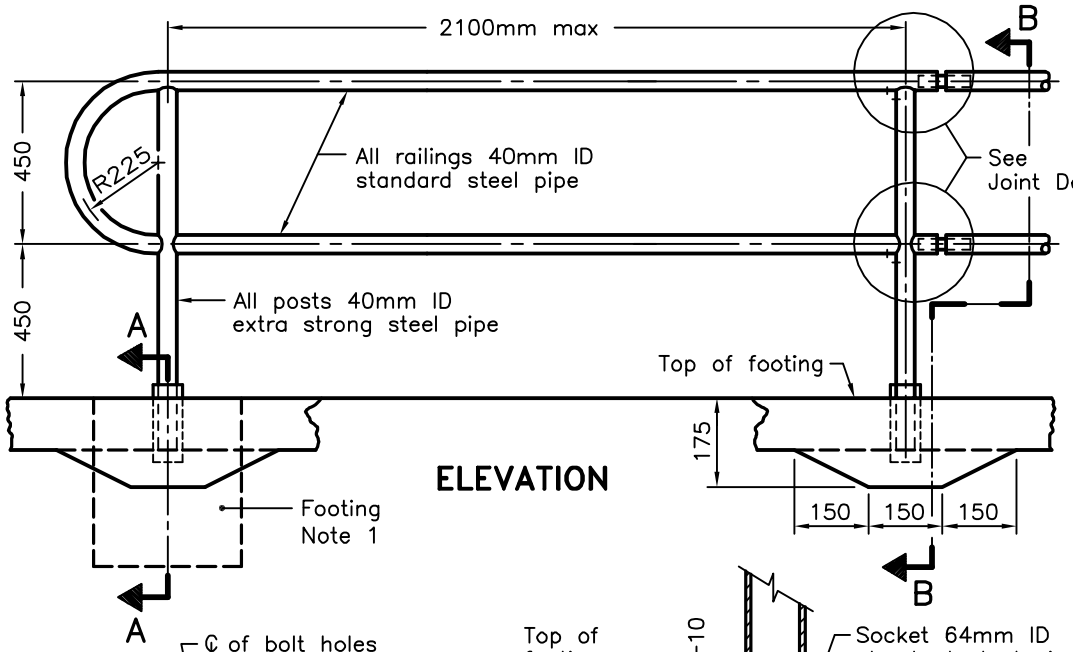
ONTARIO PROVINCIAL STANDARD DRAWING

# FENCE, CHAIN–LINK
# DETAILS AND TABLE

Nov 2012 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 972.132

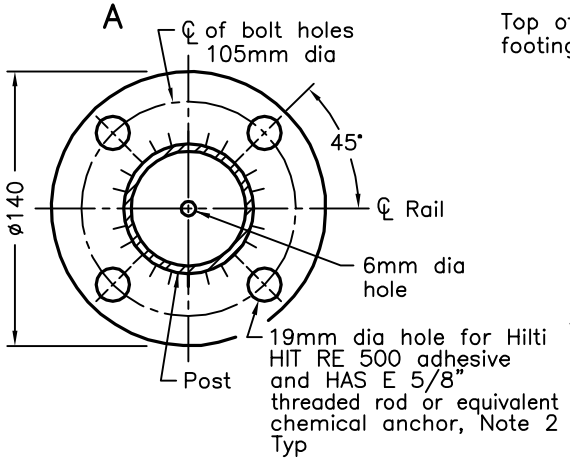



ELEVATION

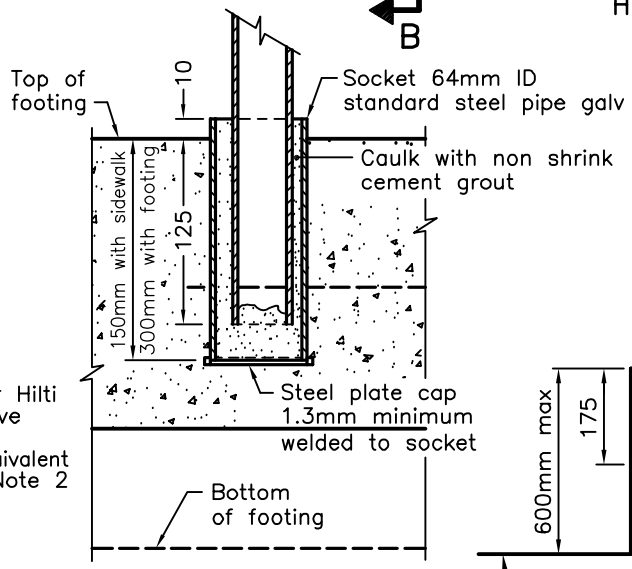
NOTES:

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.

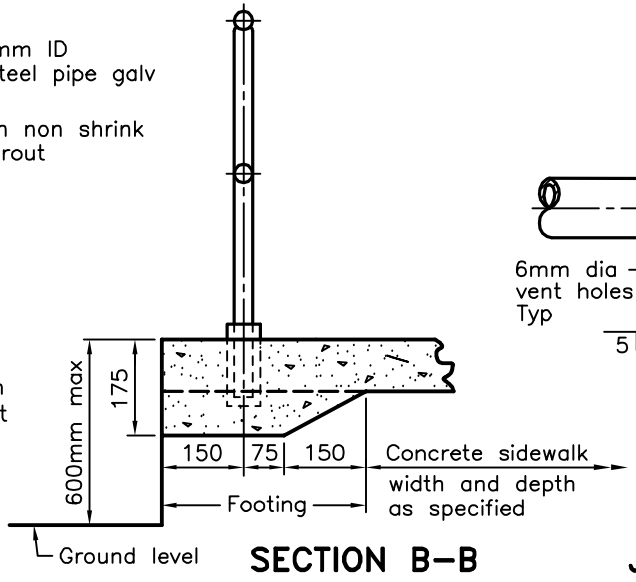
A Concrete shall have a nominal minimum 28–Day compressive strength of 20MPa.
B Posts and railings shall be hot dip galvanized according to CSA G164 after fabrication.
C Posts shall be vertical. All exposed corners shall be ground smooth.
D Welding shall be according to CSA W59.
E All joints shall be 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.



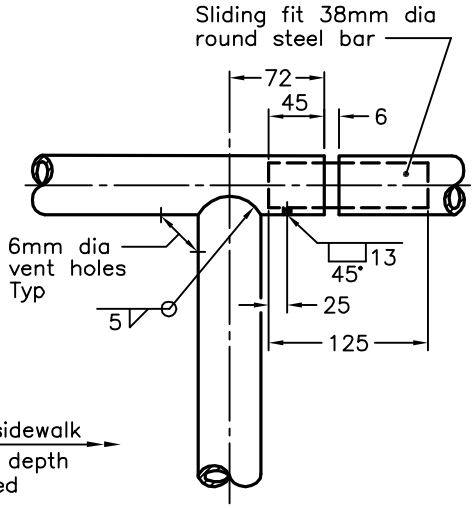

PLAN OF BASE PLATE



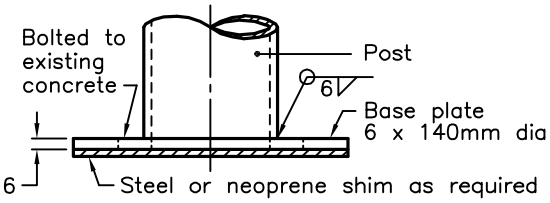

SECTION A–A




SECTION B–B




JOINT DETAIL



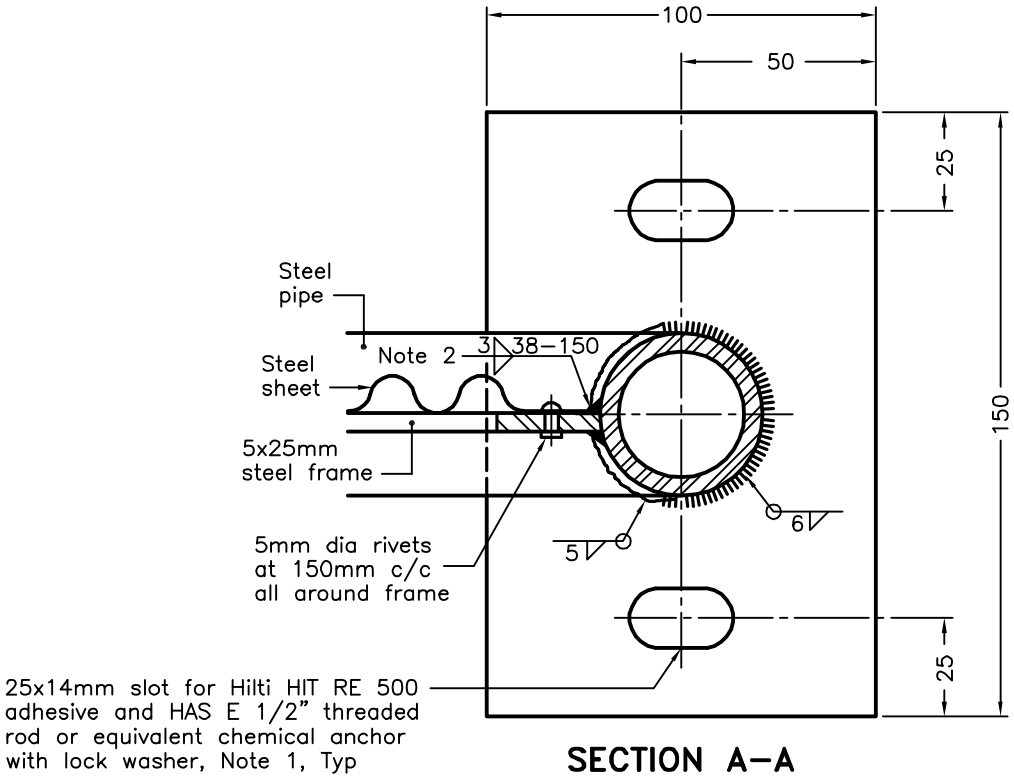

BASE PLATE ELEVATION
INSTALLATION DETAIL ON EXISTING CONCRETE

ONTARIO PROVINCIAL STANDARD DRAWING

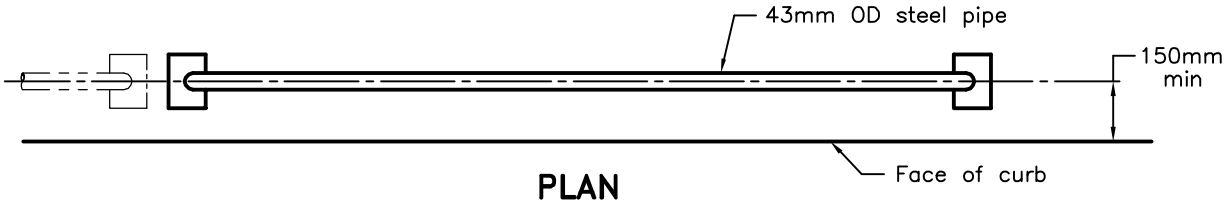
# PEDESTRIAN BARRICADE
## INSTALLATION

| Nov 2009 | Rev | 2 |
|---|---|---|

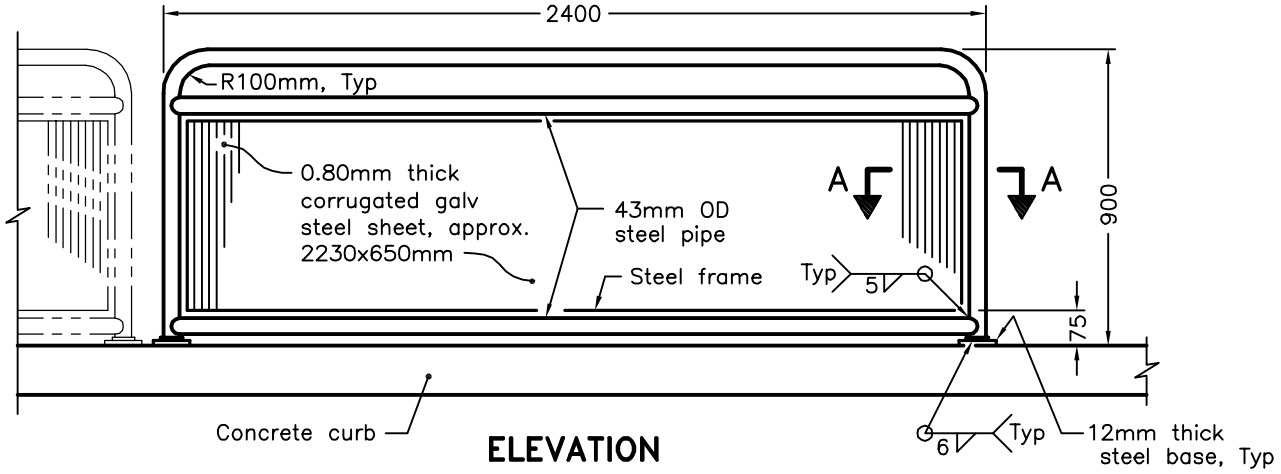
OPSD 980.101




**SECTION A–A**




**PLAN**



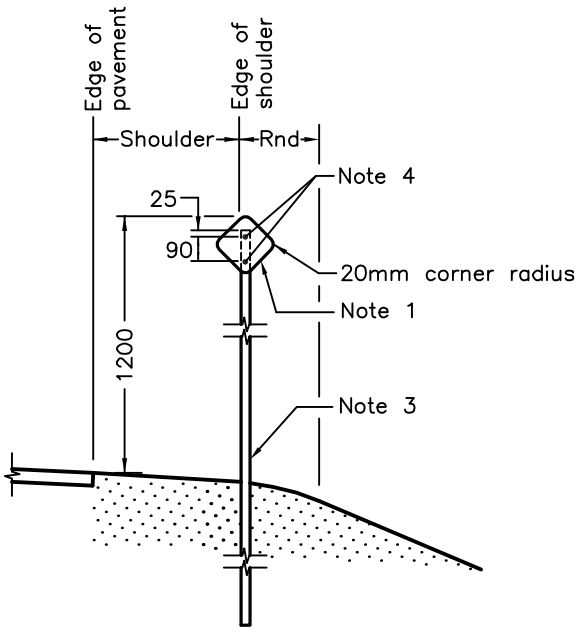

**ELEVATION**

NOTES:

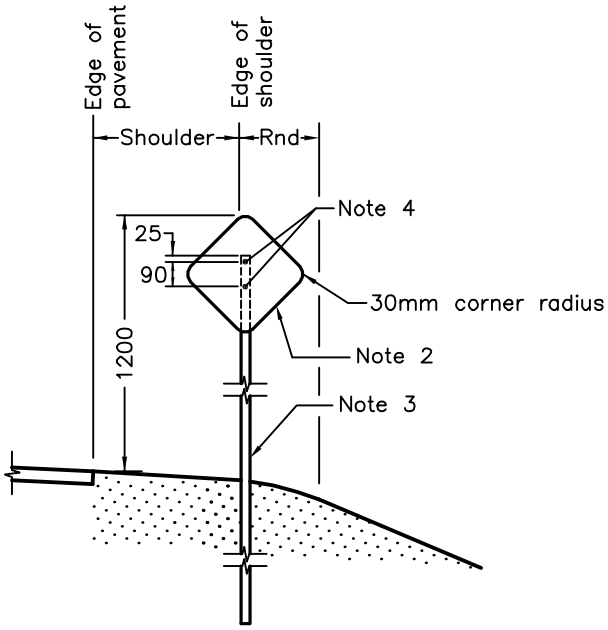
1 Anchors shall be installed according to manufacturer's specifications.
2 Frame shall be welded to the steel pipes all around.

A All steel pipe shall be according to ASTM A 53.
B Welding shall be according to CSA W59.
C All parts shall be hot dipped galvanized according to CSA G164 after fabrication.
D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2009 | Rev | 1 |
|---|---|---|---|
| SPLASH GUARD, PEDESTRIAN INSTALLATION | | | |
| | OPSD 982.101 | | |




**POST MOUNTED DELINEATOR**
**TYPE A**



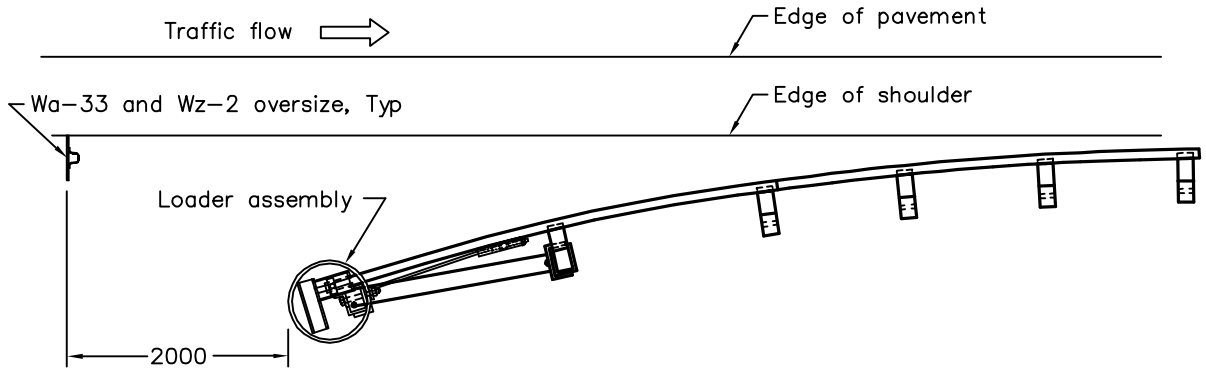

**POST MOUNTED DELINEATOR**
**TYPE B**

NOTES:

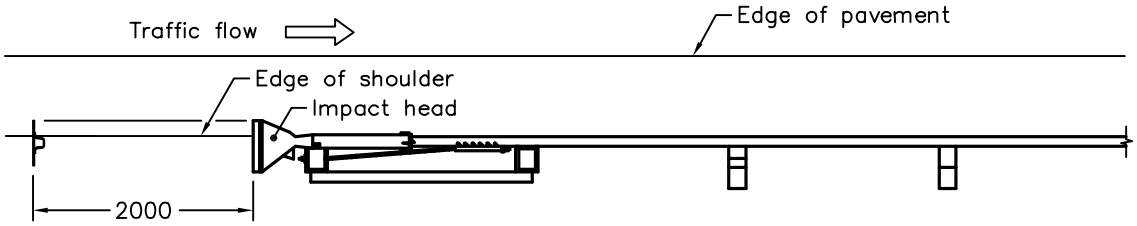
1 Type A delineators shall be 125 x 125mm.
2 Type B delineators shall be 250 x 250mm.
3 Delineator posts shall be 25 x 25mm steel square tube post, 2134mm in length.
4 Prior to galvanizing, four holes shall be drilled or punched, size No. 30, 3.2mm diameter. Delineators shall be fastened with two #10 (3/16") x 3/4" metal drilling screws.

A All dimensions are in millimetres unless otherwise shown.

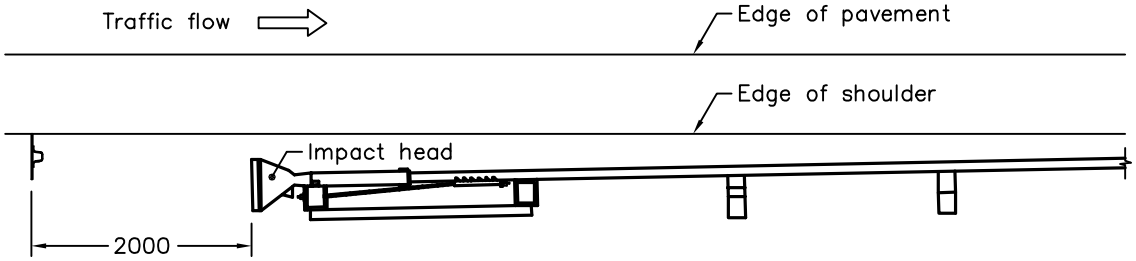
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 1 |
|---|---|---|---|
| **POST MOUNTED DELINEATOR INSTALLATION** | | | |
| | **OPSD 984.101** | | |



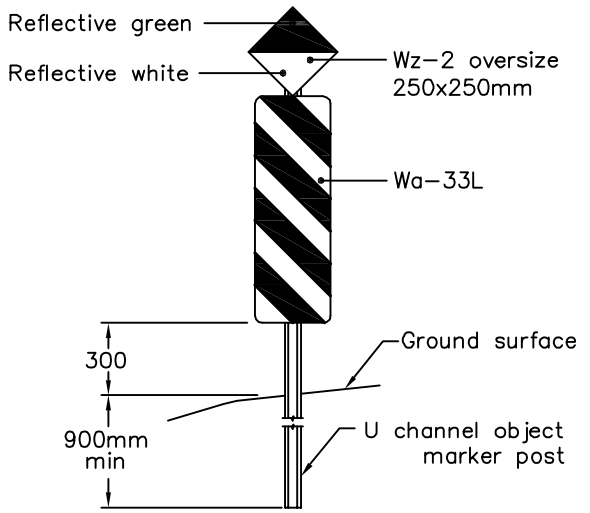

## ECCENTRIC LOADER TERMINAL



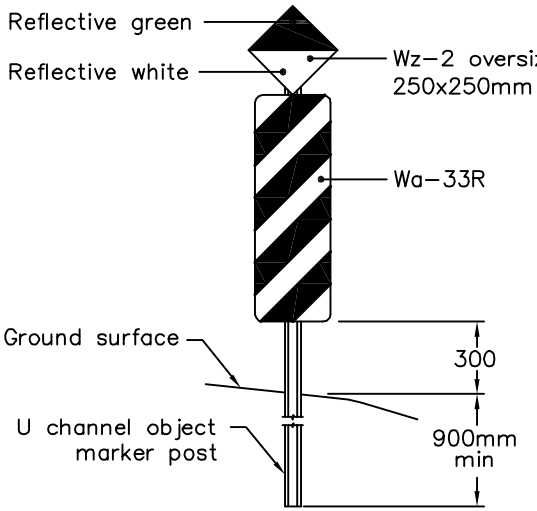

## STEEL BEAM ENERGY ATTENUATING TERMINAL – TANGENT




## STEEL BEAM ENERGY ATTENUATING TERMINAL – FLARED




## APPROACH END – LEFT SHOULDER

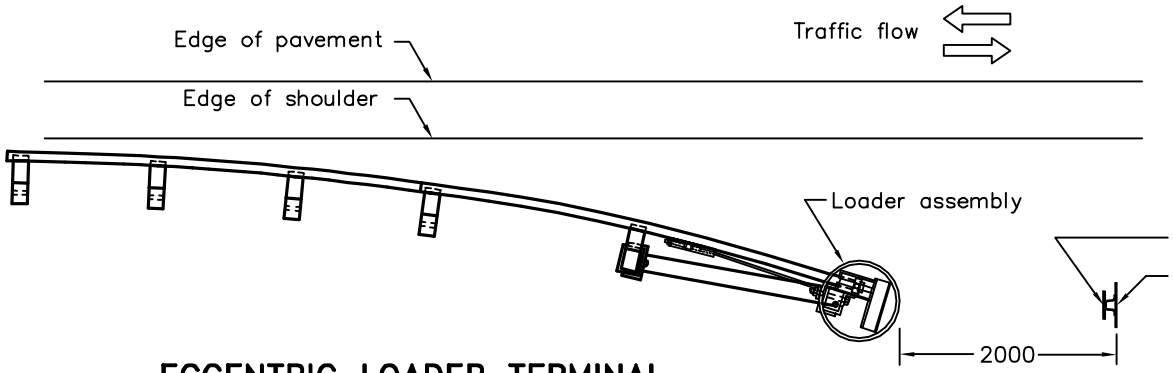



## APPROACH END – RIGHT SHOULDER

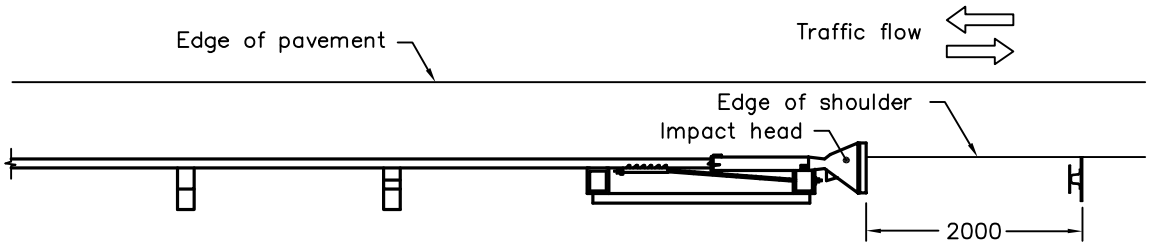
NOTES:

A All dimensions are in millimetres unless otherwise shown.

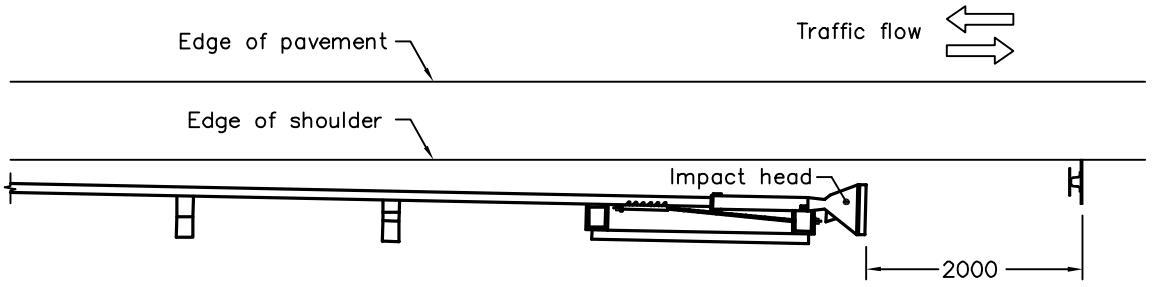
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, END TREATMENT<br>DELINEATION<br>INSTALLATION – APPROACH END | | | |
| | OPSD 984.201 | | |



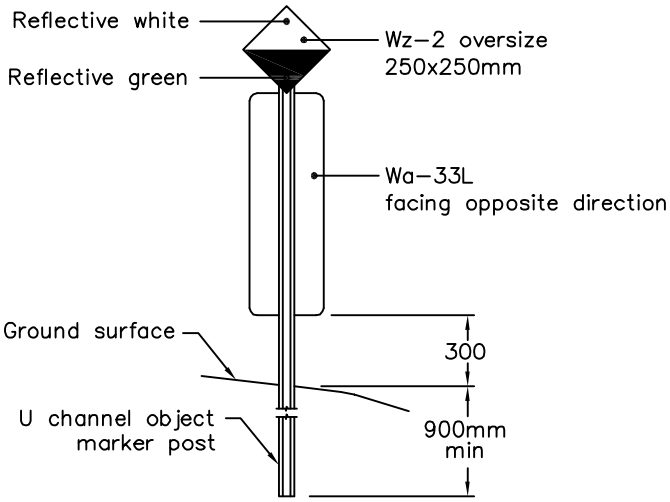

## ECCENTRIC LOADER TERMINAL




## STEEL BEAM ENERGY ATTENUATING TERMINAL – TANGENT




## STEEL BEAM ENERGY ATTENUATING TERMINAL – FLARED

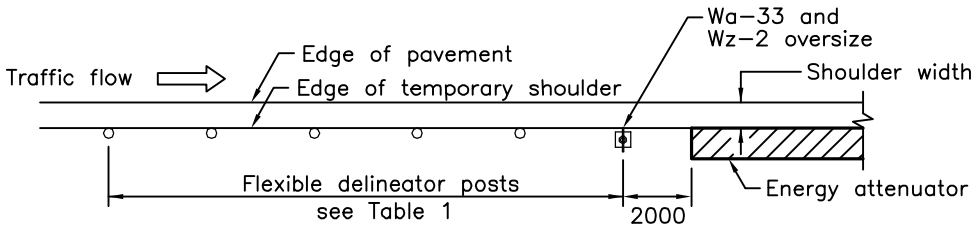



## LEAVING END

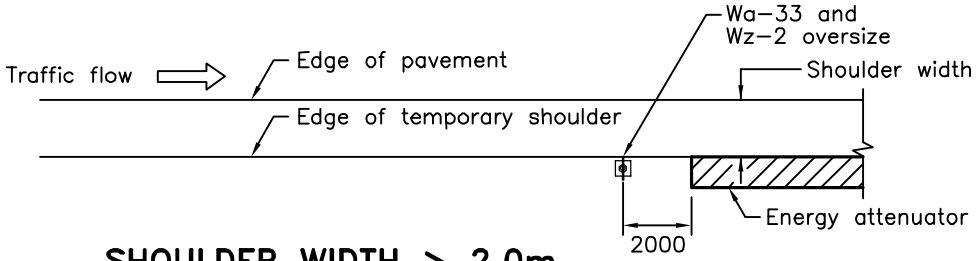
NOTES:

A All dimensions are in millimetres unless otherwise shown.

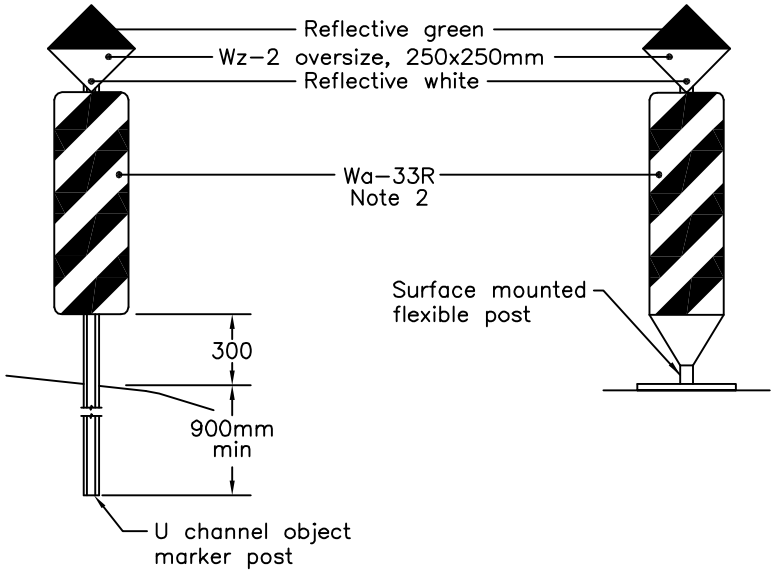
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, END TREATMENT<br>DELINEATION<br>INSTALLATION – LEAVING END | | | |
| | OPSD 984.202 | | |




**SHOULDER WIDTH < 2.0m**

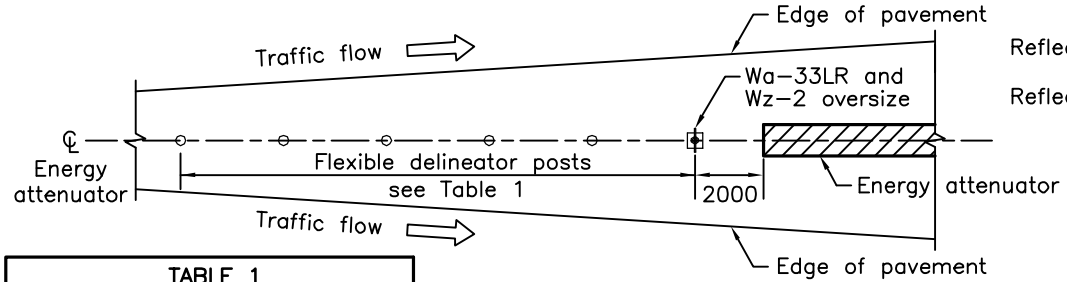



**SHOULDER WIDTH ≥ 2.0m**



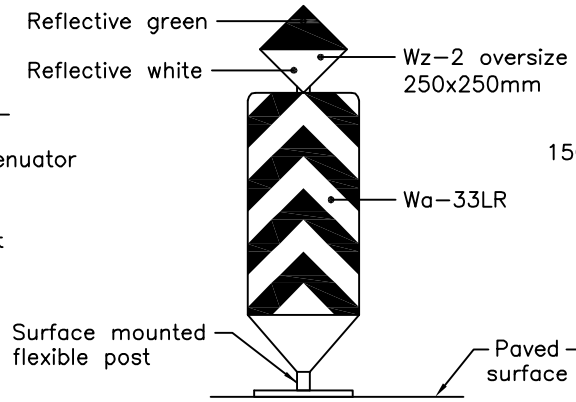

**GRANULAR SURFACE** **PAVED SURFACE**

**SHOULDER**

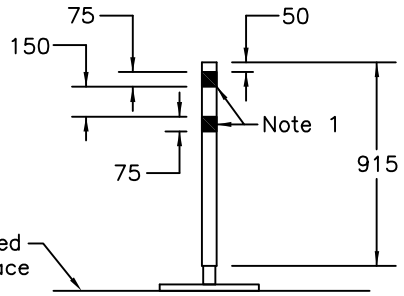



**GORE**

| TABLE 1 | | |
|---|---|---|
| POSTED SPEED km/h | FLEXIBLE DELINEATORS REQUIRED | DELINEATOR SPACING m |
| <70 | 3.0 | 3.0 |
| ≥70 | 5.0 | 3.0 |




**GORE**




**FLEXIBLE DELINEATOR POST**

NOTES:

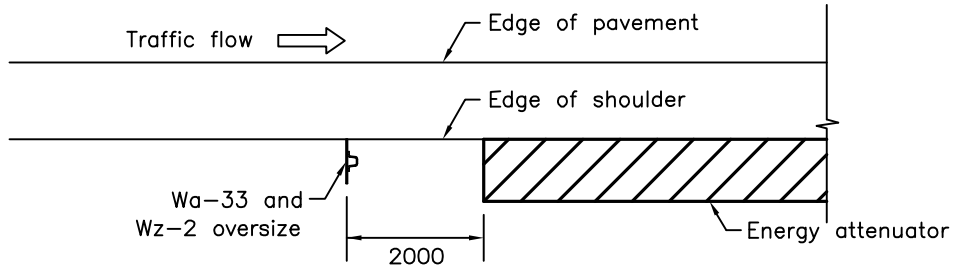
1 Type IV reflective sheeting or higher to be wrapped around post.
2 Right shoulder installation shown. For left shoulder installation, use Wa–33L.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

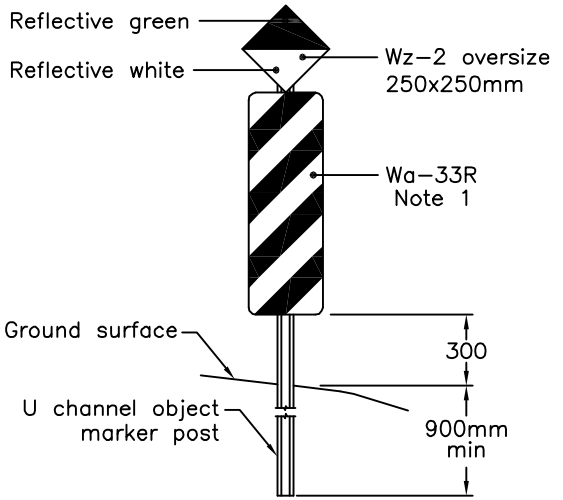
# ENERGY ATTENUATOR, CRASH CUSHION DELINEATION INSTALLATION – TEMPORARY

Nov 2010 | Rev 0

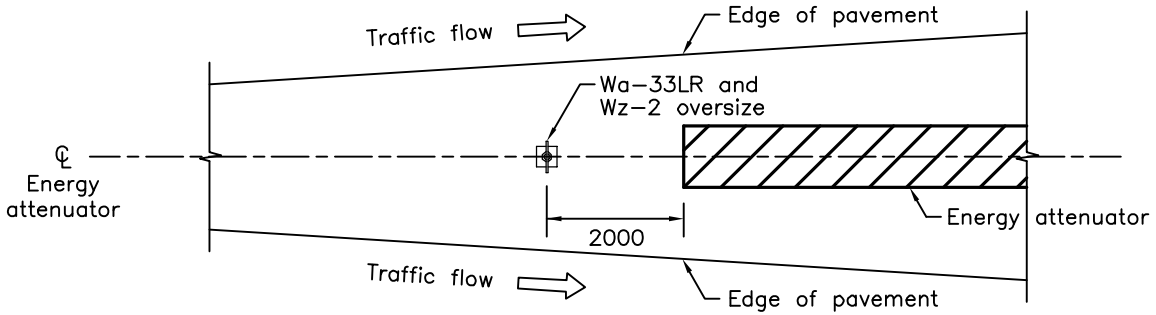
OPSD 984.203



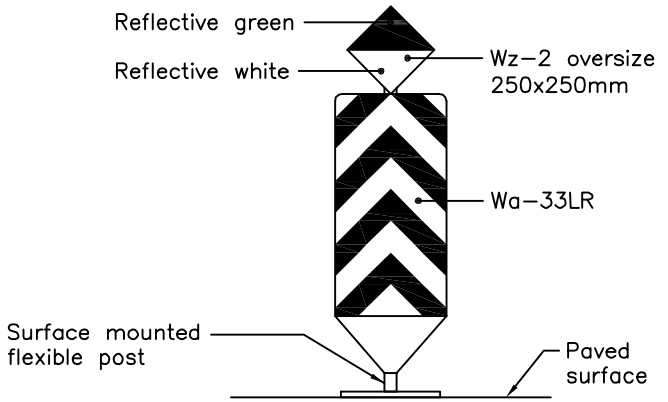

**SHOULDER**




**SHOULDER**




**GORE**




**GORE**

NOTES:

1 Right shoulder installation shown. For left shoulder installation, use Wa–33L.

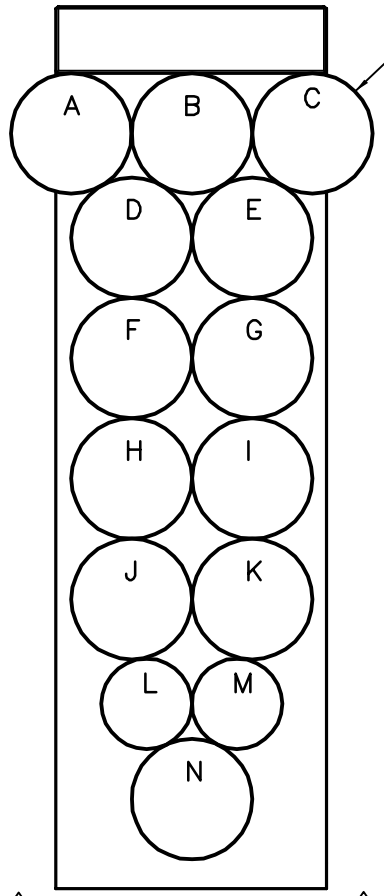
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

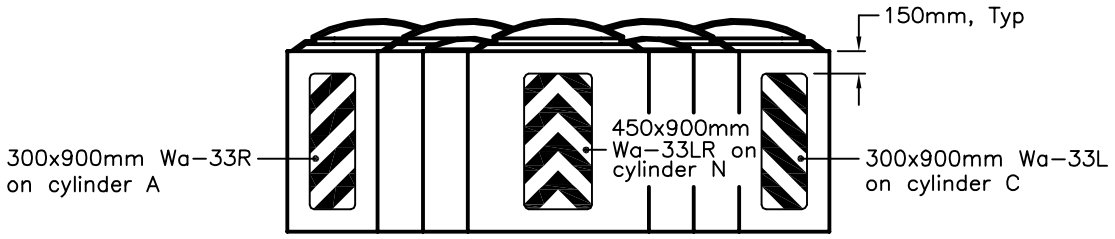
# ENERGY ATTENUATOR, CRASH CUSHION DELINEATION INSTALLATION – PERMANENT

Nov 2010 | Rev 0

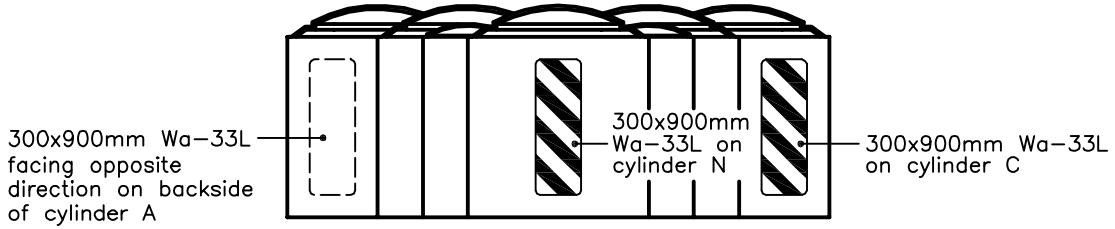
OPSD 984.204




**PLAN**




**UNIDIRECTIONAL CIAS INSTALLATION**




**BIDIRECTIONAL CIAS INSTALLATION**

NOTES:

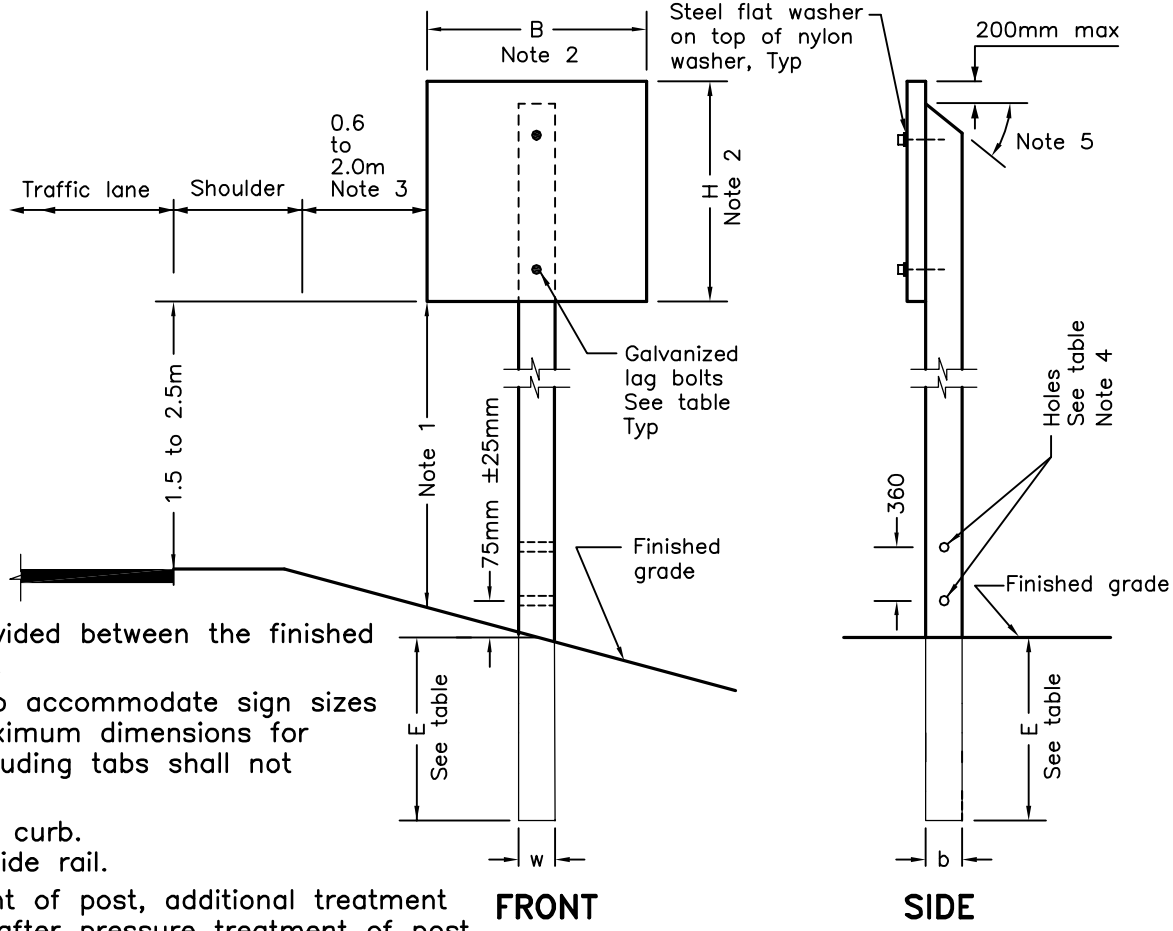
A High intensity retroreflective sheeting shall be applied directly to the CIAS cylinder.
The edges of the applied sheeting shall be vertical and free of bubbles and wrinkles.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| ENERGY ATTENUATOR, CRASH CUSHION<br>CONNECTICUT IMPACT ATTENUATION SYSTEM<br>DELINEATION<br>INSTALLATION – PERMANENT | | | |
| | OPSD 984.205 | | |

## SIGN SUPPORT REQUIREMENTS

| Embedment Depth | Dressed Post Size and Hole Diameter | | | Note 2 | | | Galvanized Lag Bolt Size |
|---|---|---|---|---|---|---|---|
| | | | | Max. Sign Dimensions | | Max. Sign Area | |
| E | w | b | Hole Dia. | B cm | H cm | A $m^2$ | inch |
| 920 | 89 | 89 | N/A | 120 | 90 | 0.41 | 3/8 X 3 |
| 1000 | 89 | 140 | 38 | 120 | 120 | 0.90 | 3/8 X 3 |
| 1000 | 140 | 140 | 51 | 120 | 180 | 1.08 | 3/8 X 4 |
| 1200 | 140 | 184 | 76 | 120 | 180 | 1.80 | 3/8 X 4 |




## NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 Dressed post size (w and b) shall be selected to accommodate sign sizes specified in the Contract Documents so that maximum dimensions for sign size (B and H) and total sign area (A) including tabs shall not exceed values in the table.

3 When curb present, minimum 0.3m from face of curb.
When guide rail present, 1.0m behind face of guide rail.

4 When holes are drilled prior to pressure treatment of post, additional treatment of holes is not required. When holes are drilled after pressure treatment of post, additional field treatment of holes is required.

5 When top of post is not cut after pressure treatment, it does not require to be bevelled as shown.
When top of post is cut after pressure treatment, it shall be bevelled at 15 to 30° angle and treated in the field.

A When Wa–33 is specified below a Rb–125, the bottom of the Wa–33 shall be 1.2m above finished grade.

B System configuration meets NCHRP Report 350 TL–3.

C Wooden dressed post shall be S–P–F species No. 1 or No. 2 grade.

D Wooden dressed post shall be stamped for grade, species, and treatment.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# SMALL SIGN SUPPORT SYSTEM
# SINGLE BREAKAWAY WOODEN POST
## 89x89mm, 89x140mm, 140x140mm, AND 140x184mm
## INSTALLATION–SINGLE POST ASSEMBLY

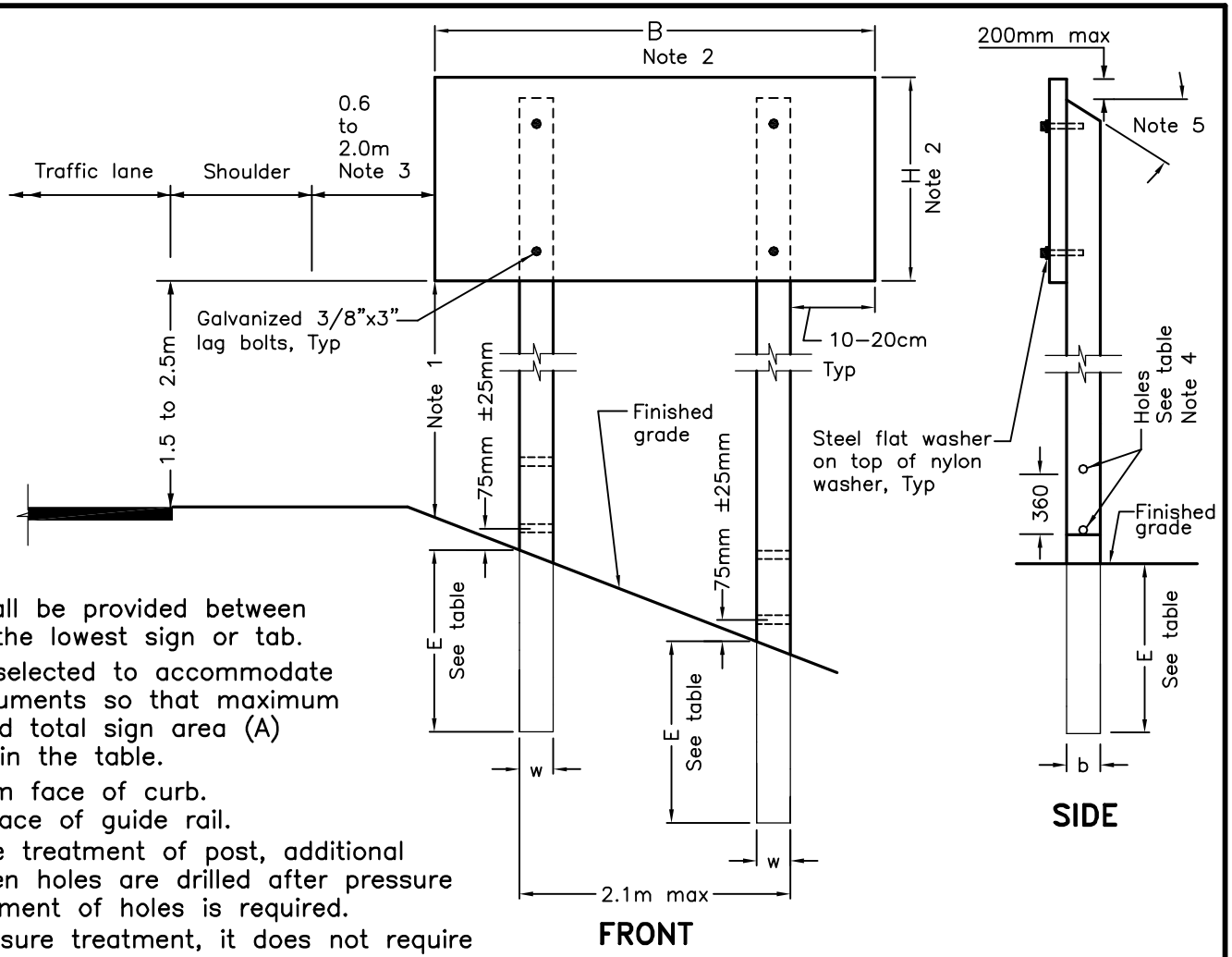
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

OPSD 985.110

## SIGN SUPPORT REQUIREMENTS

| Embedment Depth | Dressed Post Size and Hole Diameter | | | Note 2 | | |
|---|---|---|---|---|---|---|
| | | | | Max. Sign Dimensions | | Max. Sign Area |
| E | w | b | Hole Dia. | B cm | H cm | A $m^2$ |
| 920 | 89 | 89 | NA | 150 to 240 | 90 | 0.90 |
| 1000 | 89 | 140 | 38 | 150 to 240 | 120 | 1.89 |




## NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 Dressed post size (w and b) shall be selected to accommodate sign size specified in the Contract Documents so that maximum dimensions for sign size (B and H) and total sign area (A) including tabs shall not exceed values in the table.

3 When curb present, minimum 0.3m from face of curb. When guide rail present, 1.0m behind face of guide rail.

4 When holes are drilled prior to pressure treatment of post, additional treatment of holes is not required. When holes are drilled after pressure treatment of post, additional field treatment of holes is required.

5 When top of post is not cut after pressure treatment, it does not require to be bevelled as shown. When top of post is cut after pressure treatment, it shall be bevelled at 15 to 30° angle and treated in the field.

A System configuration meets NCHRP Report 350 TL–3.

B Wooden dressed post shall be S–P–F species No. 1 or No. 2 grade.

C Wooden dressed post shall be stamped for grade, species, and treatment.

D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# SMALL SIGN SUPPORT SYSTEM DOUBLE BREAKAWAY WOODEN POST 89x89mm AND 89x140mm INSTALLATION–DOUBLE POST ASSEMBLY

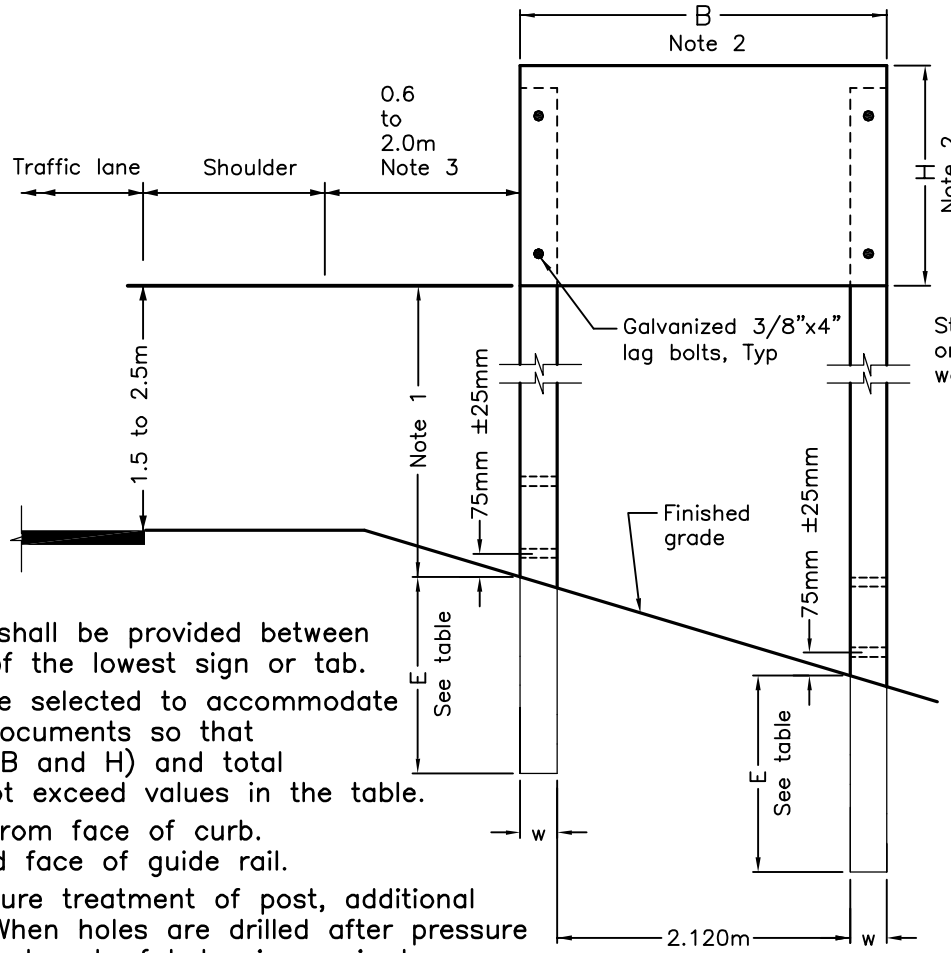
Nov 2013 | Rev 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

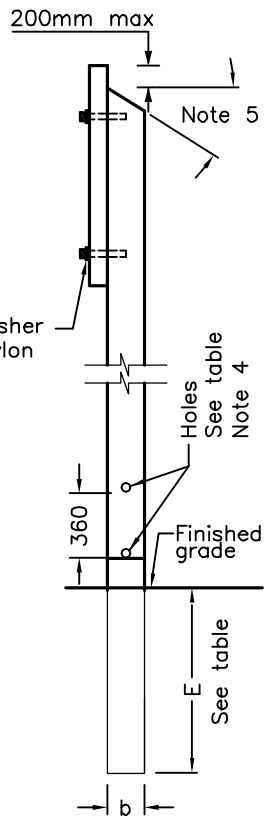
OPSD 985.210

## SIGN SUPPORT REQUIREMENTS

| Embedment Depth | Dressed Post Size and Hole Diameter | | | Note 2 | | |
|---|---|---|---|---|---|---|
| | | | | Sign Dimensions | | Max. Sign Area |
| E | w | b | Hole Dia. | B cm | Max. H cm | A $m^2$ |
| 1000 | 140 | 140 | 51 | 240 | 90 | 2.16 |
| 1200 | 140 | 184 | 76 | 240 | 150 | 3.60 |




FRONT




SIDE

## NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 Dressed post size (w and b) shall be selected to accommodate sign size specified in the Contract Documents so that maximum dimensions for sign size (B and H) and total sign area (A) including tabs shall not exceed values in the table.

3 When curb present, minimum 0.3m from face of curb. When guide rail present, 1.0m behind face of guide rail.

4 When holes are drilled prior to pressure treatment of post, additional treatment of holes is not required. When holes are drilled after pressure treatment of post, additional field treatment of holes is required.

5 When top of post is not cut after pressure treatment, it does not require to be bevelled as shown. When top of post is cut after pressure treatment, it shall be bevelled at 15 to 30° angle and treated in the field.

A System configuration meets NCHRP Report 350 TL–3.

B Wooden dressed post shall be S–P–F species No. 1 grade.

C Wooden dressed post shall be stamped for grade, species, and treatment.

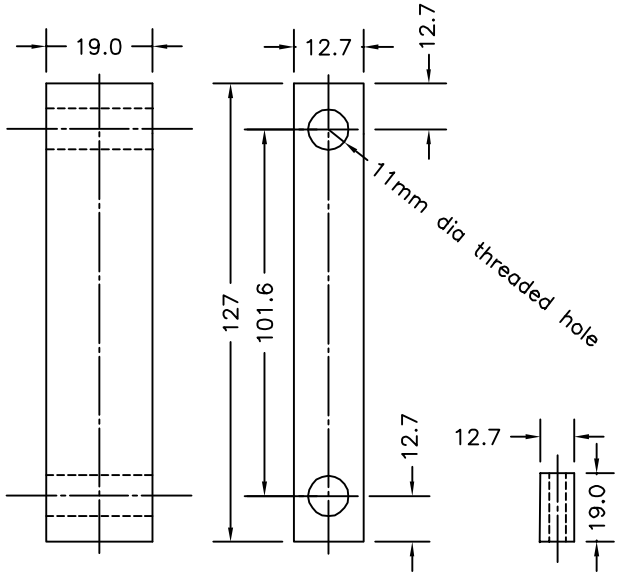
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

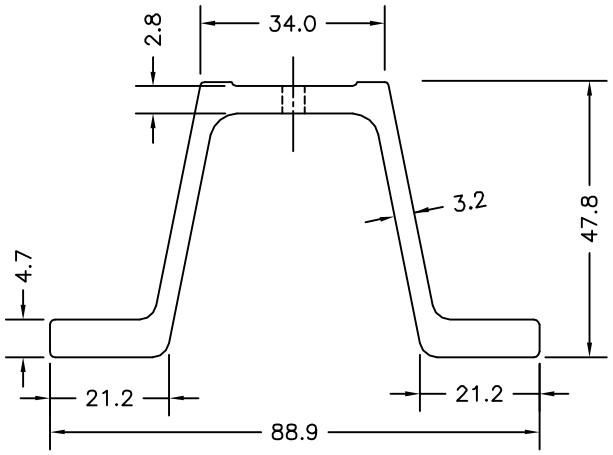
# SMALL SIGN SUPPORT SYSTEM DOUBLE BREAKAWAY WOODEN POST 140x140mm AND 140x184mm INSTALLATION–DOUBLE POST ASSEMBLY

Nov 2013 | Rev 0

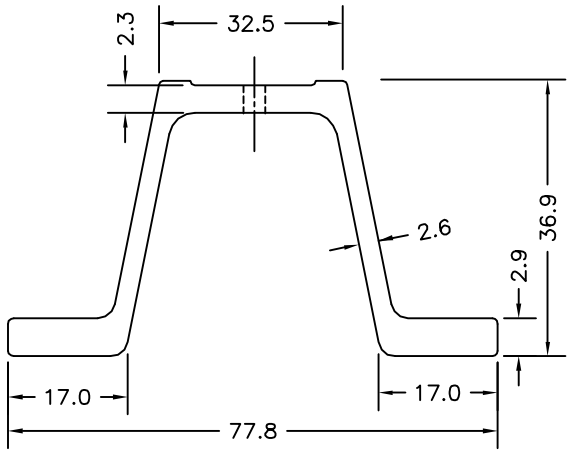
OPSD 985.220



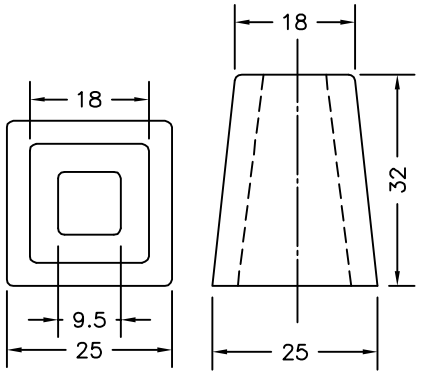

**SPACER FOR LAP SPLICE**
**Gold coloured nickel/steel**



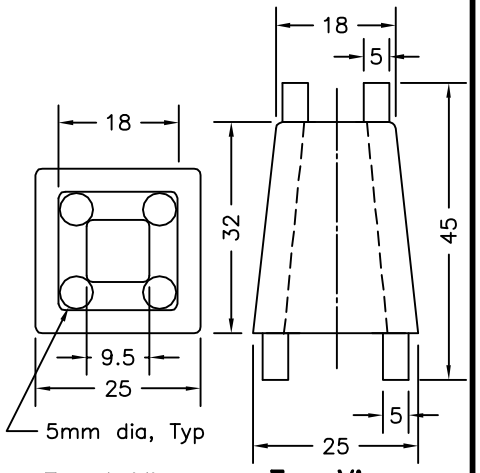

**4.46 kg/m RIB–BAK POST**




**2.61 kg/m RIB–BAK POST**




**Front View** **Top View**
**TYPE A, Note 1 and 3**




**Front View** **Top View**
**TYPE B, Note 2 and 3**

**SPACER FOR SIGN TO POST**

NOTES:

1 Type A sign spacer shall be used with 2.61 kg/m upper post.
2 Type B sign spacer shall be used with 4.46 kg/m upper post.
3 Sign spacers shall be molded from Acrylonitrile Butadiene Styrene thermoplastic resin.

A Posts and hardware depicted on this OPSD are proprietary.
B Posts shall be manufactured from hot rolled carbon steel bars according to Marion Steel Company Grade SP–80 having minimum yield strength of 552 MPa according to ASTM A 499.
C Posts shall be perforated with 11mm diameter holes @ 51mm c/c spacing.
D Posts shall be hot dip galvanized after fabrication.
E Lap splice spacer bar shall be fabricated from hot rolled carbon steel bars according to ASTM A36M.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

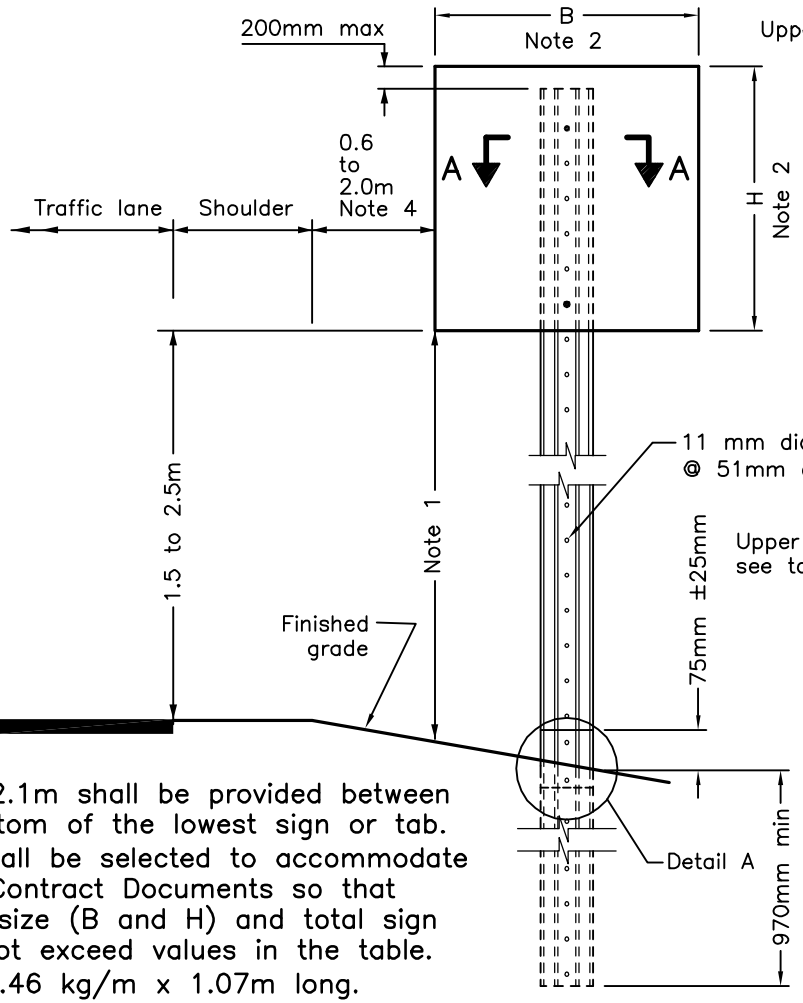
# SMALL SIGN SUPPORT SYSTEM
# LAP SPLICE RIB–BAK BREAKAWAY SYSTEM COMPONENTS

Nov 2013 | Rev 0

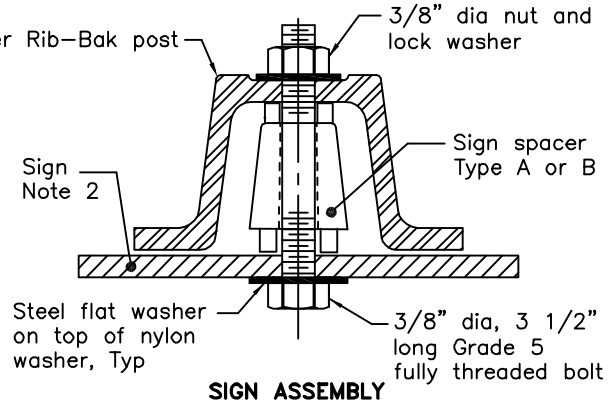
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 987.101

| SIGN SUPPORT REQUIREMENTS Note 2 | | | |
|---|---|---|---|
| Max. Sign Dimensions | | Max. Sign Area | Upper Post |
| B cm | H cm | A $m^2$ | kg/m |
| 90 | 135 | 0.45 | 2.61 |
| | 150 | 0.81 | 4.46 |

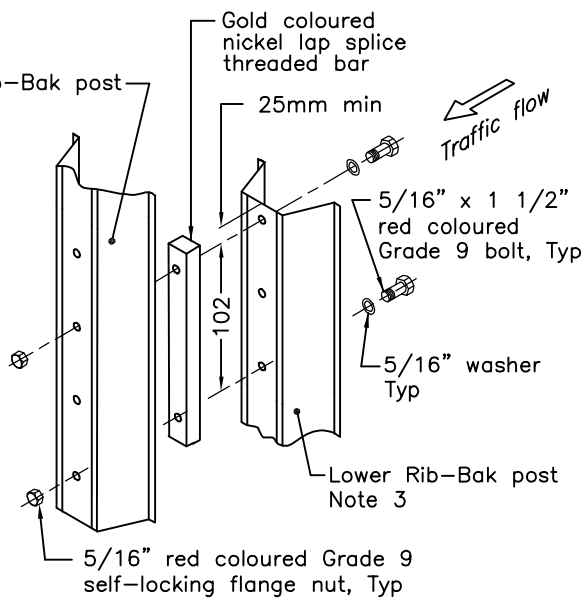



FRONT




SIGN ASSEMBLY

SECTION A–A




DETAIL A

## NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 The upper post size (kg/m) shall be selected to accommodate the sign size specified in the Contract Documents so that maximum dimensions for sign size (B and H) and total sign area (A) including tabs shall not exceed values in the table.

3 Lower Rib–Bak post shall be 4.46 kg/m x 1.07m long.

4 When curb is present, minimum 0.3m from face of curb. When guide rail is present, 1.0m behind face of guide rail.

A The system depicted on this OPSD is a propriety system and shall be installed according to manufacturer's specifications.

B This OPSD shall be read in conjunction with OPSD 987.101.

C System configuration meets NCHRP Report 350 TL–3.

D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

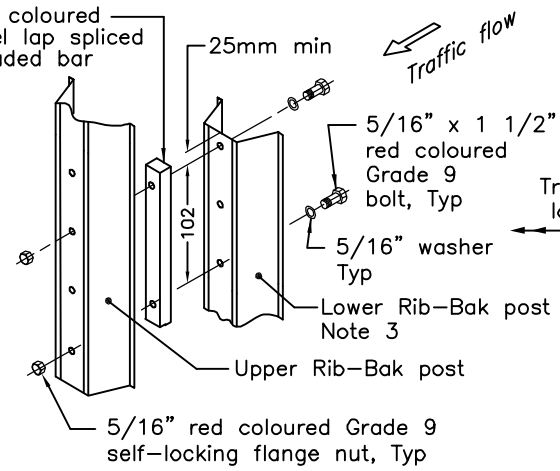
# SMALL SIGN SUPPORT SYSTEM
# LAP SPLICE RIB–BAK BREAKAWAY SYSTEM
# INSTALLATION–SINGLE POST ASSEMBLY

Nov 2013 | Rev 0

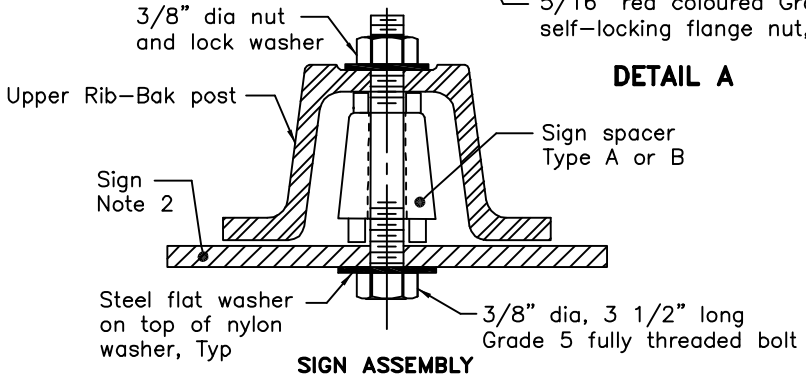
ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

OPSD 987.110

| SIGN SUPPORT REQUIREMENTS Note 2 | | | |
|---|---|---|---|
| Max. Sign Dimensions | | Max. Sign Area | Upper Post |
| B cm | H cm | A $m^2$ | kg/m |
| 90 to 240 | 105 | 1.10 | 2.61 |
| | 150 | 2.02 | 4.46 |

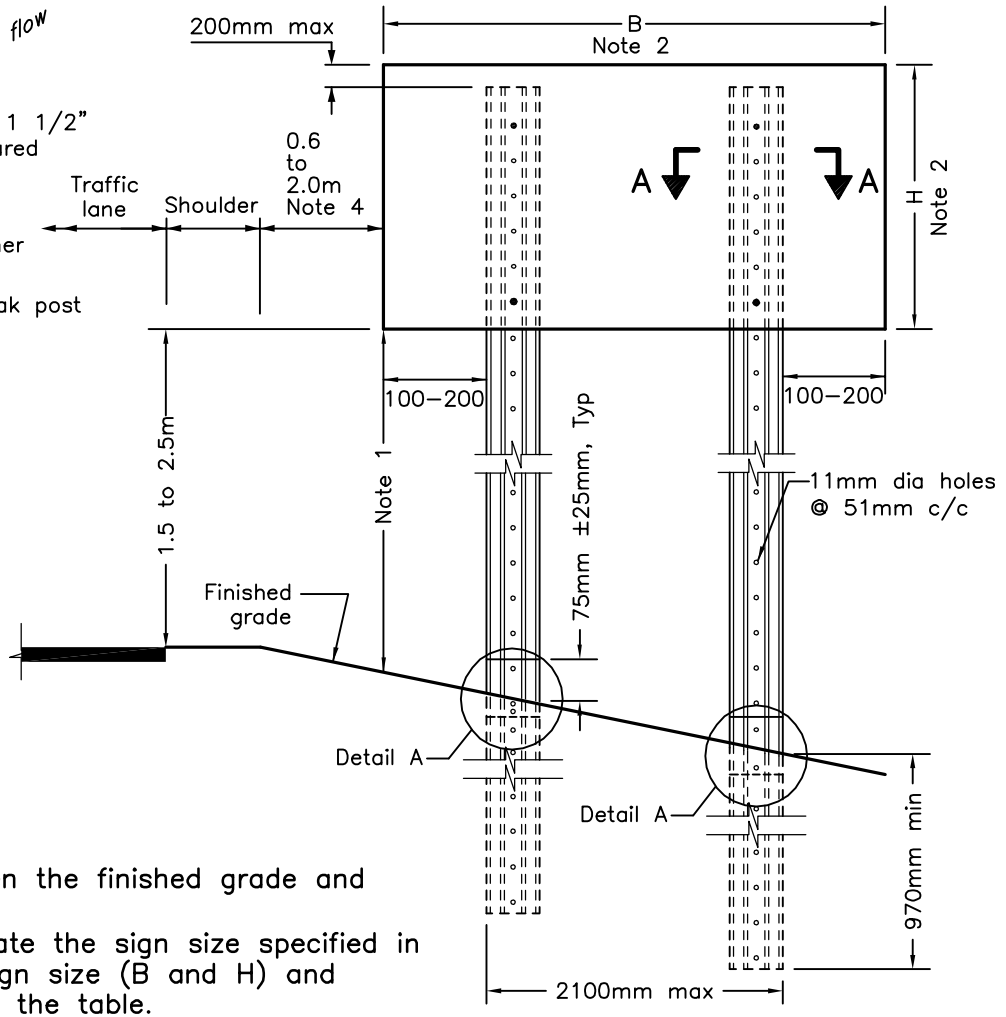



**DETAIL A**




**SIGN ASSEMBLY**

**SECTION A–A**




**FRONT**

NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 The upper post size (kg/m) shall be selected to accommodate the sign size specified in the Contract Documents so that maximum dimensions for sign size (B and H) and total sign area (A) including tabs shall not exceed values in the table.

3 Lower Rib–Bak post shall be 4.46 kg/m x 1.07m long.

4 When curb is present, minimum 0.3m from face of curb.
When guide rail is present, 1.0m behind face of guide rail.

A The system depicted on this OPSD is a propriety system and shall be installed according to manufacturer's specifications.

B This OPSD shall be read in conjunction with OPSD 987.101.

C System configuration meets NCHRP Report 350 TL–3.

D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

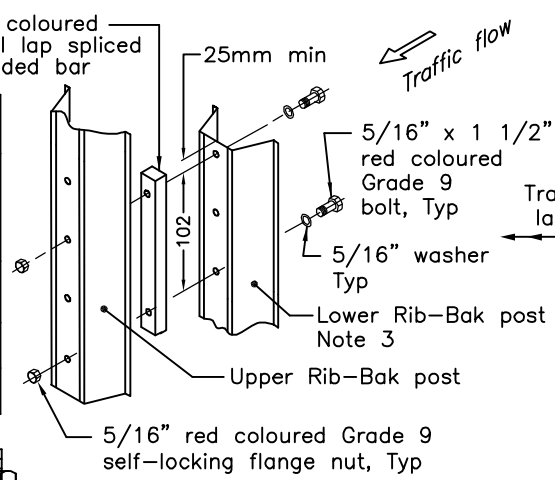
Nov 2013 | Rev 0

# SMALL SIGN SUPPORT SYSTEM
# LAP SPLICE RIB–BAK BREAKAWAY SYSTEM
# INSTALLATION–DOUBLE POST ASSEMBLY

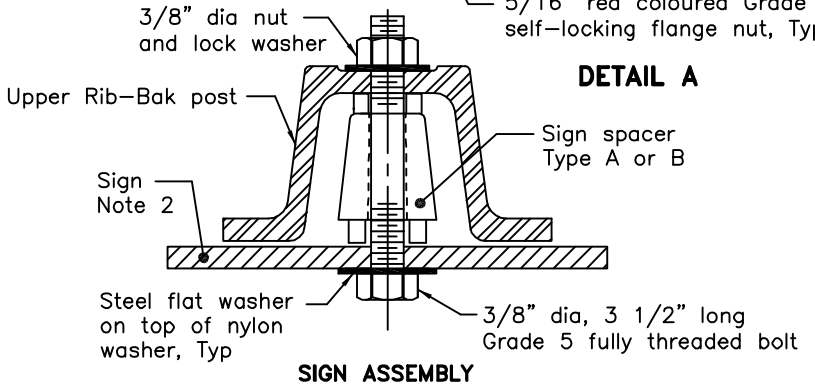
ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

**OPSD 987.210**

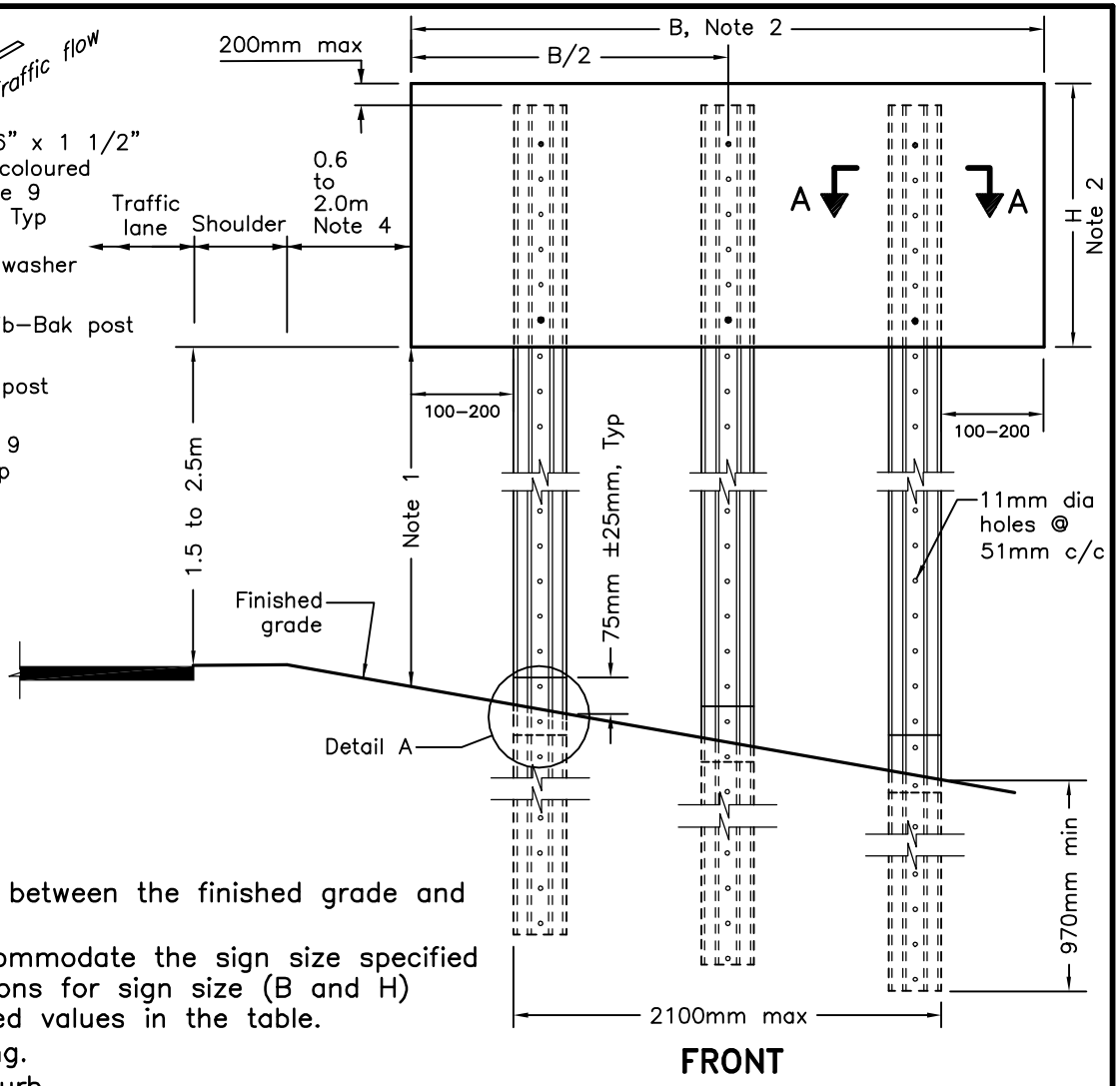
| SIGN SUPPORT REQUIREMENTS Note 2 | | | |
|---|---|---|---|
| Max. Sign Dimensions | | Max. Sign Area | Upper Post |
| B cm | H cm | A $m^2$ | kg/m |
| 180 to 240 | 75 | 1.58 | 2.61 |
| | 150 | 2.92 | 4.46 |




**DETAIL A**




**SIGN ASSEMBLY**




**SECTION A–A**

**FRONT**

NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 The upper post size (kg/m) shall be selected to accommodate the sign size specified in the Contract Documents so that maximum dimensions for sign size (B and H) and total sign area (A) including tabs shall not exceed values in the table.

3 Lower Rib–Bak post shall be 4.46 kg/m x 1.07m long.

4 When curb is present, minimum 0.3m from face of curb.
When guide rail is present, 1.0m behind face of guide rail.

A The system depicted on this OPSD is a propriety system and shall be installed according to manufacturer's specifications.

B This OPSD shall be read in conjunction with OPSD 987.101.

C System configuration meets NCHRP Report 350 TL–3.

D All dimensions are in millimetres unless otherwise shown.

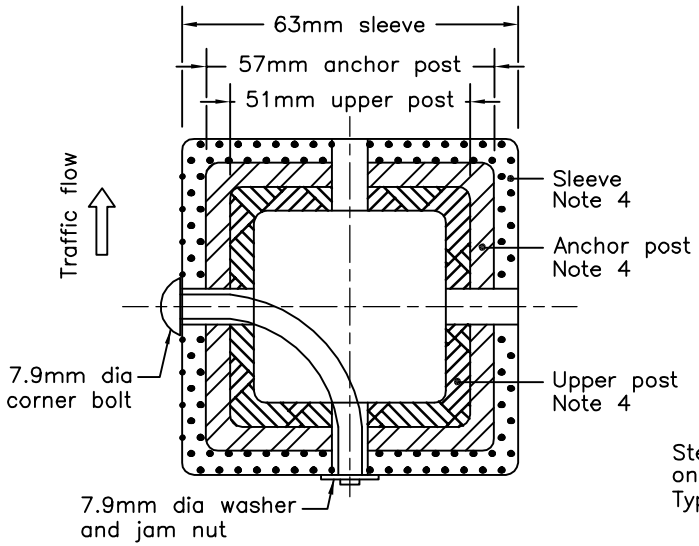
ONTARIO PROVINCIAL STANDARD DRAWING

# SMALL SIGN SUPPORT SYSTEM
# LAP SPLICE RIB–BAK BREAKAWAY SYSTEM
# INSTALLATION–TRIPLE POST ASSEMBLY

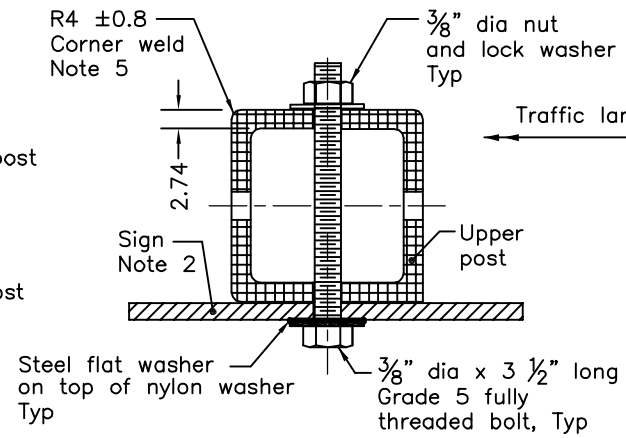
Nov 2013 | Rev 0

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

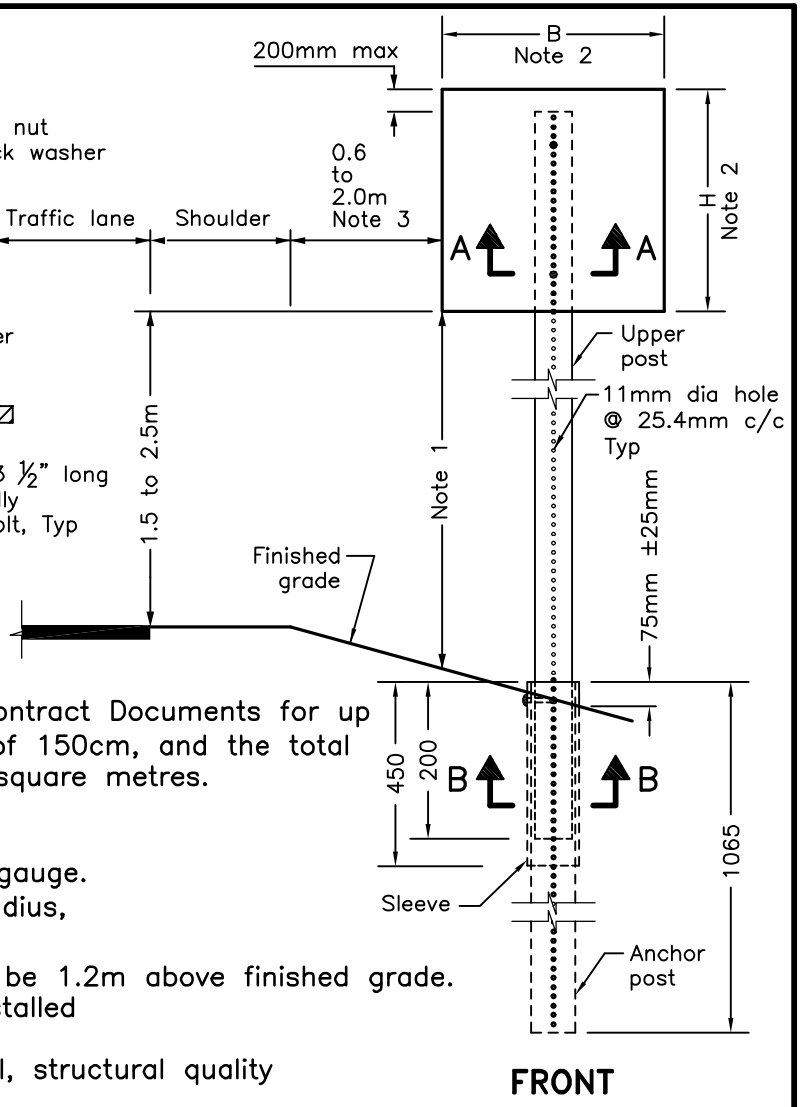
OPSD 987.310




SECTION B–B




SECTION A–A




FRONT

NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 This support system shall accommodate sign board sizes specified in the Contract Documents for up to maximum sign width (B) of 120cm, up to a maximum sign height (H) of 150cm, and the total sign area including tabs shall not exceed the maximum sign area of 1.44 square metres.

3 When curb is present, minimum 0.3m from face of the curb.
When guide rail is present, 1.0m behind face of guide rail.

4 Base metal thickness shall be 2.74mm nominal and 2.44mm minimum, 12 gauge.

5 Corner weld by high frequency electric resistance, scarf to match formed radius, and zinc coat weld after scarfing.

A When Wa–33 is specified below a Rb–125, the bottom of the Wa–33 shall be 1.2m above finished grade.

B The system depicted on this OPSD is a proprietary system and shall be installed according to manufacturer's specifications.

C Posts and sleeves shall be manufactured from hot rolled carbon sheet steel, structural quality according to ASTM A 653, Grade 50 steel or ASTM A 1011, Grade 50 steel.

D Posts and sleeves manufactured from ASTM A 653, Grade 50 steel shall be stripped prior to being hot dip galvanized.

E Posts and sleeves shall be hot dip galvanized after fabrication. Excess zinc shall be removed to ensure telescoping of posts and sleeves.

F System configuration meets NCHRP Report 350 TL–3.

G All dimensions are in millimetres unless otherwise shown.

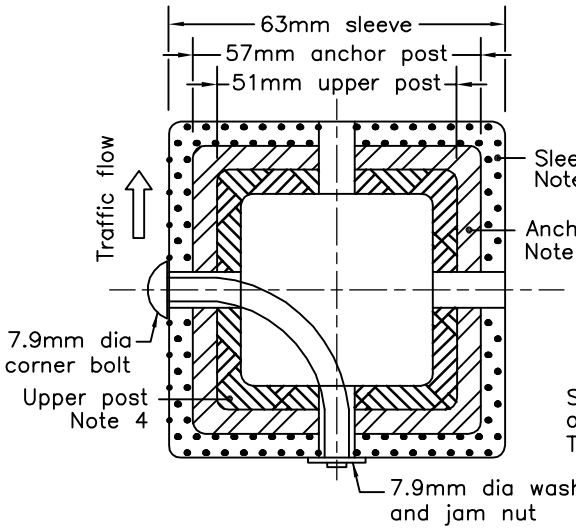
ONTARIO PROVINCIAL STANDARD DRAWING

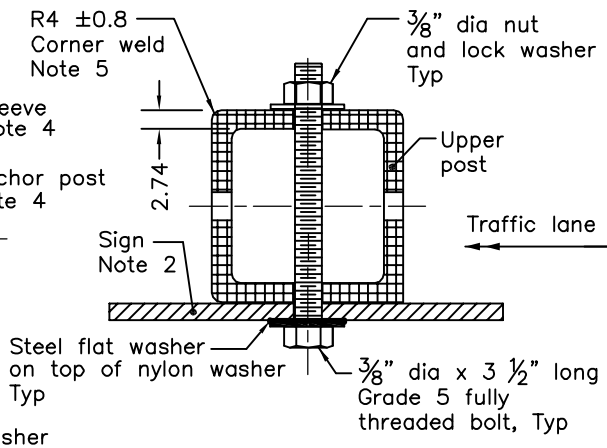
# SMALL SIGN SUPPORT SYSTEM
# SQR–LOC PERFORATED STEEL
# SQUARE SIGN POST SYSTEM
# INSTALLATION–SINGLE POST ASSEMBLY

Nov 2013 | Rev 0

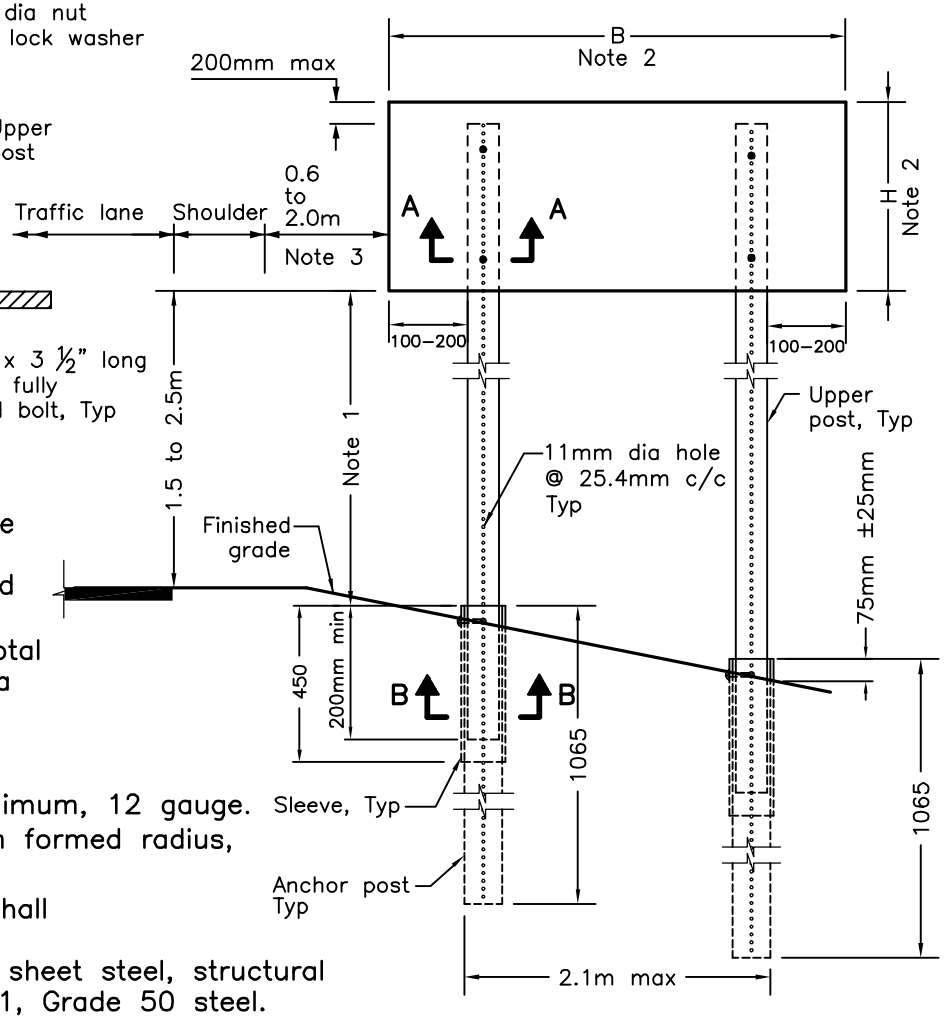
ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

OPSD 989.110




SECTION A–A




FRONT

SECTION B–B

NOTES:

1 Minimum vertical clearance of 2.1m shall be provided between the finished grade and the bottom of the lowest sign or tab.

2 This support system shall accommodate sign board sizes specified in the Contract Documents for a sign width (B) from 90cm to 240cm, up to a maximum sign height (H) of 150cm, and the total sign area including tabs shall not exceed the maximum sign area of 3.15 square metres.

3 When curb is present, minimum 0.3m from face of the curb. When guide rail is present, 1.0m behind face of guide rail.

4 Base metal thickness shall be 2.74mm nominal and 2.44mm minimum, 12 gauge.

5 Corner weld by high frequency electric resistance, scarf to match formed radius, and zinc coat weld after scarfing.

A The system depicted on this OPSD is a proprietary system and shall be installed according to manufacturer's specifications.

B Posts and sleeves shall be manufactured from hot rolled carbon sheet steel, structural quality according to ASTM A 653, Grade 50 steel or ASTM A 1011, Grade 50 steel.

C Posts and sleeves manufactured from ASTM A 653, Grade 50 steel shall be stripped prior to being hot dip galvanized.

D Posts and sleeves shall be hot dip galvanized after fabrication. Excess zinc shall be removed to ensure telescoping of posts and sleeves.

E System configuration meets NCHRP Report 350 TL–3.

F All dimensions are in millimetres unless otherwise shown.

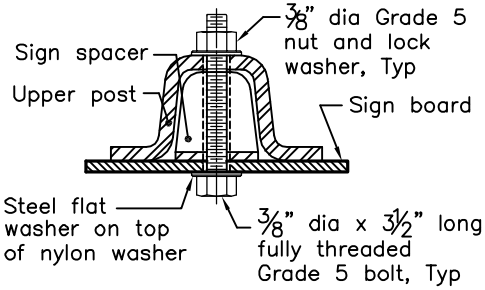
ONTARIO PROVINCIAL STANDARD DRAWING

# SMALL SIGN SUPPORT SYSTEM SQR–LOC PERFORATED STEEL SQUARE POST SYSTEM INSTALLATION–DOUBLE POST ASSEMBLY

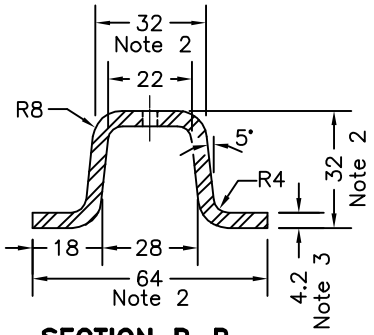
Nov 2013 | Rev 0

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

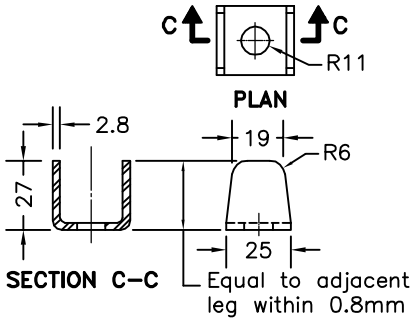
OPSD 989.210




SECTION A–A

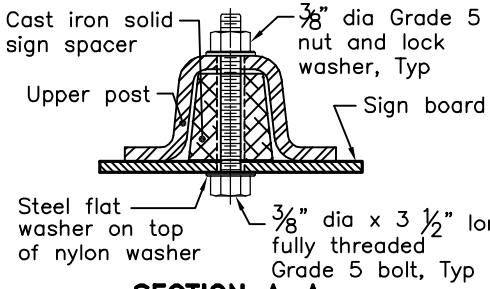



SECTION B–B

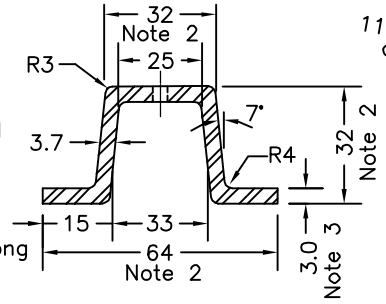



SIGN SPACER

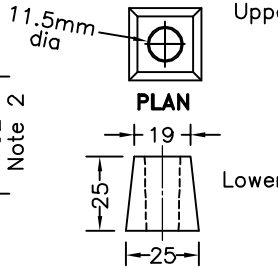
## COLD FORMED STEEL POST DETAILS, Note B and C

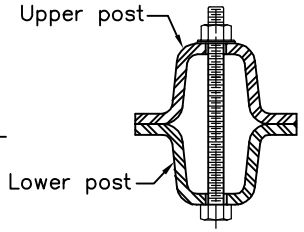



SECTION A–A



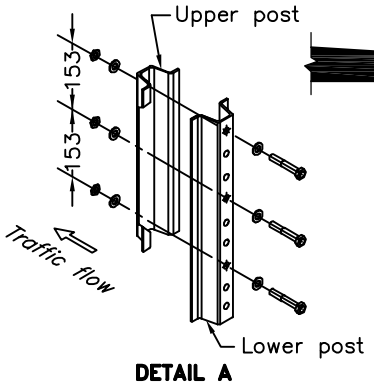

SECTION B–B



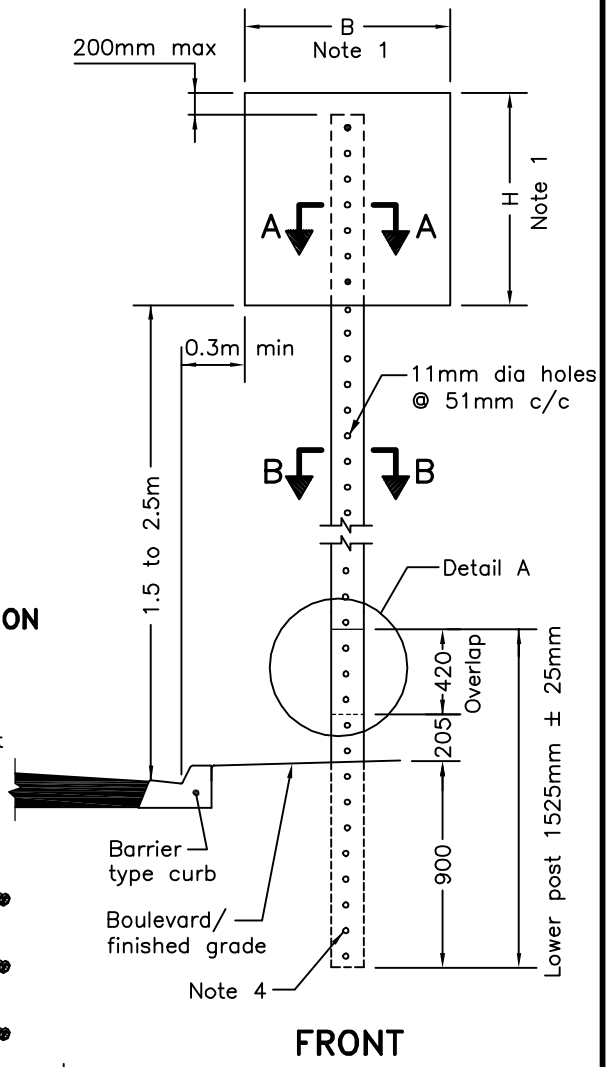




OVERLAP SECTION

## HOT FORMED STEEL POST DETAILS, Note B and D




DETAIL A




FRONT

## NOTES:

1 Sign dimensions shall be selected up to maximum sign width (B) of 90cm, up to maximum sign height (H) of 90cm, and the total sign area including tabs shall not exceed 0.56 square metres.

2 Tolerance shall be ± 1.6mm.

3 Tolerance for thickness shall be ± 0.38mm. All other tolerances shall be ± 0.8mm.

4 Holes below grade in lower post shall be optional.

A This system may be installed on low speed roadways with barrier type curb and posted speeds less than 70 km/h.

B Posts shall be manufactured from either cold formed steel or hot formed steel.

C Cold formed steel shall have a minimum yield strength of 345 MPa and weigh a minimum of 3.36 kg/m.

D Hot formed steel shall have a minimum yield strength of 380 MPa and weigh a minimum of 3.02 kg/m.

E Post and hardware shall be hot dip galvanized after fabrication.

F All dimensions are in millimetres unless otherwise shown.

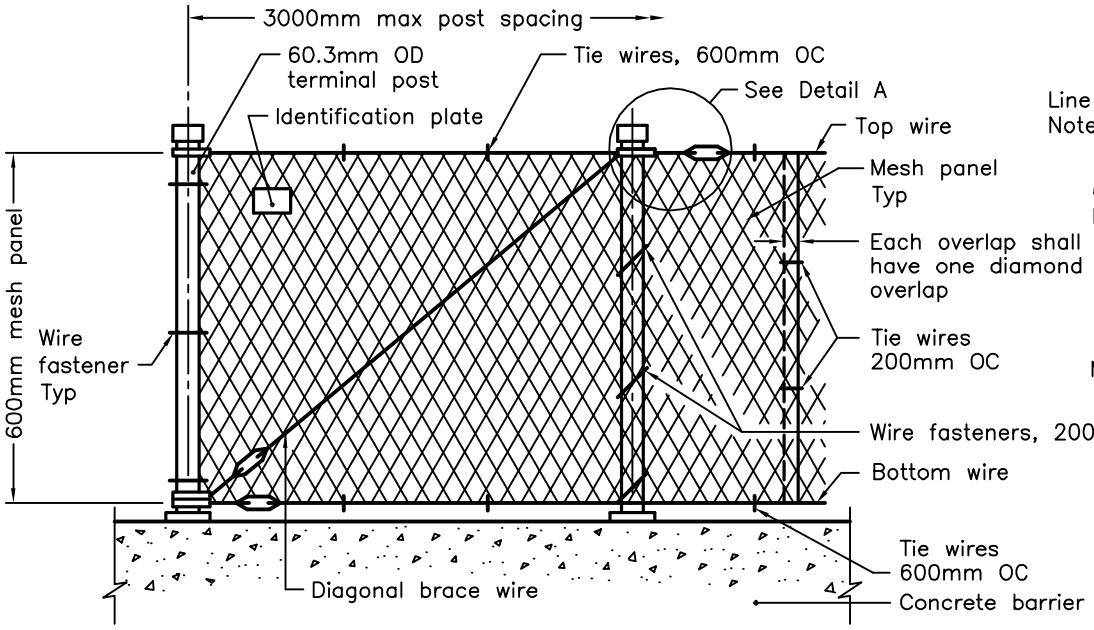
ONTARIO PROVINCIAL STANDARD DRAWING

# SMALL SIGN SUPPORT SYSTEM
# NON–BREAKAWAY U–FLANGE POST SYSTEM
# INSTALLATION–SINGLE POST ASSEMBLY

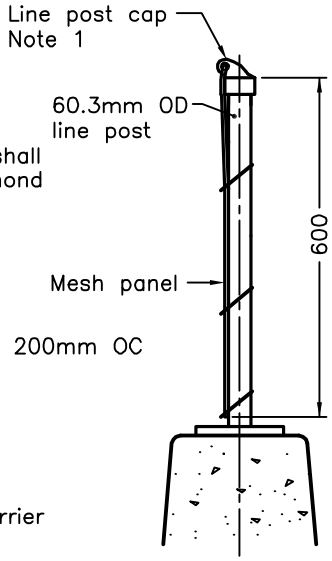
Nov 2014 | Rev 1

ONTARIO STANDARDS MUNICIPAL–PROVINCIAL

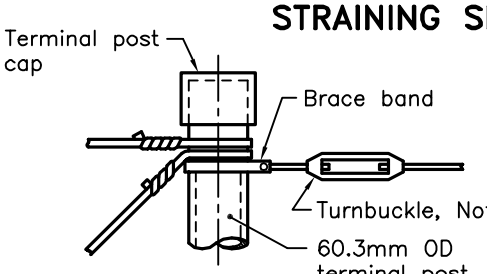
OPSD 990.110



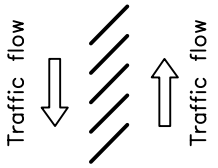

## STRAINING SECTION DETAIL



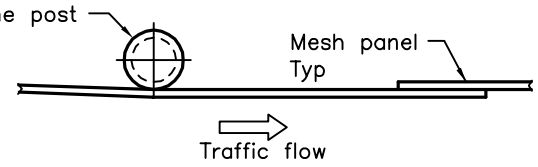

## LINE POST DETAIL



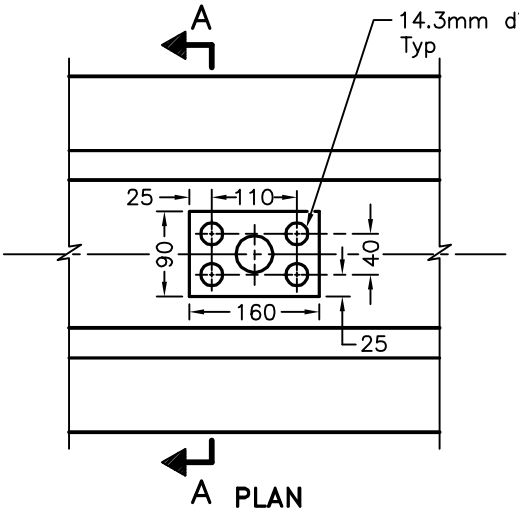

## DETAIL A



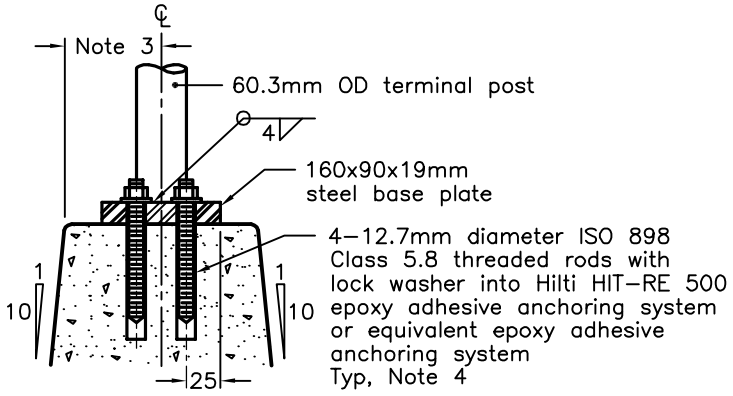

## MESH PANEL OPENINGS ORIENTATION




## OVERLAP DETAIL




PLAN



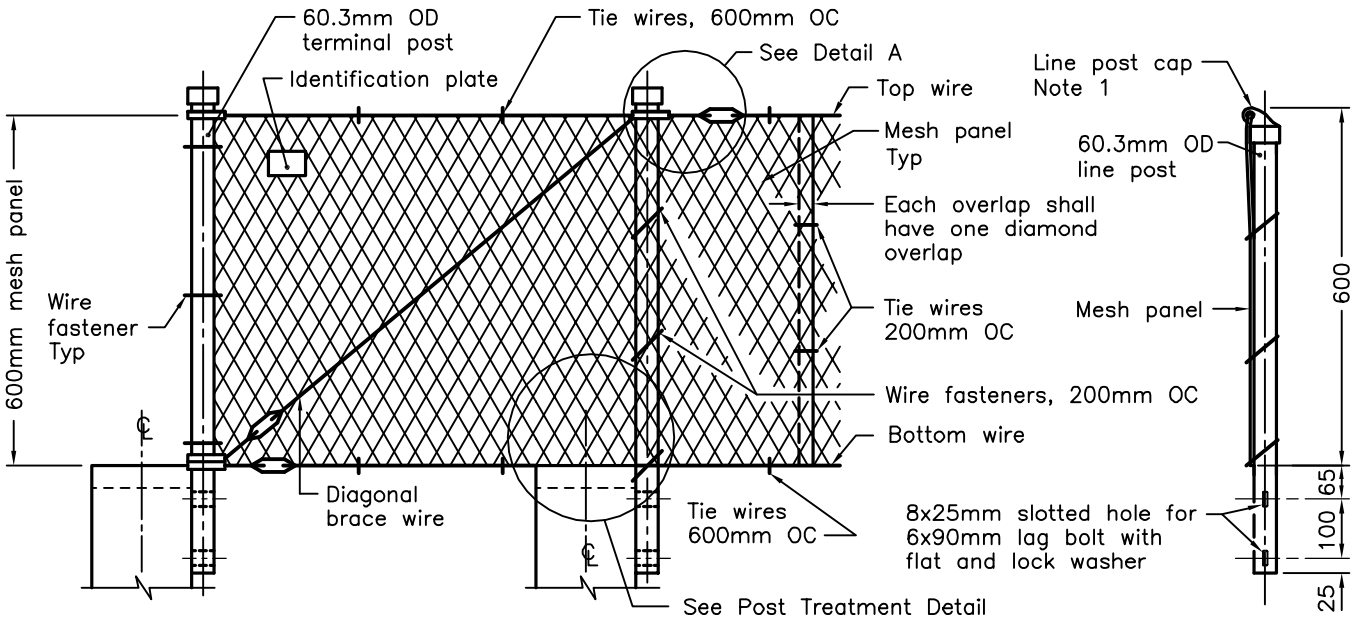

SECTION A–A

## ANCHORAGE DETAIL

NOTES:

1 For line post cap detail refer to OPSD 972.132.
2 Turnbuckles shall be installed on diagonal brace wires and top and bottom wires, at intervals of 150m maximum and at terminal posts.
3 Posts shall be located on centreline of concrete barrier.
4 Anchors shall be installed according to manufacturer's specifications.
A All dimensions are in millimetres unless otherwise shown.

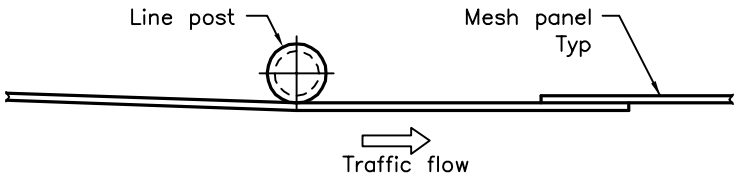
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 3 |
|---|---|---|---|
| EXPANDED METAL ANTI–GLARE SCREEN INSTALLATION – CONCRETE BARRIER | | | |
| | OPSD 991.130 | | |



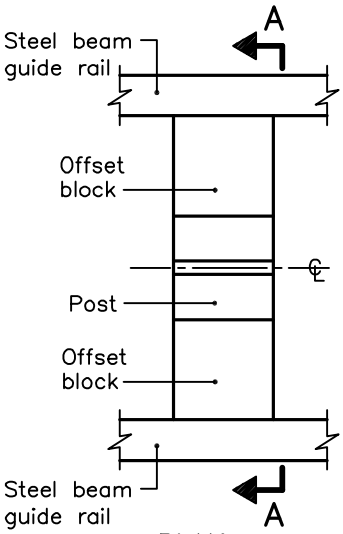

## STRAINING SECTION DETAIL

STEEL BEAM GUIDE RAIL NOT SHOWN FOR CLARITY

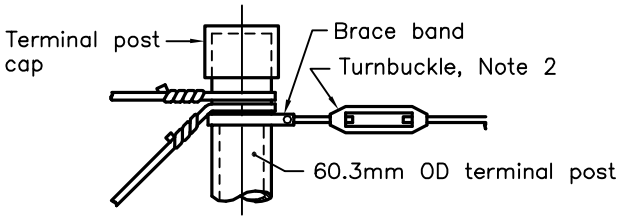
## LINE POST DETAIL



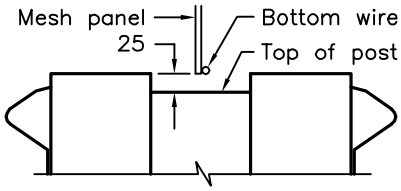

## OVERLAP DETAIL




PLAN

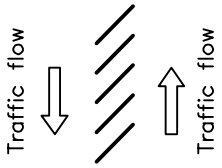



## DETAIL A




SECTION A–A

## POST TREATMENT DETAIL




## MESH PANEL OPENINGS ORIENTATION

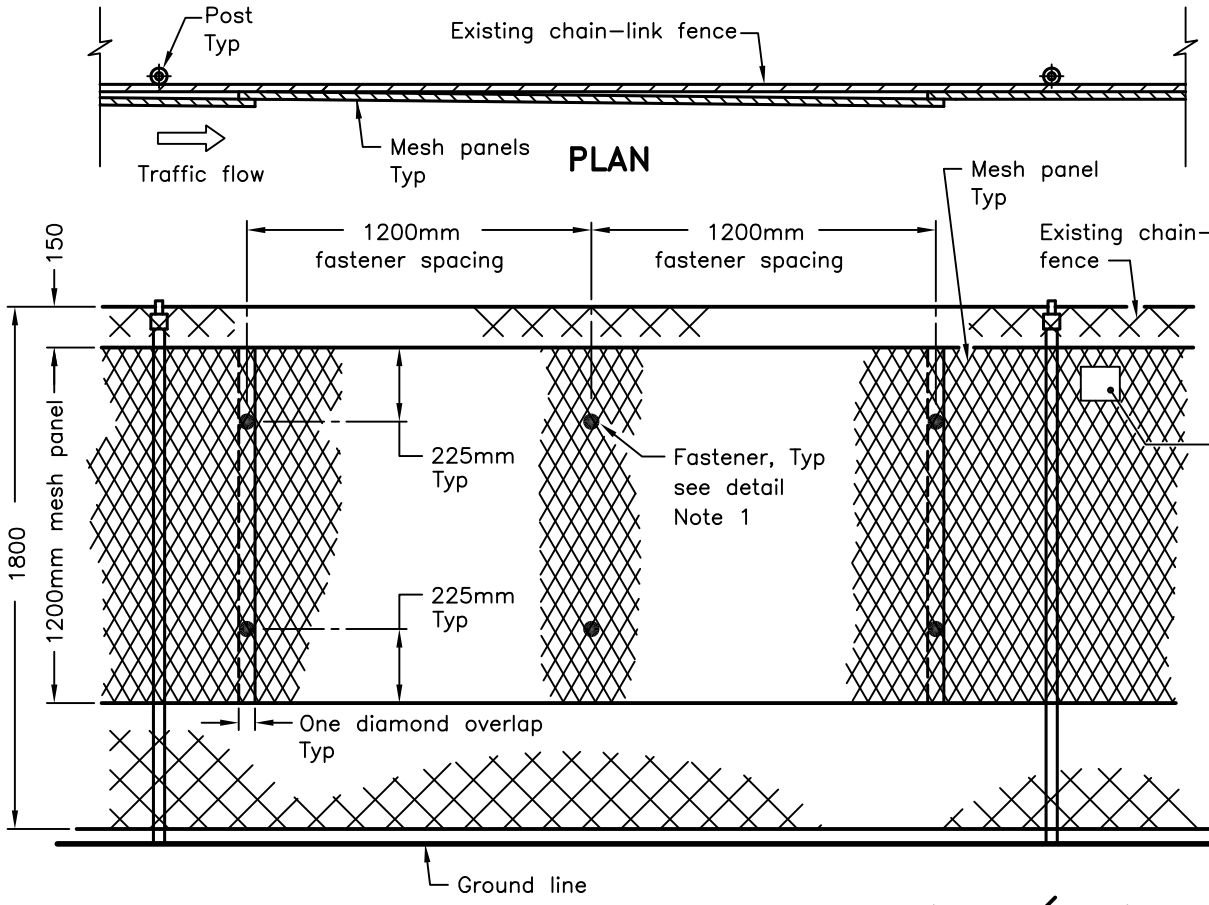
NOTES:

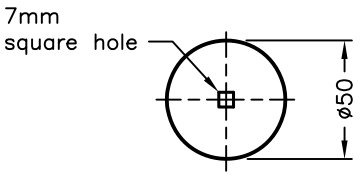
1 For line post cap detail refer to OPSD 972.132.

2 Turnbuckles shall be installed on diagonal brace wires and top and bottom wires, at intervals of 150m maximum and at terminal posts.

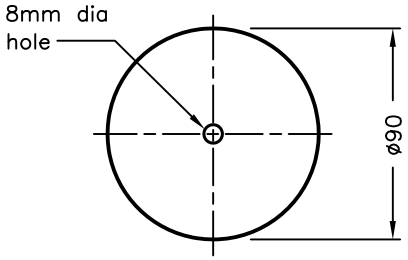
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 3 |
|---|---|---|---|
| EXPANDED METAL ANTI–GLARE SCREEN INSTALLATION – STEEL BEAM GUIDE RAIL WITH WOODEN POST | | | |
| | OPSD 991.131 | | |

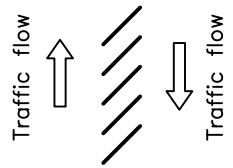


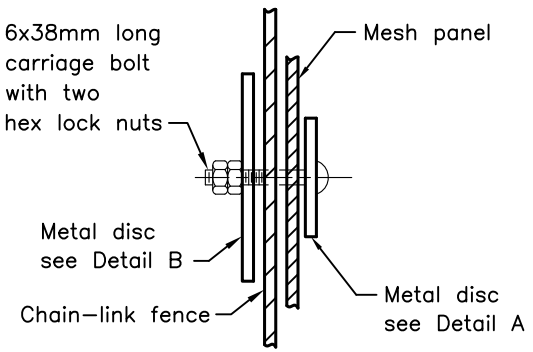

DETAIL A




DETAIL B




MESH PANEL
OPENINGS ORIENTATION



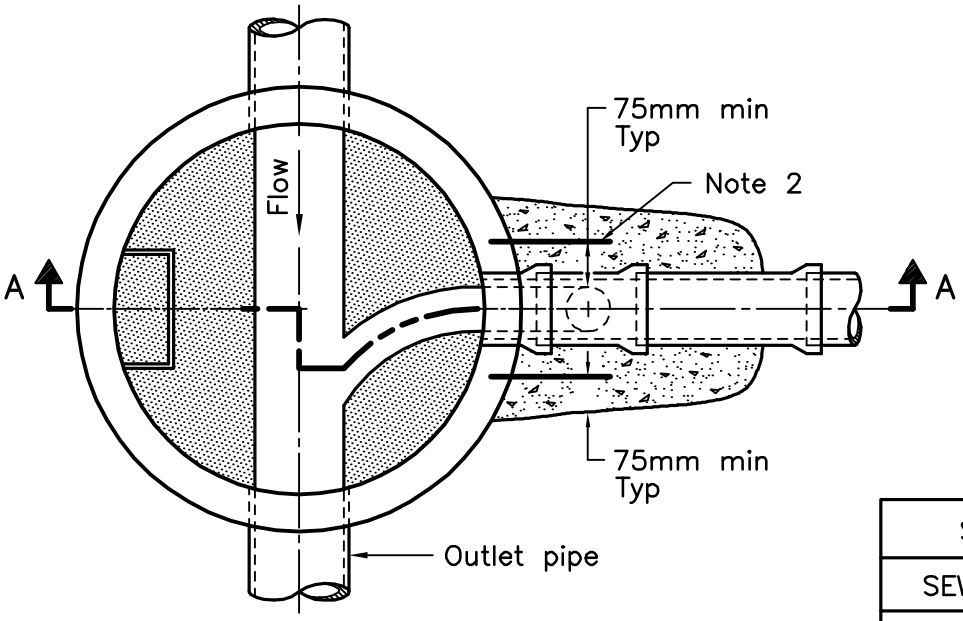

FASTENER DETAIL

NOTES:

1 Fasteners shall be installed so that the hex nuts are on the highway side of fence.

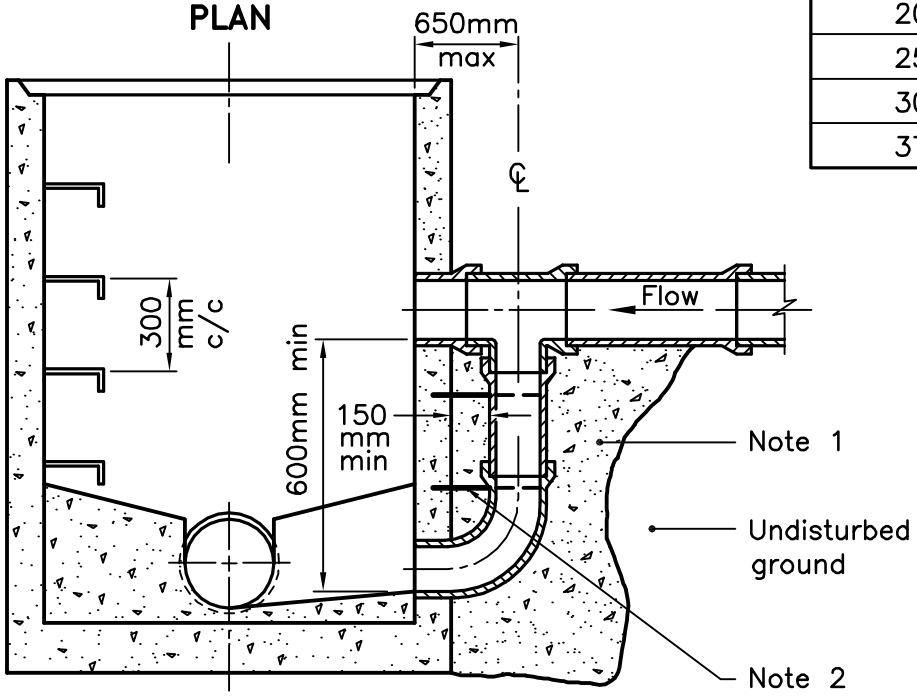
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| EXPANDED METAL ANTI–GLARE SCREEN INSTALLATION – CHAIN–LINK FENCE | | | |
| | OPSD 991.132 | | |




PLAN

| SIZE OF DROP PIPE | |
|---|---|
| SEWER ID | DROP PIPE ID |
| 200 | 200 |
| 250 | 200 |
| 300 | 250 |
| 375 | 300 |




SECTION A–A

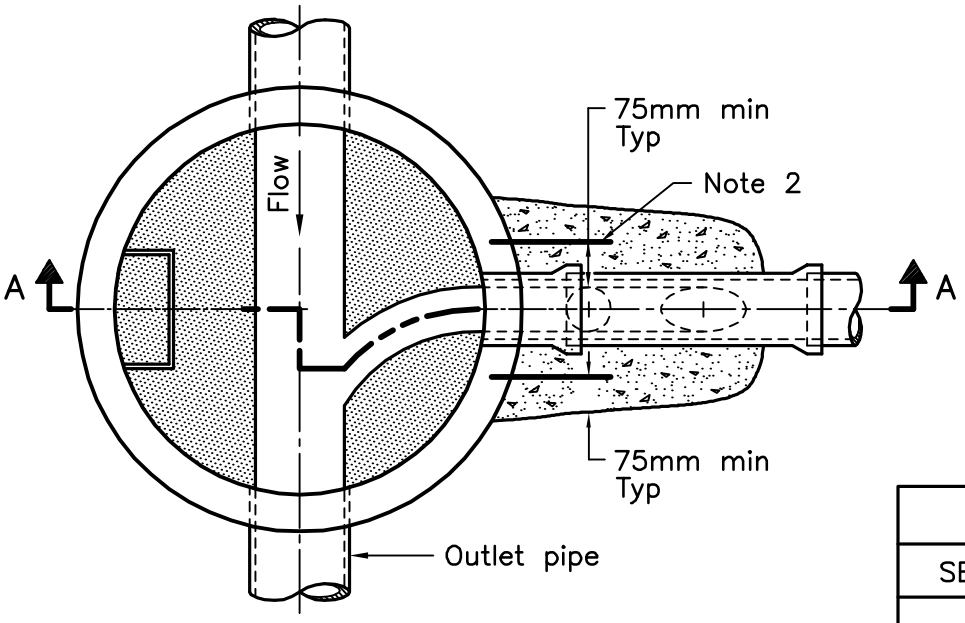
NOTES:

1 Concrete shall be placed to undisturbed ground and the outside face of the maintenance hole, but there shall be a minimum of 150mm of 15MPa concrete around the drop pipe.

2 Concrete shall be secured to the maintenance hole with 450mm long, 13mm diameter threaded rods and drilled expansion anchors down either side of the drop pipe at 300mm centres.

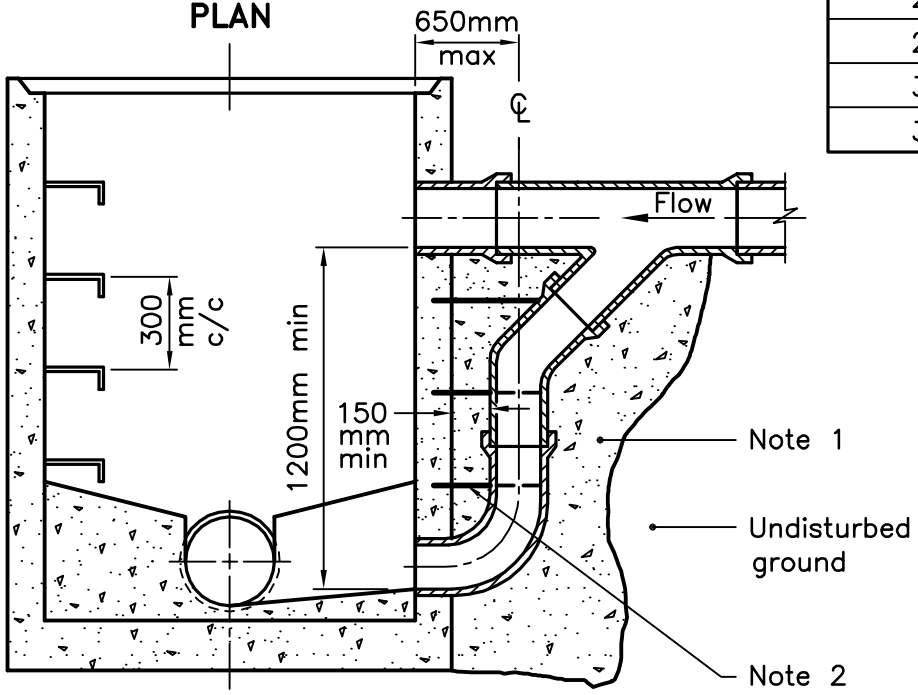
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 2 |
|---|---|---|---|
| CAST–IN–PLACE MAINTENANCE HOLE DROP STRUCTURE TEE | | | |
| | | | OPSD 1003.010 |




PLAN

| SIZE OF DROP PIPE | |
|---|---|
| SEWER ID | DROP PIPE ID |
| 200 | 200 |
| 250 | 200 |
| 300 | 250 |
| 375 | 300 |




SECTION A–A

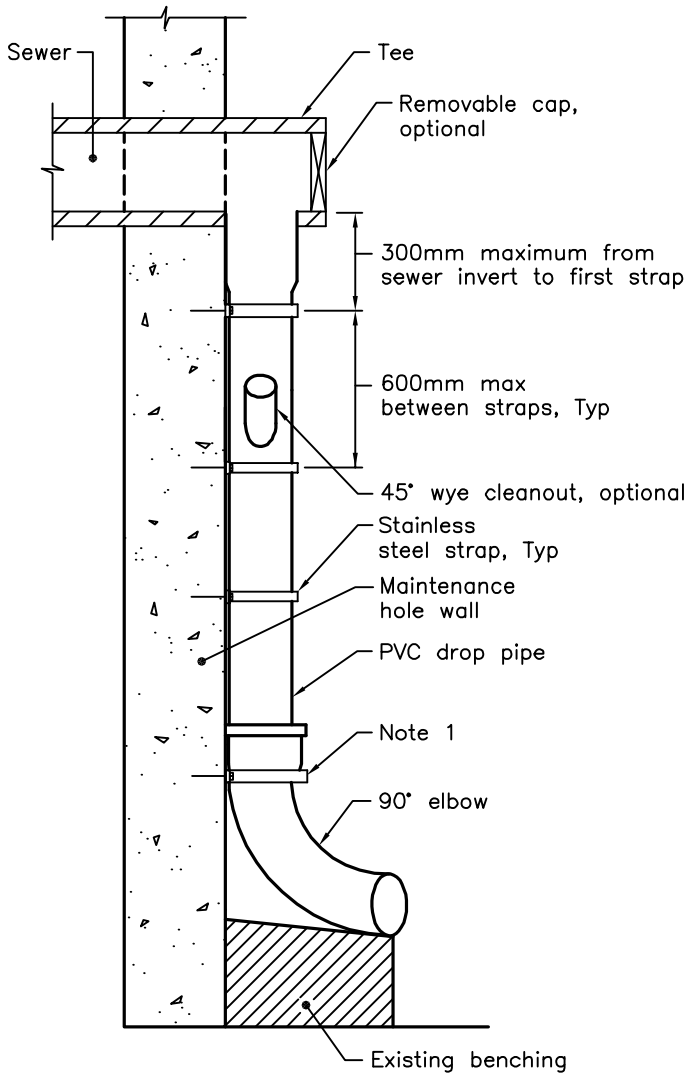
NOTES:

1 Concrete shall be placed to undisturbed ground and the outside face of the maintenance hole, but there shall be a minimum of 150mm of 15MPa concrete around the drop pipe.

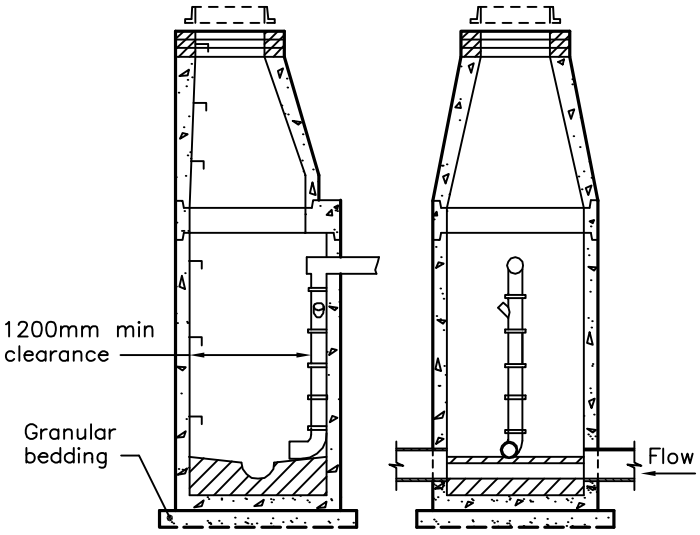
2 Concrete shall be secured to the maintenance hole with 450mm long, 13mm diameter threaded rods and drilled expansion anchors down either side of the drop pipe at 300mm centres.

A All dimensions are in millimetres unless otherwise shown.

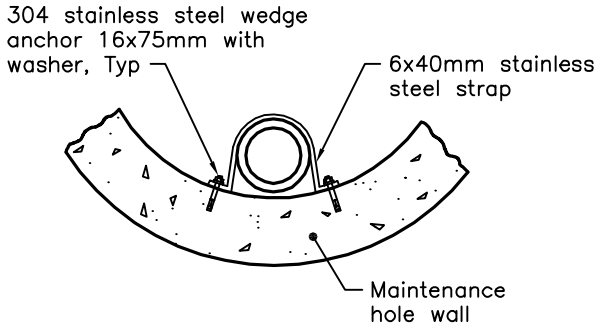
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 2 |
|---|---|---|---|
| CAST–IN–PLACE MAINTENANCE HOLE DROP STRUCTURE WYE | | | |
| | OPSD 1003.020 | | |




## INTERNAL DROP STRUCTURE DETAIL




## MAINTENANCE HOLE IN SECTION




## FASTENER DETAIL

NOTES:

1 At the elbow, a stainless steel strap is required at bottom of bell.

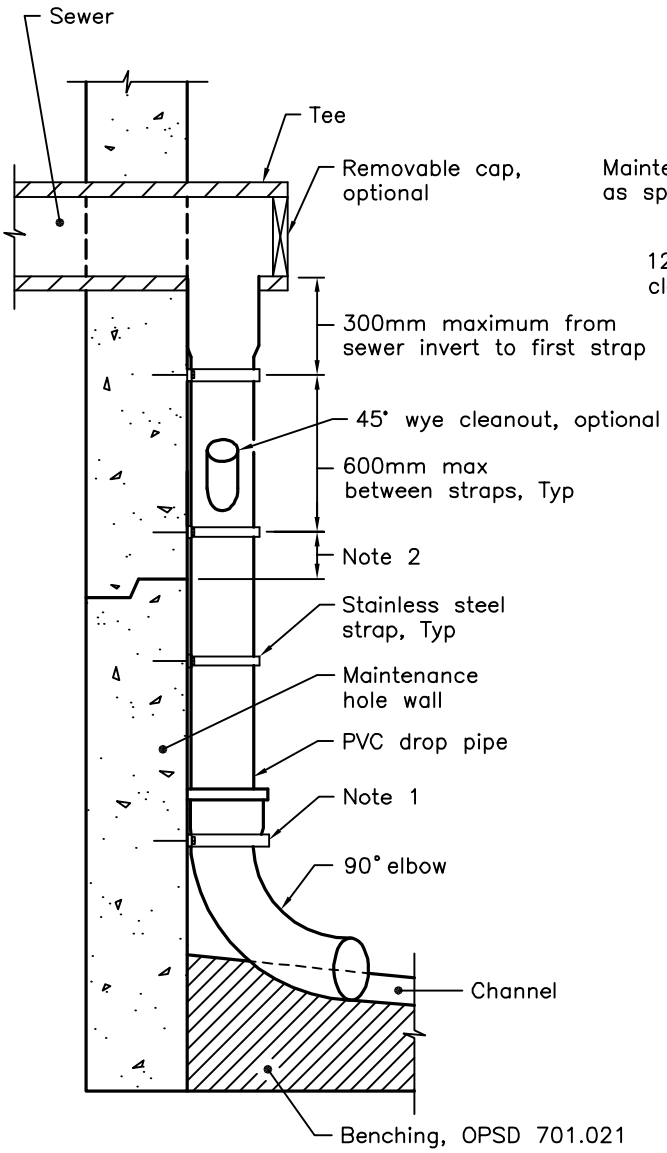
A Internal drop structure shall be used on existing maintenance holes 1500mm diameter and larger with a minimum height of 600mm from the inlet pipe invert to the top of benching. The existing benching shall be modified as required.

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.

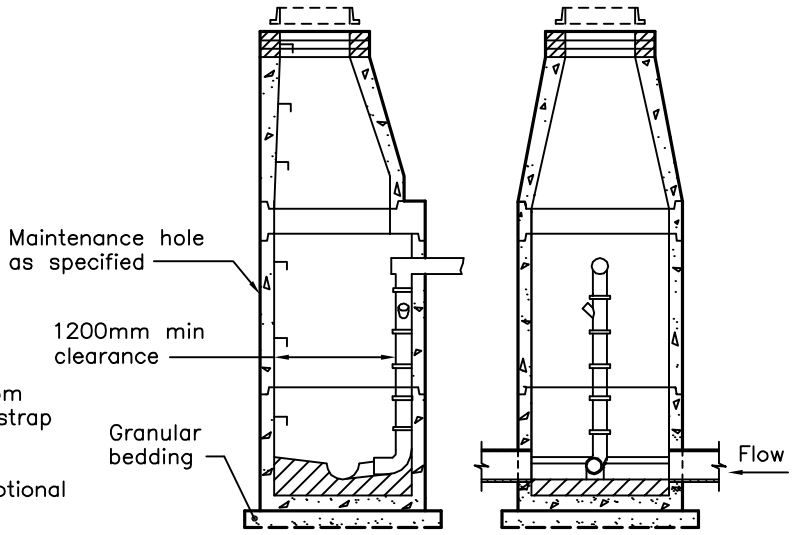
C Straps shall not be placed within 150mm of any maintenance hole section joint.

D All dimensions are in millimetres unless otherwise shown.

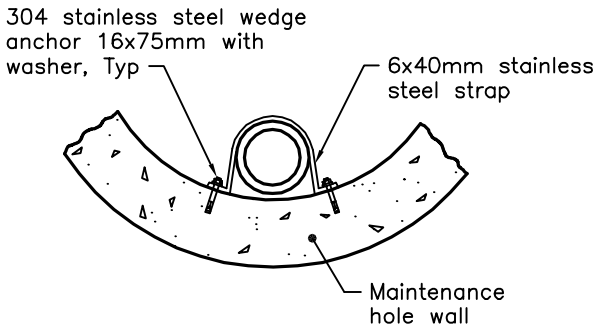
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| INTERNAL DROP STRUCTURE FOR EXISTING MAINTENANCE HOLES | | | |
| | OPSD 1003.030 | | |




## INTERNAL DROP STRUCTURE DETAIL




## MAINTENANCE HOLE IN SECTION




## FASTENER DETAIL

NOTES:

1 At the elbow, a stainless steel strap is required at bottom of bell.

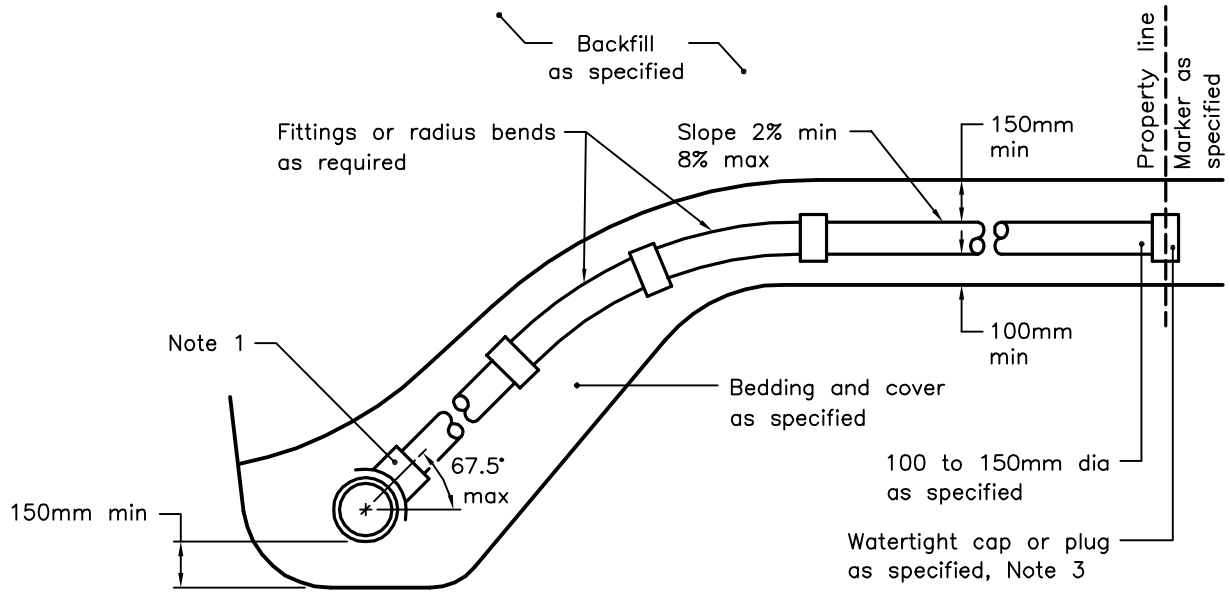
2 Straps shall not be placed within 150mm of any maintenance hole section joint.

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.

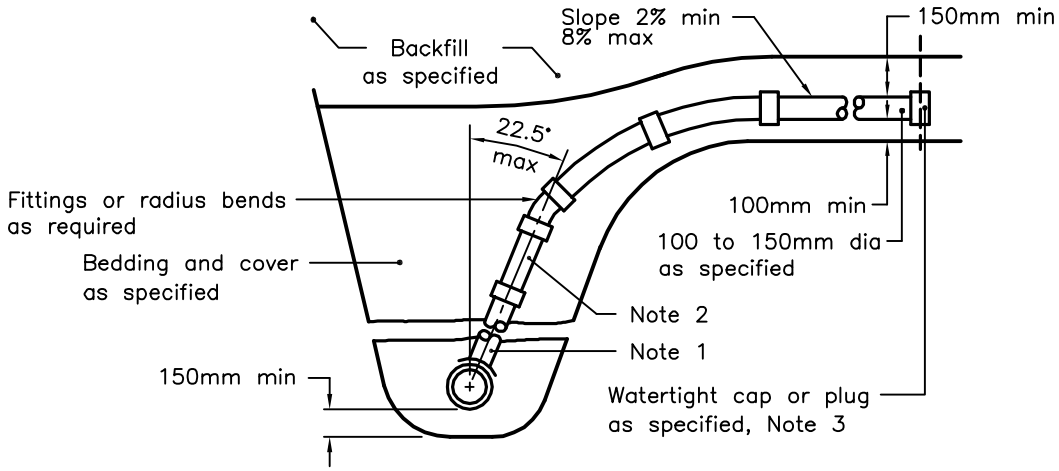
B Drop pipe shall be one size smaller than the incoming sewer with a minimum 150mm diameter and maximum of 375mm diameter. A maximum of 300mm diameter for 1500mm maintenance holes.

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 | | |




## CONNECTION WITHOUT VERTICAL RISER




## CONNECTION WITH VERTICAL RISER

NOTES:

1 Sewer service connections to the main pipe sewer shall be made using factory made tees, strap–on–saddles, or other approved saddles.

2 Vertical risers shall be as specified.

3 Cap or plug at property line shall be adequately braced.

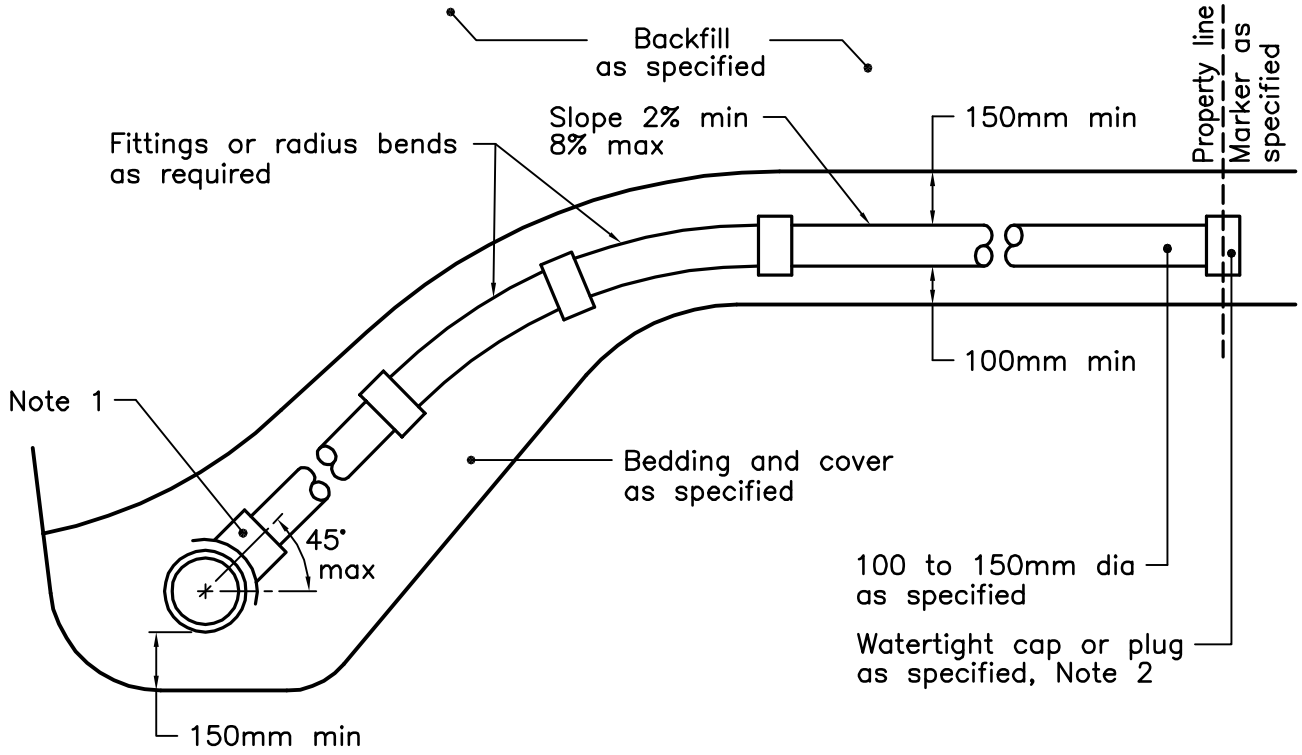
A Maintenance holes shall be used at the main sewer to connect service connections greater than or equal to 200mm.

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 RIGID MAIN PIPE SEWER | | | |
| | OPSD 1006.010 | | |




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.

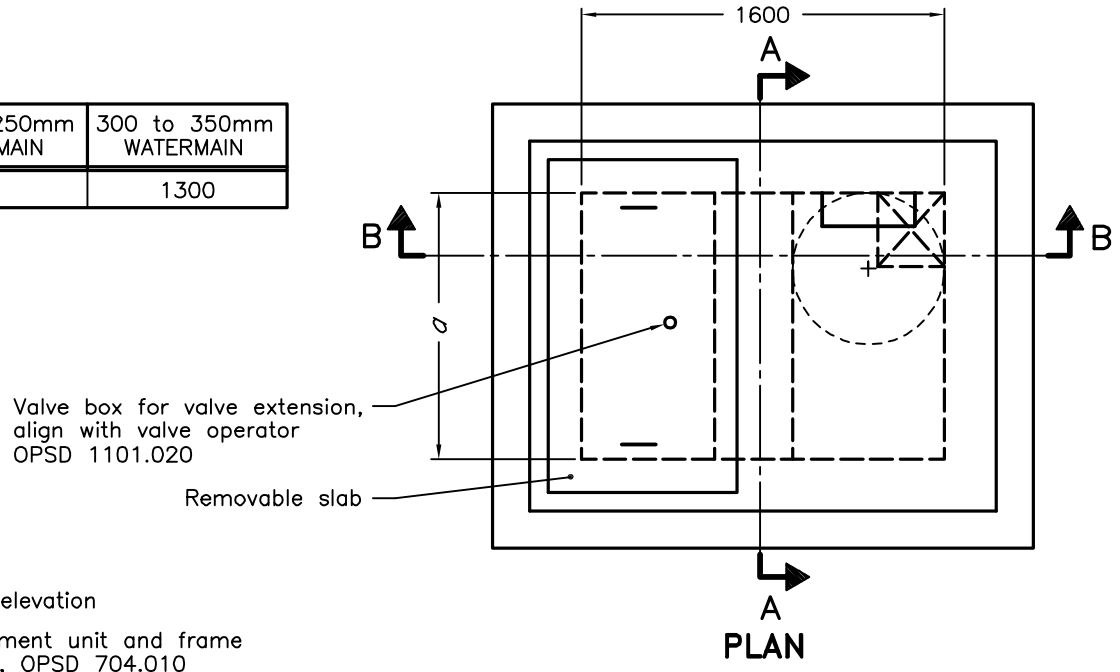
B For new construction, saddles shall be installed on the main pipe before that pipe is laid.

C Approved cut–in tool shall be used for field made connections.

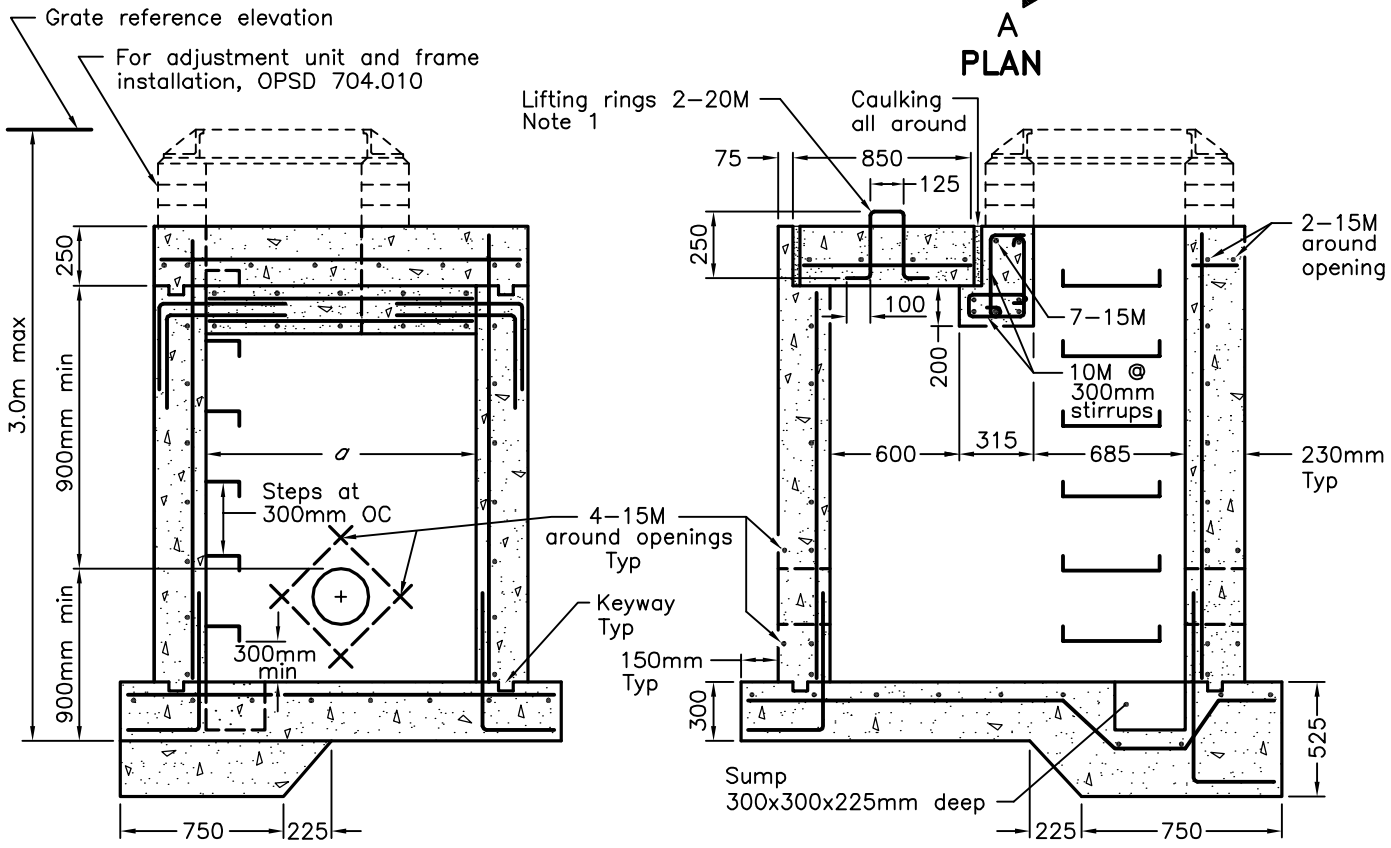
D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 2 |
|---|---|---|---|
| SEWER SERVICE CONNECTIONS FOR FLEXIBLE MAIN PIPE SEWER | | | |
| | OPSD 1006.020 | | |

| | 100 to 250mm WATERMAIN | 300 to 350mm WATERMAIN |
|---|---|---|
| a | 1100 | 1300 |




PLAN




SECTION A–A

SECTION B–B

NOTES:

1 Exposed portion of lift rings shall be coated with heavy asphalt paint prior to backfilling operations.

A Reinforcement shall have 50mm minimum cover.

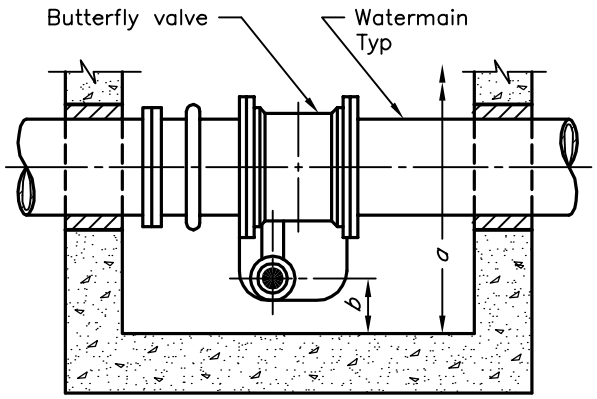
B All steel reinforcement shall be 15M at 300mm unless otherwise shown.

C This OPSD shall be read in conjunction with OPSD 1100.011.

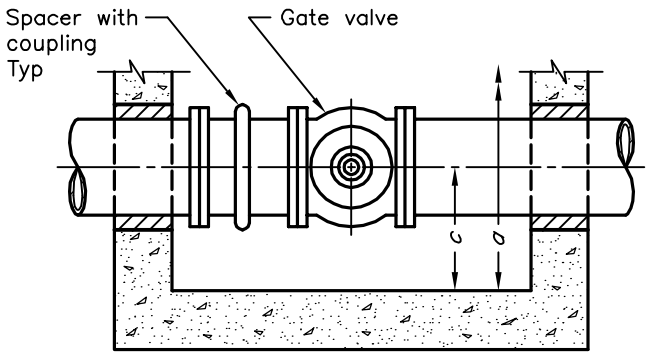
D Joint around removable slab shall be sealed as specified.

E All dimensions are in millimetres unless otherwise shown.

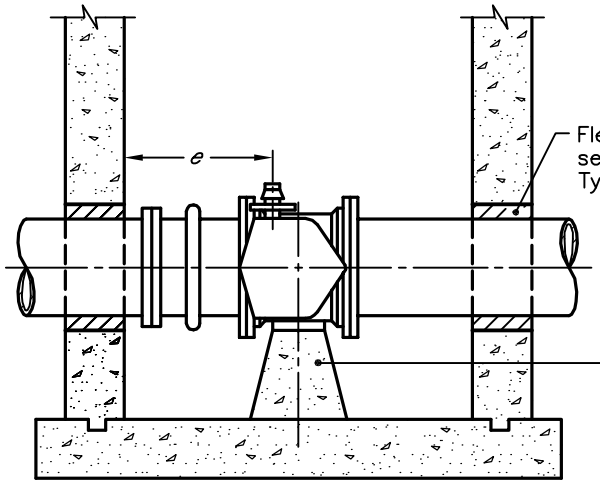
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 3 |
|---|---|---|---|
| CAST–IN–PLACE CHAMBER FOR VALVES UP TO 350mm DIAMETER | | | |
| | | | OPSD 1100.010 |



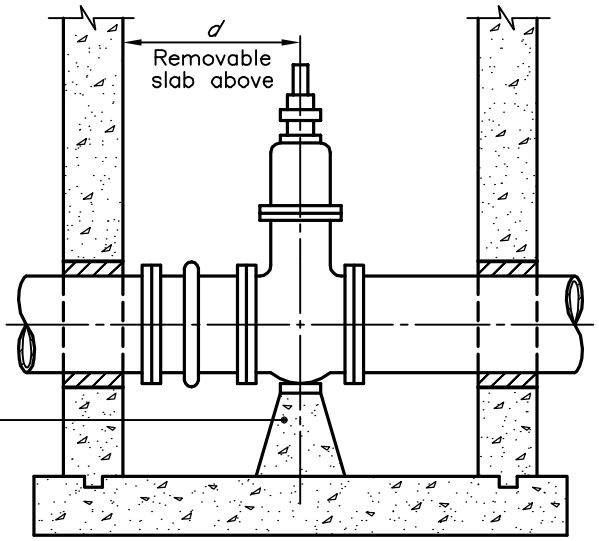

PLAN




PLAN




ELEVATION




ELEVATION

| | Pipe Diameter | |
|---|---|---|
| | 100 to 250mm | 300 to 350mm |
| *a* – Chamber Width | 1100 | 1300 |
| *b* | 300 | 300 |
| *c* | 550 | 650 |
| *d* | 450 | 450 |
| *e* | 550 | 550 |

NOTES:

A Bond breaker shall be used between the concrete and the fittings and appurtenances.

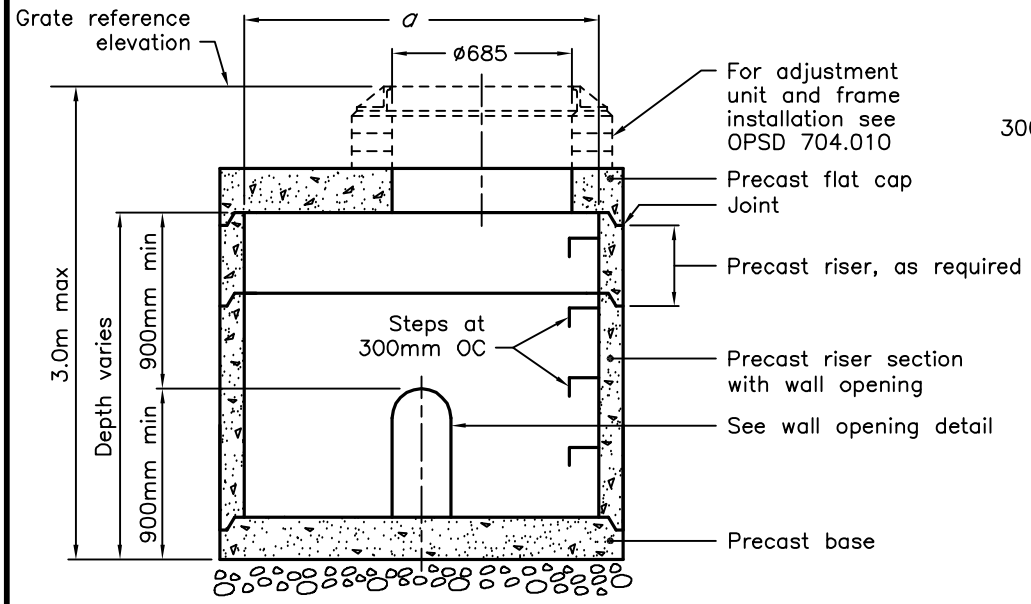
B Concrete support shall be minimum 200mm high.

C This OPSD shall be read in conjunction with OPSD 1100.010.

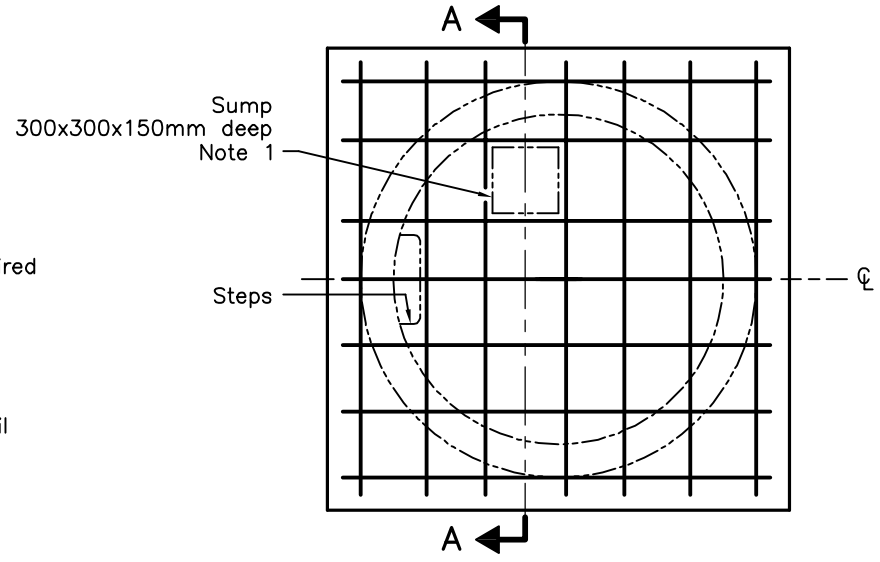
D All joints shall be restrained.

E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| PIPING LAYOUT FOR BUTTERFLY AND GATE VALVES UP TO 350mm DIAMETER IN CAST–IN–PLACE CHAMBERS | | | |
| | OPSD 1100.011 | | |

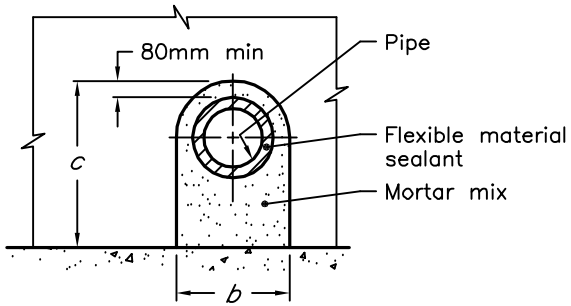



CROSS SECTION

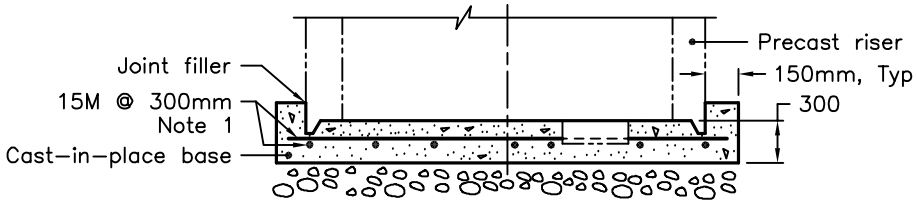



PLAN

CAST–IN–PLACE BASE




WALL OPENING DETAIL




SECTION A–A

| Dimension | Pipe diameter | |
|---|---|---|
| | 100 to 250mm | 300 to 350mm |
| *a* | ø1200 | ø1500 |
| *b* | 400 | 550 |
| *c* | 600 | 750 |

NOTES:

1 Sump shall be placed to avoid associated appurtenances and step landing. Position steel reinforcement to maintain minimum 50mm cover at sump.

A This OPSD shall be read in conjunction with OPSD 701.030, 701.031, 701.032, 701.041, and 703.011.

B Bond breaker shall be used between the concrete and the fittings and appurtenances.

C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

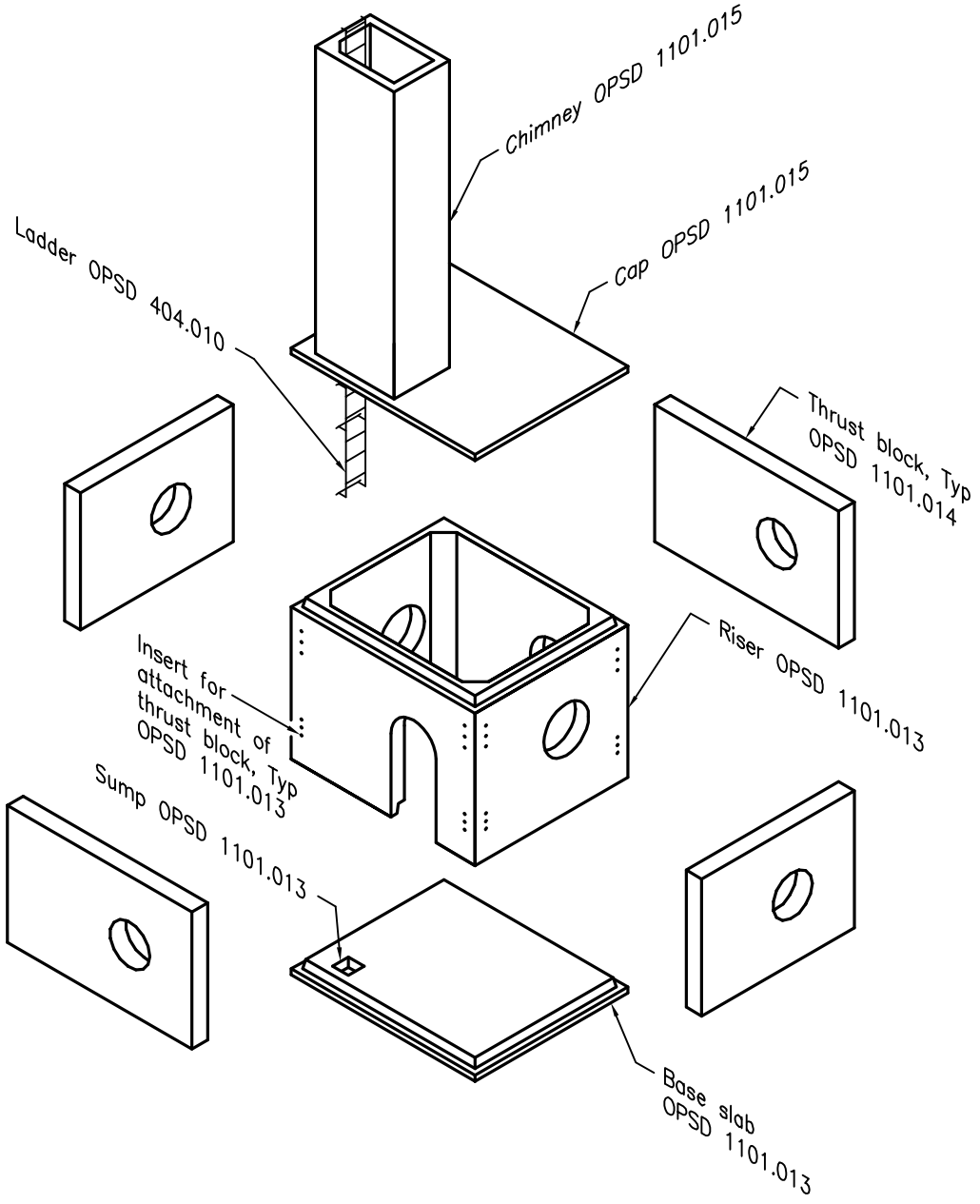
# PRECAST VALVE CHAMBER

1200mm AND 1500mm DIAMETER

Nov 2015 | Rev 4

ONTARIO STANDARDS · MUNICIPAL–PROVINCIAL · O P S

OPSD 1101.010




NOTES:

A Design according to CAN/CSA S6 and Ministry of Transportation of Ontario Structural Manual, Division 1, for maximum 4.0m of earth cover.

B The valve chamber may be buoyant. Measures required to counteract buoyancy shall be as specified.

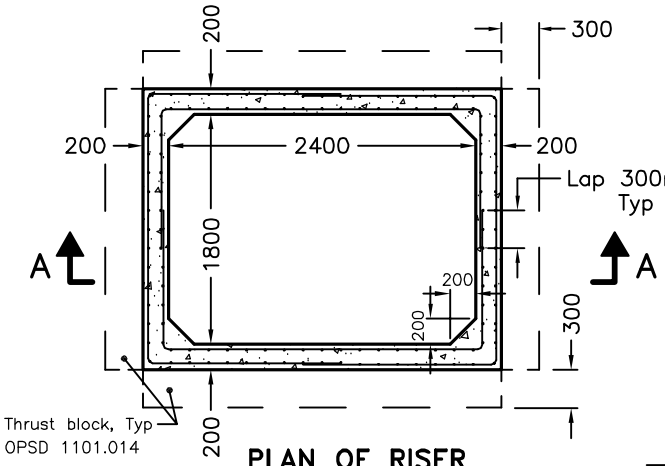
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

D Standing water shall not be allowed to accumulate during construction to within 1.6m of top of chamber when chamber is not backfilled to grade.

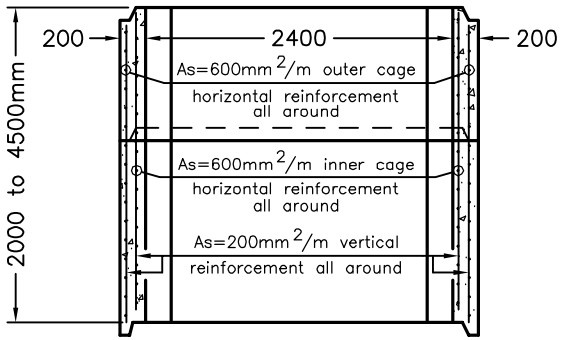
E Thrust blocks designed for a water pressure of 0.86 MPa and a maximum watermain size of 600mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides as specified.

F All dimensions are in millimetres unless otherwise shown.

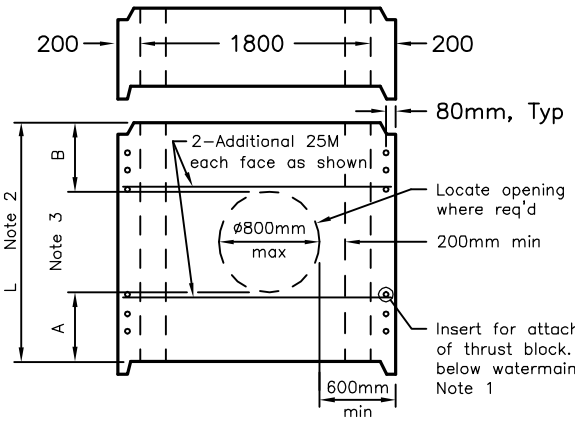
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev 2 | ONTARIO STANDARDS MUNICIPAL-PROVINCIAL |
|---|---|---|---|
| PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 1800 x 2400mm COMPONENTS | | | |
| | | | OPSD 1101.012 |



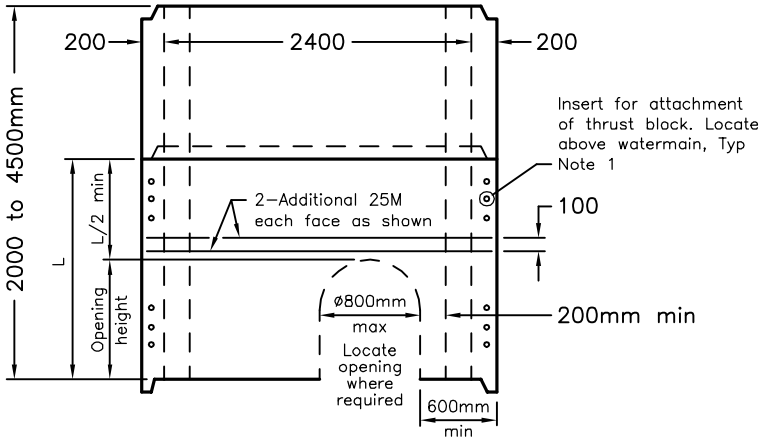

PLAN OF RISER



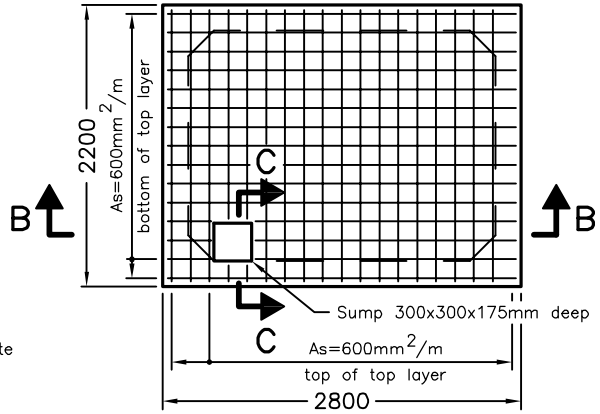

SECTION A–A



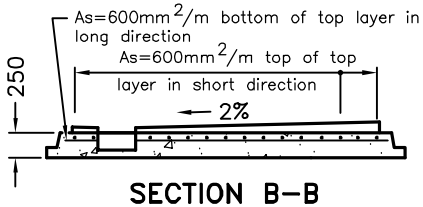

VIEW OF SIDES WITH CIRCULAR OPENING



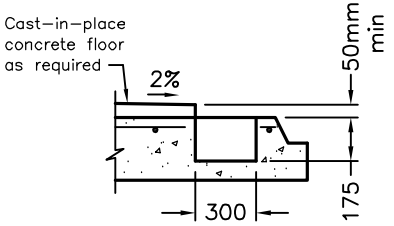

VIEW OF SIDES WITH SLOTTED OPENING




PLAN OF BASE




SECTION B–B




SECTION C–C

## NOTES:

1 Threaded inserts for the attachment of thrust blocks shall be 15M equivalent with strength of 125% of yield strength of coupled rebar. For location and number of inserts see OPSD 1101.014.

2 If no opening in a single riser, the height of that riser may be 2000 to 4500mm.

3 A+B shall be a minimum of L/2.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

B Main reinforcing shall be welded wire fabric, fy=500MPa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.

C Precast concrete strength shall be 40MPa.

D Clear cover to reinforcing in precast shall be a minimum of 40mm and a maximum of 50mm.

E This OPSD shall be read in conjunction with OPSD 1101.012, 1101.014, and 1101.015.

F All dimensions are nominal.

G All dimensions are in millimetres unless otherwise shown.

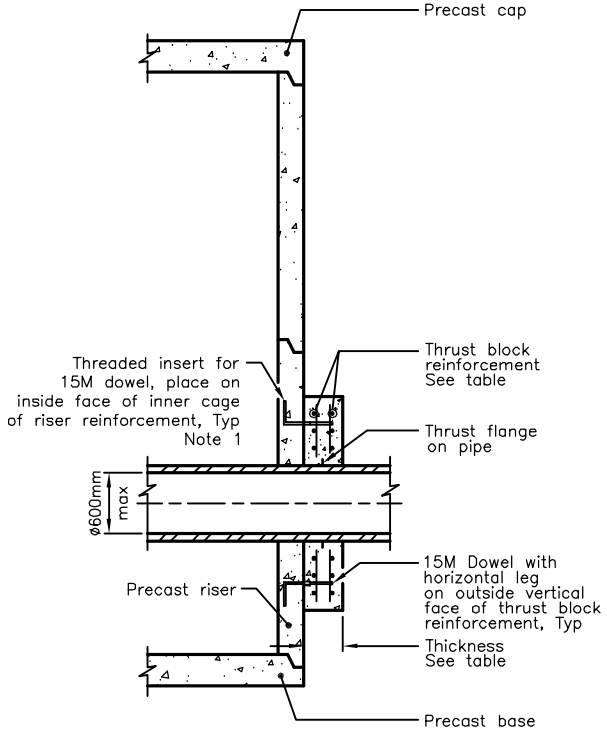
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 1800 x 2400mm RISER AND BASE

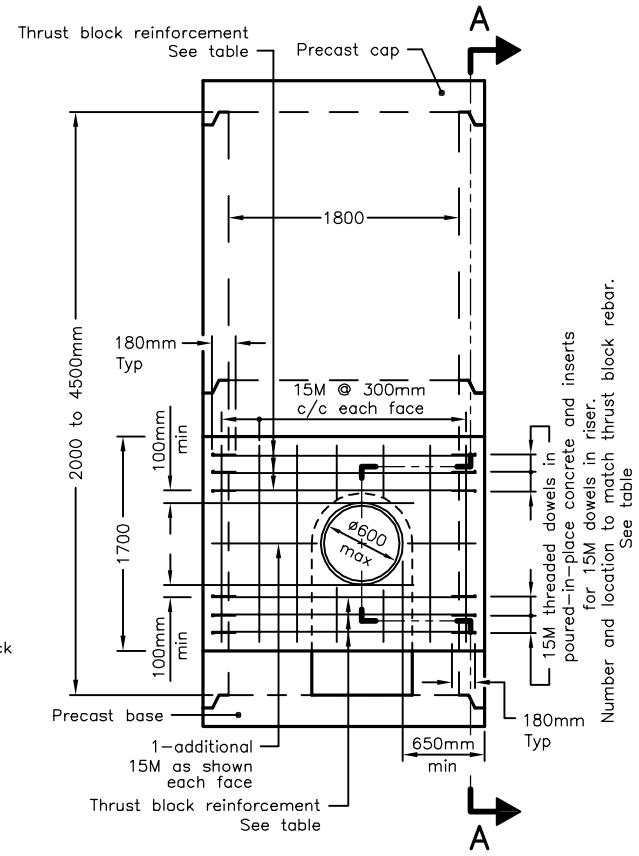
Nov 2013 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

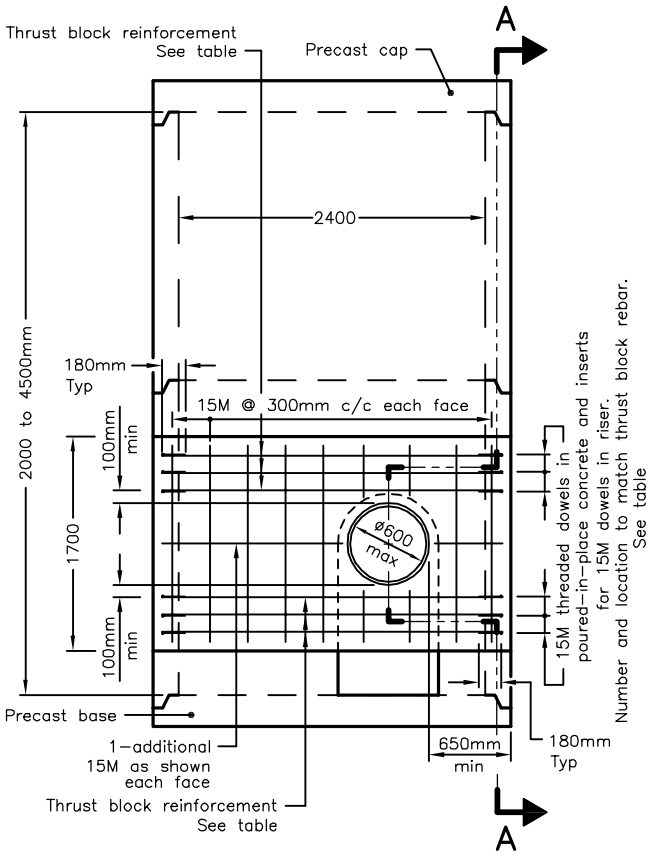
OPSD 1101.013




SECTION A–A




ELEVATION OF SHORT WALL THRUST BLOCK




ELEVATION OF LONG WALL THRUST BLOCK

## NOTES:

1 Threaded inserts for the attachment of thrust block shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

B Thrust blocks shall be poured–in–place concrete as specified.

C Thrust block concrete requirements are:
–Strength 30MPa
–Air content 5 to 7%
–Slump 70mm ±20mm.

D Clear cover to reinforcing steel:
–100mm ±25mm to bottom of thrust block
–70mm ±20mm to remainder of thrust block.

E This OPSD shall be read in conjunction with OPSD 1101.012, 1101.013, and 1101.015.

F All dimensions are in millimetres unless otherwise shown.

| Thrust Block Wall | Nominal Watermain Size | Thrust Block Thickness | Thrust Block Reinforcement |
|---|---|---|---|
| Long Wall | ≤ ø600 | 400 | 8–20M each face* |
| Short Wall | ≤ ø600 | 350 | 6–20M each face* |

* Other reinforcement as shown

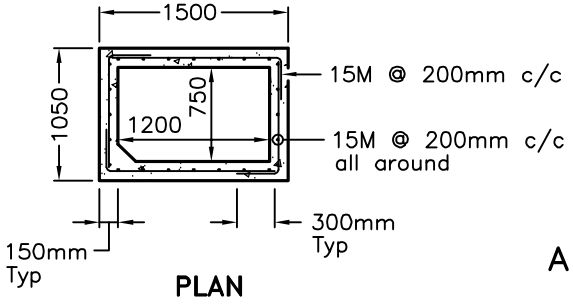
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 1800 x 2400mm THRUST BLOCKS

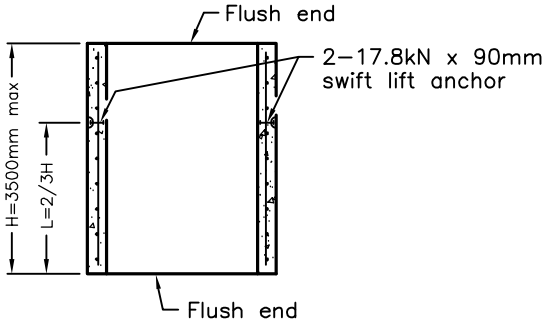
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

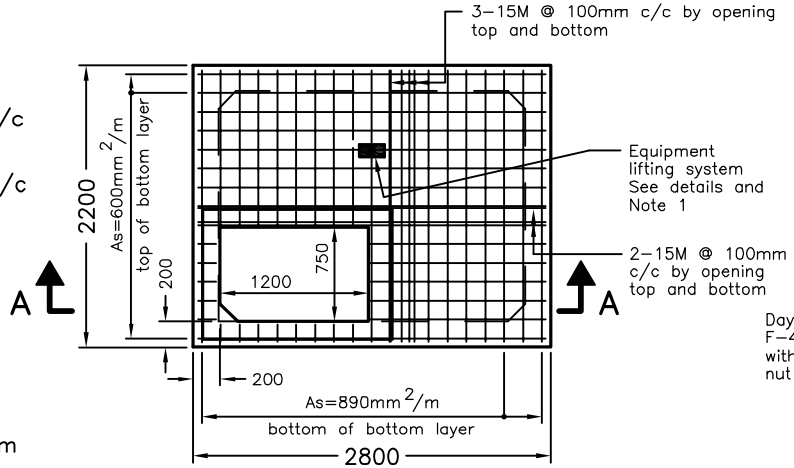
OPSD 1101.014



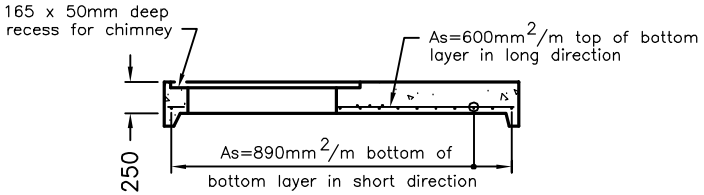

PLAN



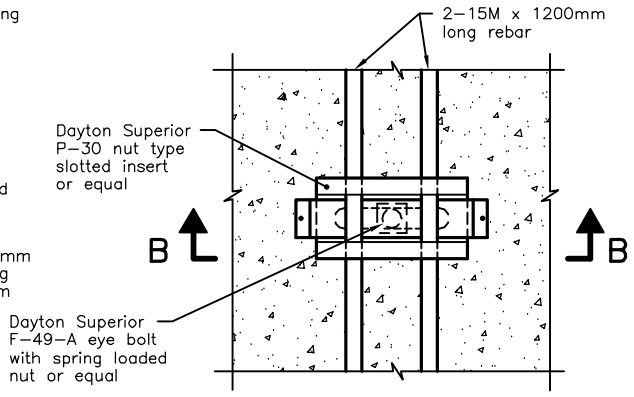

ELEVATION
CHIMNEY



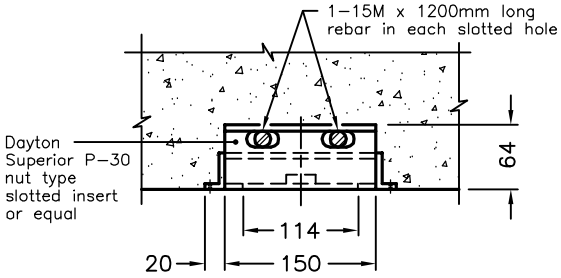

PLAN OF CAP



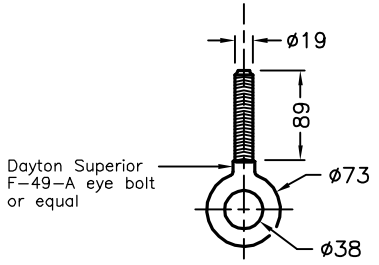

SECTION A–A




PLAN




SECTION B–B




EQUIPMENT LIFTING SYSTEM

## NOTES:

1 Equipment lifting system shall be installed on underside of precast concrete cap, when required.

A Precast concrete strength shall be 40MPa.

B Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

C Main reinforcing shall be welded wire fabric, fy=500Mpa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.

D Clear cover to reinforcing steel in precast shall be a minimum of 40mm and a maximum of 50mm.

E This OPSD shall be read in conjunction with OPSD 1101.012, 1101.013, and 1101.014.

F All dimensions are nominal.

G All dimensions are in millimetres unless otherwise shown.

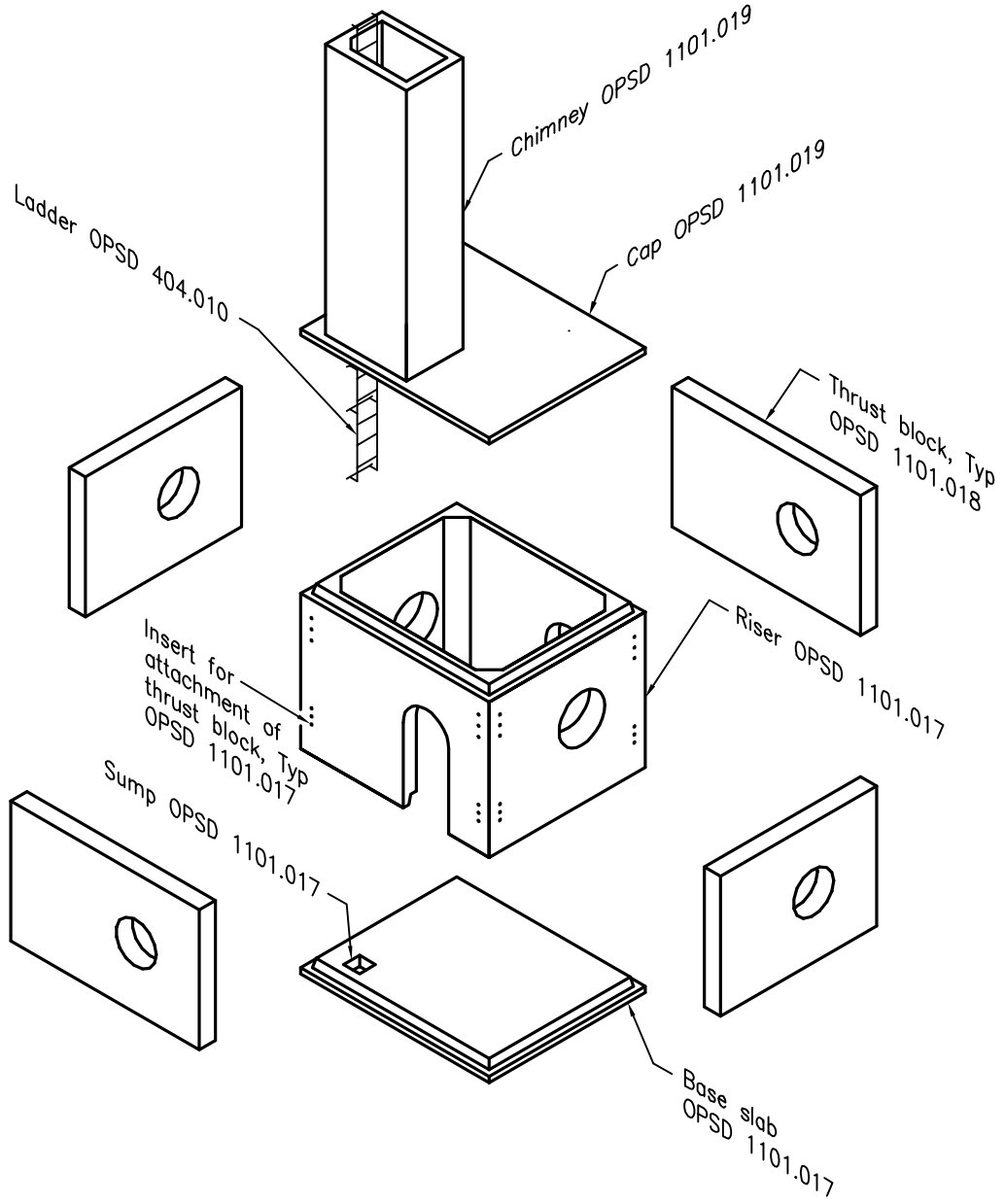
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 1800 x 2400mm CHIMNEY AND CAP

Nov 2013 | Rev 2

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL

OPSD 1101.015




NOTES:

A Design according to CAN/CSA S6 and Ministry of Transportation of Ontario Structural Manual, Division 1, for maximum 4.0m of earth cover.

B The valve chamber may be buoyant. Measures required to counteract buoyancy shall be as specified.

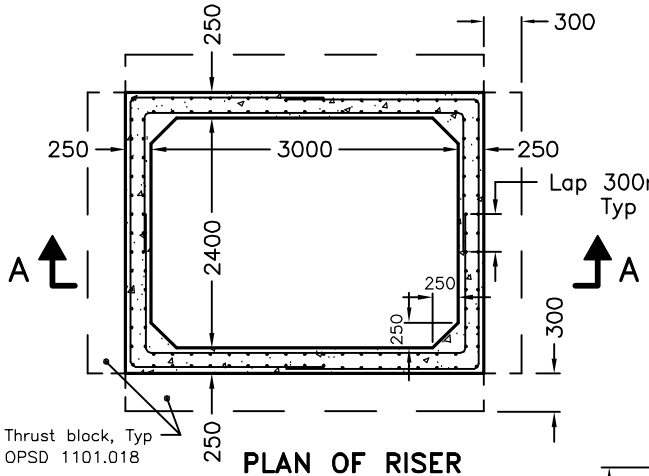
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

D Standing water shall not be allowed to accumulate during construction to within 1.7m of top of chamber when chamber is not backfilled to grade.

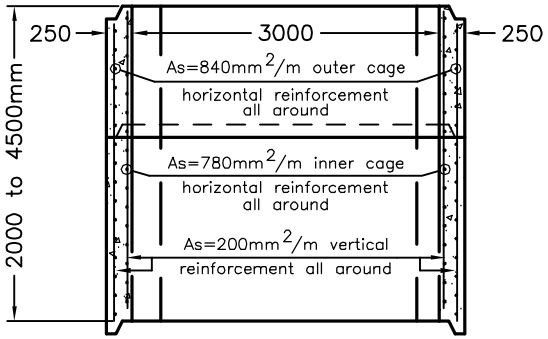
E Thrust blocks designed for a water pressure of 0.86 MPa and a maximum watermain size of 750mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides as specified.

F All dimensions are in millimetres unless otherwise shown.

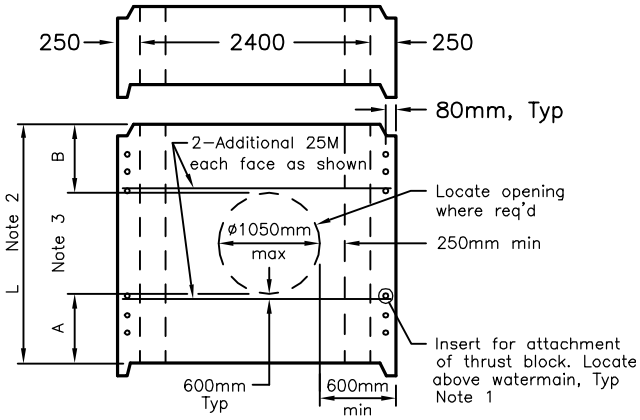
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 2400 x 3000mm COMPONENTS | | | |
| | OPSD 1101.016 | | |



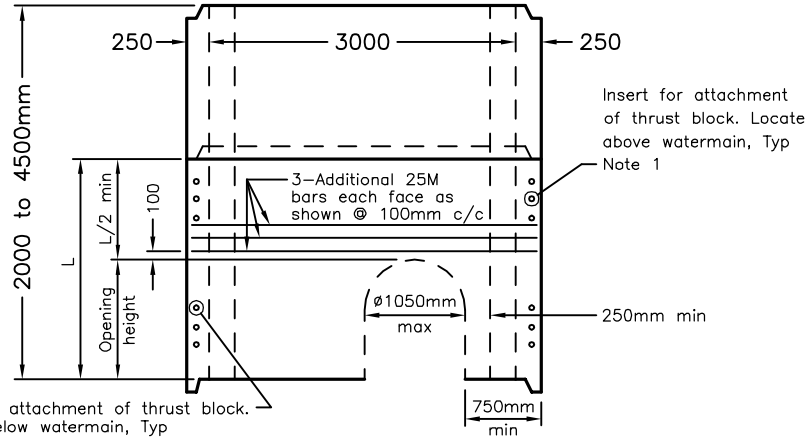

PLAN OF RISER



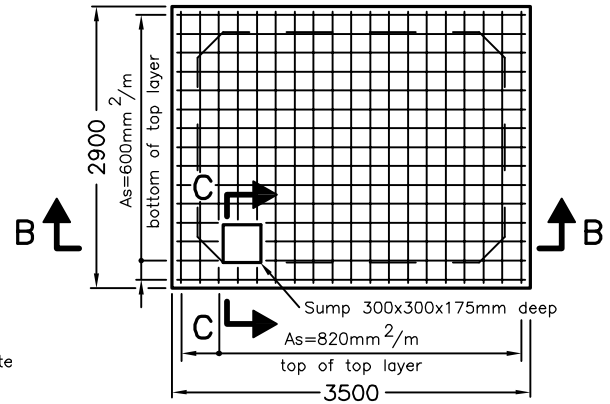

SECTION A–A



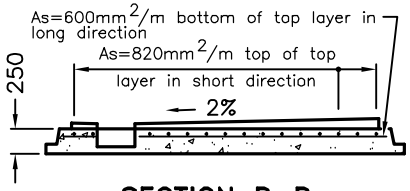

VIEW OF SIDES WITH CIRCULAR OPENING



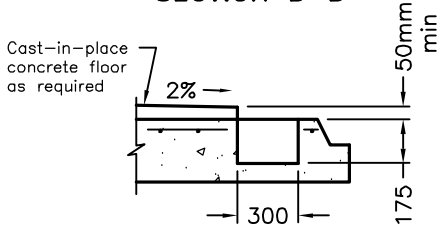

VIEW OF SIDES WITH SLOTTED OPENING




PLAN OF BASE




SECTION B–B




SECTION C–C

## NOTES:

1 Threaded inserts for the attachment of thrust blocks shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar. For location and number of inserts see OPSD 1101.018.
2 If no opening in a single riser, the height of that riser may be 2000 to 4500mm.
3 A+B shall be a minimum of L/2.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.
B Main reinforcing shall be welded wire fabric, fy=500MPa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.
C Precast concrete strength shall be 40MPa.
D Clear cover to reinforcing in precast shall be a minimum of 40mm and a maximum of 50mm.
E This OPSD shall be read in conjunction with OPSD 1101.016, 1101.018, and 1101.019.
F All dimensions are nominal.
G All dimensions are in millimetres unless otherwise shown.

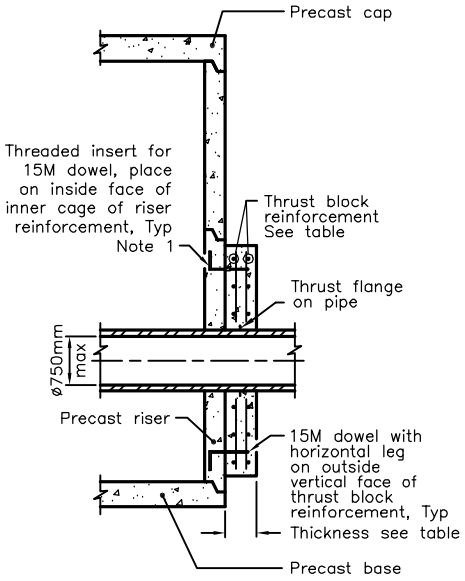
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 2400 x 3000mm RISER AND BASE

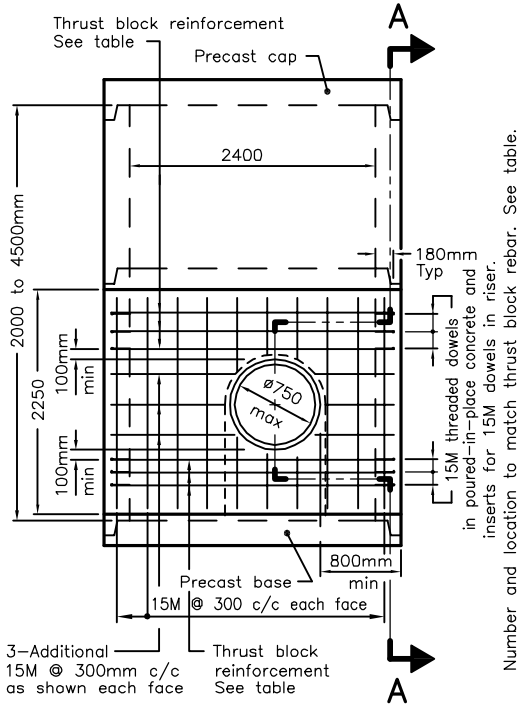
Nov 2013 | Rev 2

ONTARIO STANDARD · MUNICIPAL – PROVINCIAL · O P S

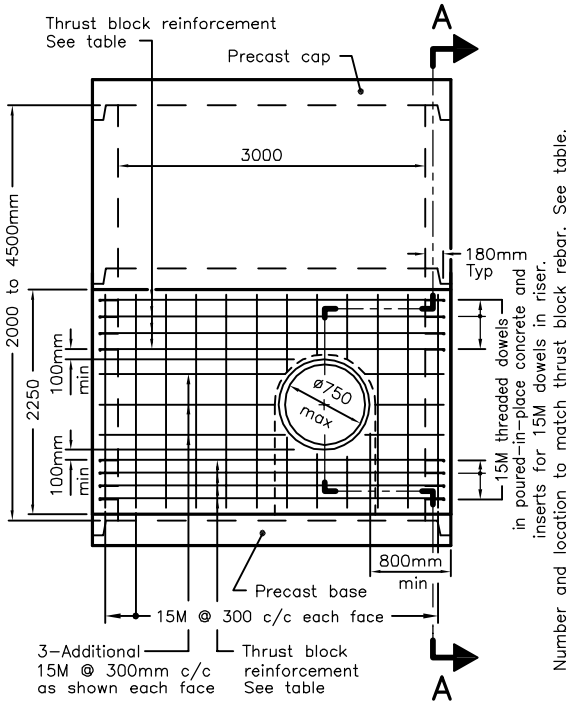
OPSD 1101.017




SECTION A–A




ELEVATION OF SHORT WALL THRUST BLOCK




ELEVATION OF LONG WALL THRUST BLOCK

## NOTES:

1 Threaded inserts for the attachment of thrust block shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

B Thrust blocks shall be poured–in–place concrete as specified.

C Thrust block concrete requirements are:
- –Strength 30MPa
- –Air content 5 to 7%
- –Slump 70mm ±20mm.

D Clear cover to reinforcing steel:
- –100mm ±25mm to bottom of thrust block
- –70mm ±20mm to remainder of thrust block.

E This OPSD shall be read in conjunction with OPSD 1101.016, 1101.017, and 1101.019.

F All dimensions are in millimetres unless otherwise shown.

| Thrust Block Wall | Nominal Watermain Size | Thrust Block Thickness | Thrust Block Reinforcement |
|---|---|---|---|
| Long Wall | ≤ø750 | 450 | 8–25M each face* |
| Short Wall | ≤ø750 | 400 | 6–25M each face* |

* Other reinforcement as shown

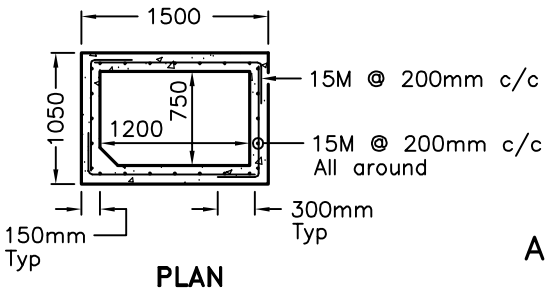
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 2400 x 3000mm THRUST BLOCKS

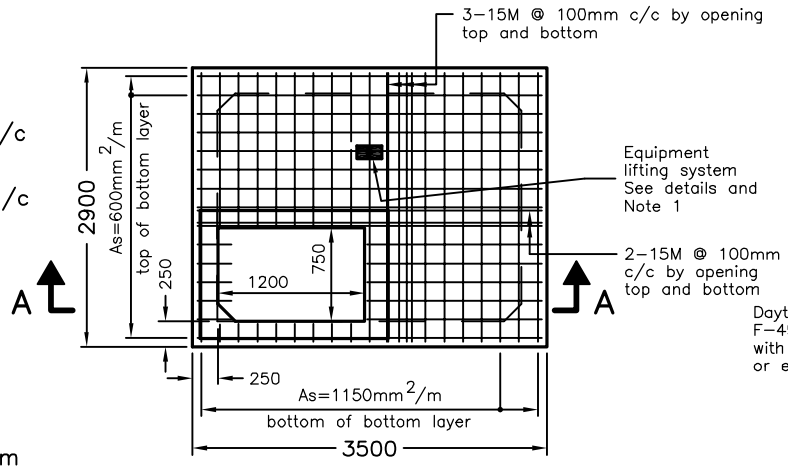
Nov 2013 | Rev 3

ONTARIO STANDARD MUNICIPAL – PROVINCIAL

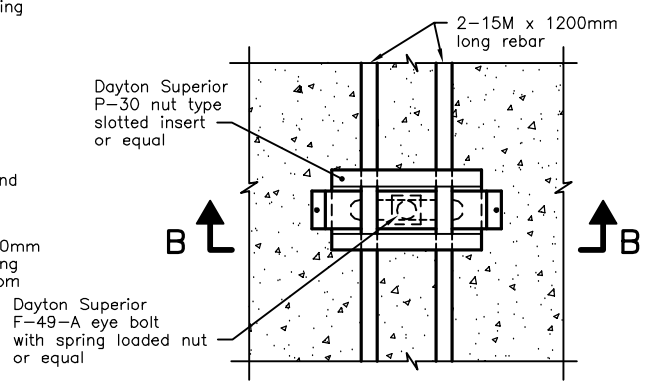
OPSD 1101.018



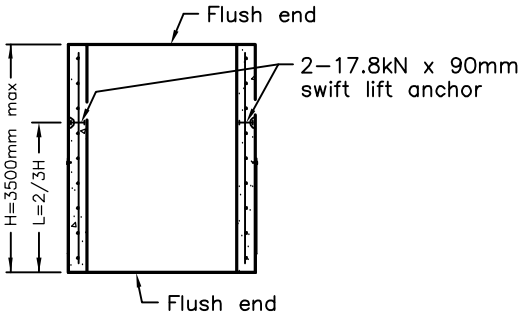

PLAN



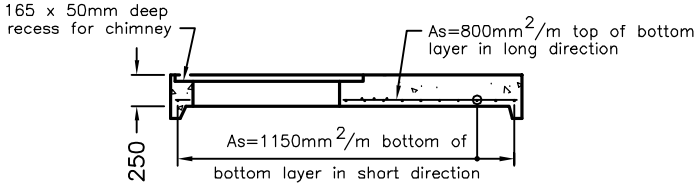

PLAN OF CAP



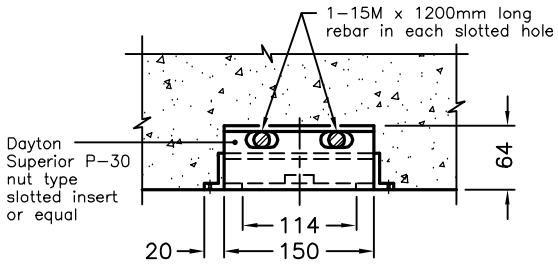

PLAN



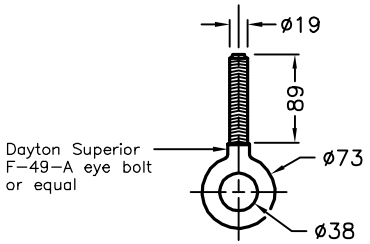

ELEVATION
CHIMNEY




SECTION A–A




SECTION B–B




EQUIPMENT LIFTING SYSTEM

## NOTES:

1 Equipment lifting system shall be installed on underside of precast concrete cap, where required.

A Precast concrete strength shall be 40MPa.

B Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

C Main reinforcing shall be welded wire fabric, fy=500Mpa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.

D Clear cover to reinforcing steel in precast shall be a minimum of 40mm and a maximum of 50mm.

E This OPSD shall be read in conjunction with OPSD 1101.016, 1101.017, and 1101.018.

F All dimensions are nominal.

G All dimensions are in millimetres unless otherwise shown.

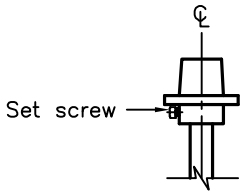
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 2400 x 3000mm CHIMNEY AND CAP

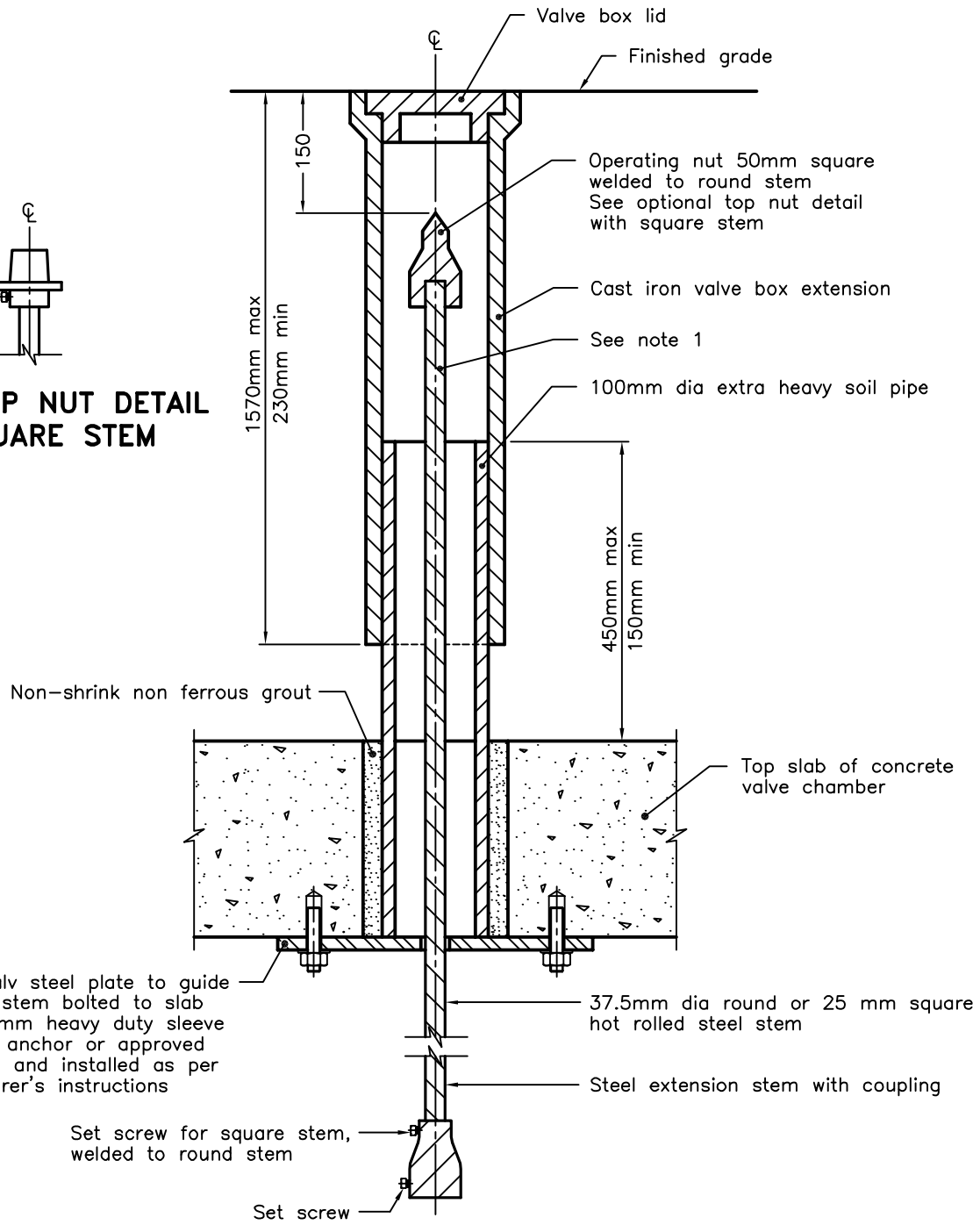
Nov 2013 | Rev 2

ONTARIO STANDARDS MUNICIPAL – PROVINCIAL

OPSD 1101.019




**OPTIONAL TOP NUT DETAIL WITH SQUARE STEM**




**CROSS SECTION**

NOTES:

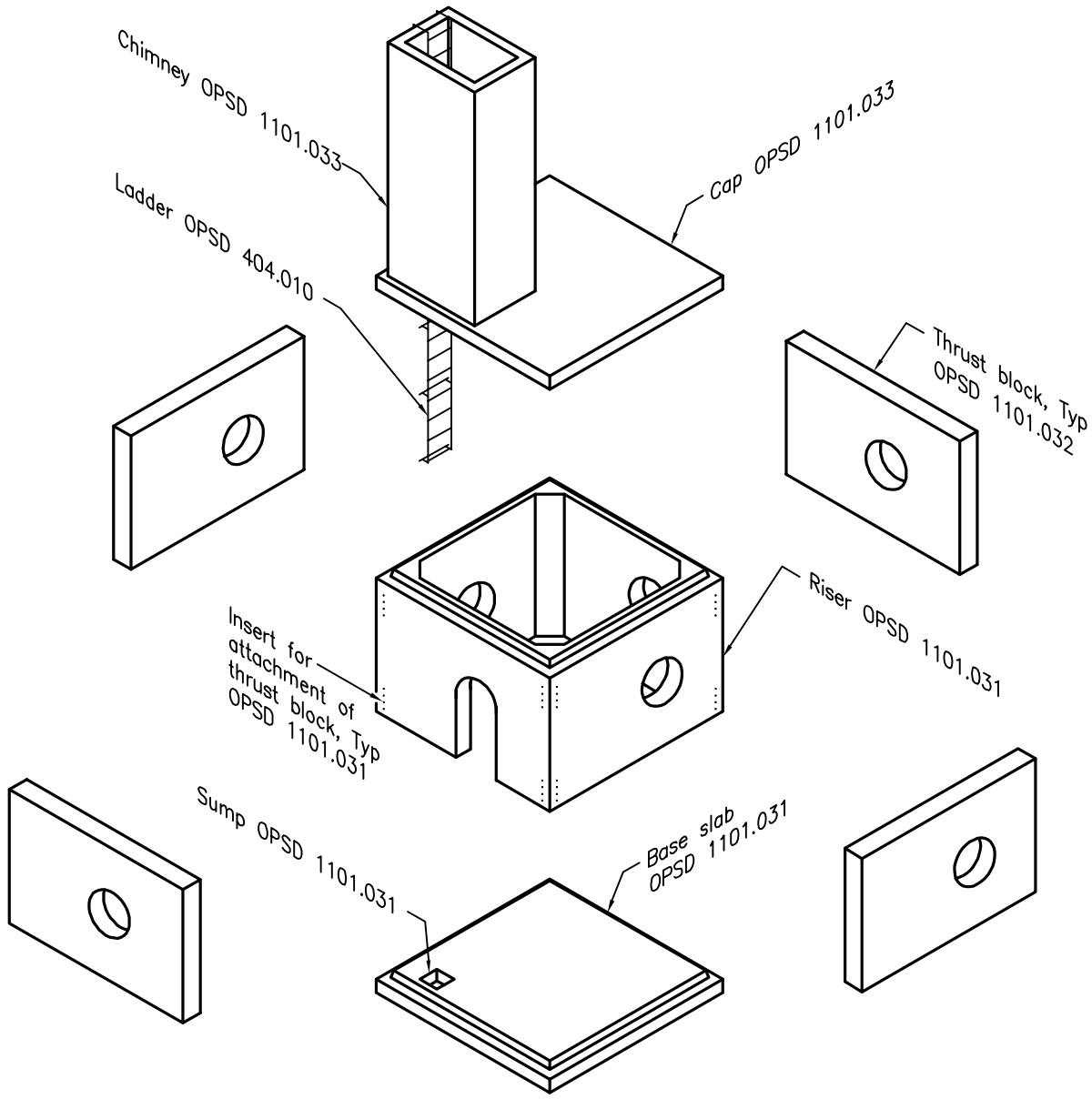
1 Either the square or round stem shall be used with specified connections.

A Valve stem and valve shall be placed plumb.

B Stem guide is required if the unsupported length exceeds 2.0m.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 3 |
|---|---|---|---|
| **VALVE OPERATOR** | | | |
| | **OPSD 1101.020** | | |




NOTES:

A Design according to CAN/CSA S6 and Ministry of Transportation of Ontario Structural Manual, Division 1, for minimum 0.5m and maximum 4.0m of earth cover. The maximum buried depth to bottom of chamber is 7.5m.

B The valve chamber may be buoyant. Measures required to counteract buoyancy shall be as specified.

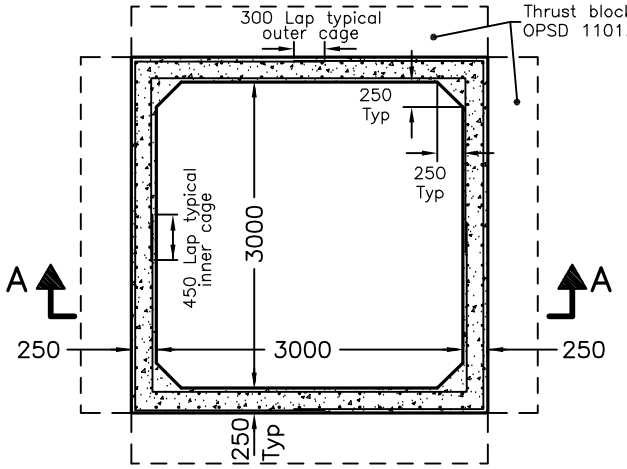
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

D Standing water shall not be allowed to accumulate during construction to within 1.7m of top of chamber when chamber is not backfilled to grade.

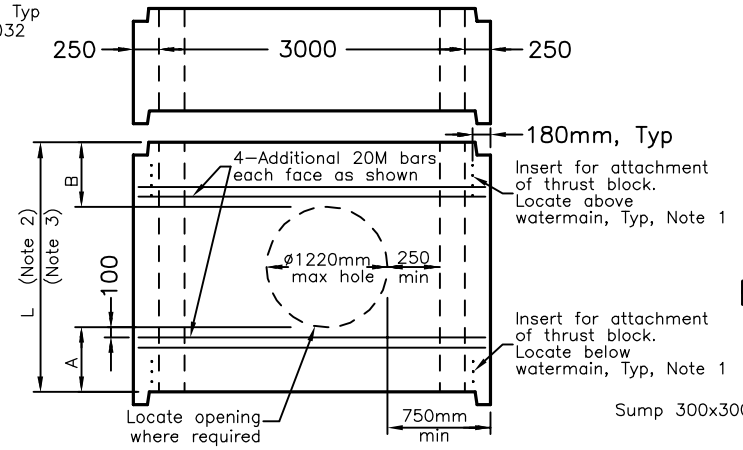
E Thrust blocks designed for a maximum water surge pressure of 1.72 MPa and a maximum opening size of 1220mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides specified.

F All dimensions are in millimetres unless otherwise shown.

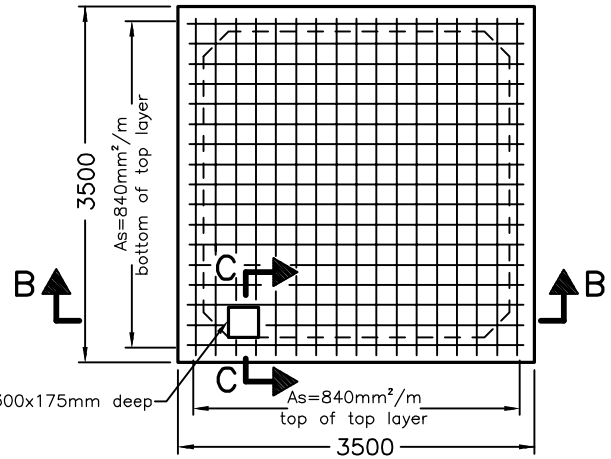
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3000 x 3000mm COMPONENTS | | | |
| | OPSD 1101.030 | | |



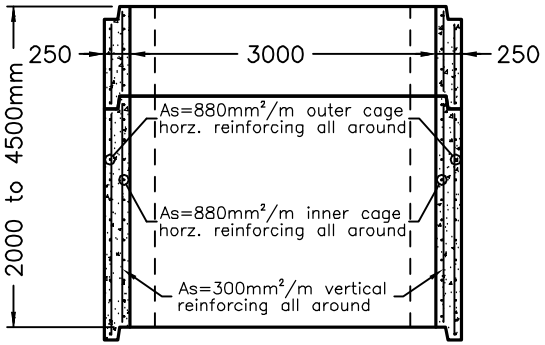

PLAN OF RISER



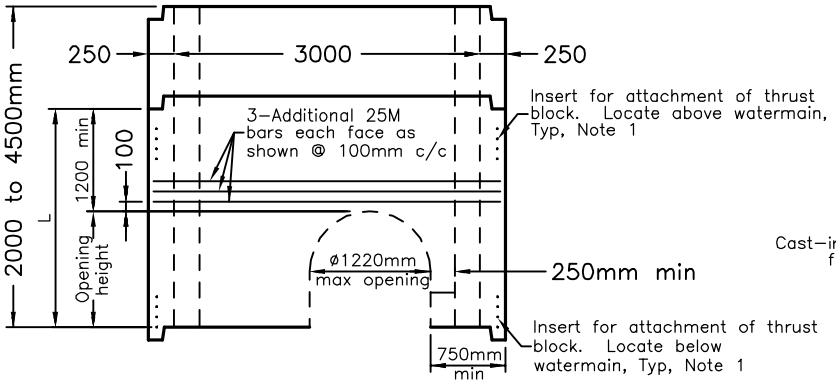

VIEW OF SIDES WITH CIRCULAR OPENING



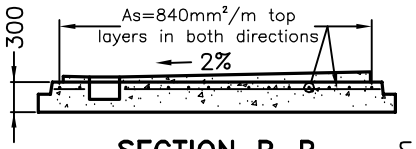

PLAN OF BASE



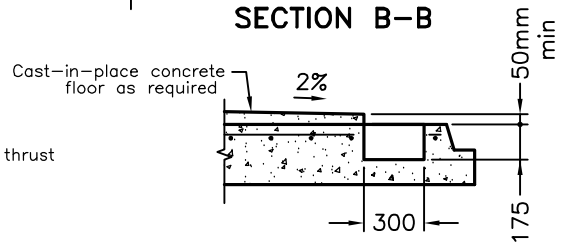

SECTION A–A




VIEW OF SIDES WITH SLOTTED OPENING




SECTION B–B




SECTION C–C

## NOTES:

1 Threaded inserts for the attachment of thrust blocks shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar. For location and number of inserts see OPSD 1101.032.
2 If no opening in a single riser, the height of that riser may be 2000 to 4500mm.
3 A+B shall be a minimum of L/2 or 1200mm.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.
B Main reinforcing shall be welded wire fabric, fy=500MPa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.
C Precast concrete strength shall be 40MPa.
D Clear cover to reinforcing in precast shall be a minimum of 40mm and a maximum of 50mm.
E This OPSD shall be read in conjunction with OPSD 1101.030, 1101.032, and 1101.033.
F All dimensions are nominal.
G All dimensions are in millimetres unless otherwise shown.

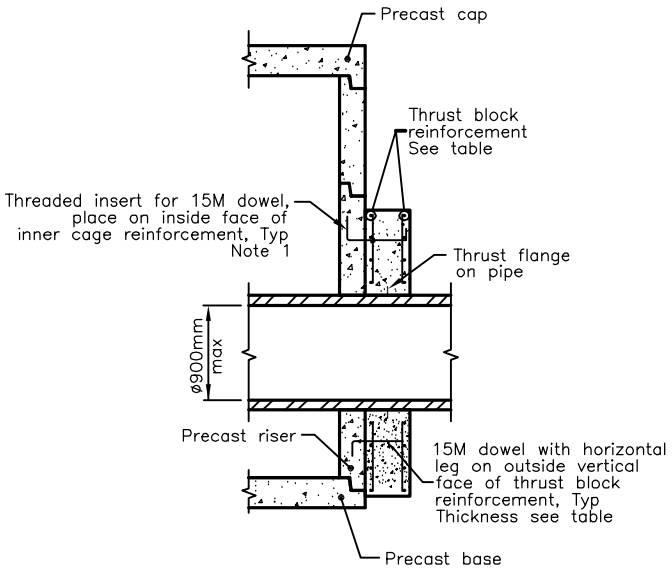
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3000 x 3000mm RISER AND BASE

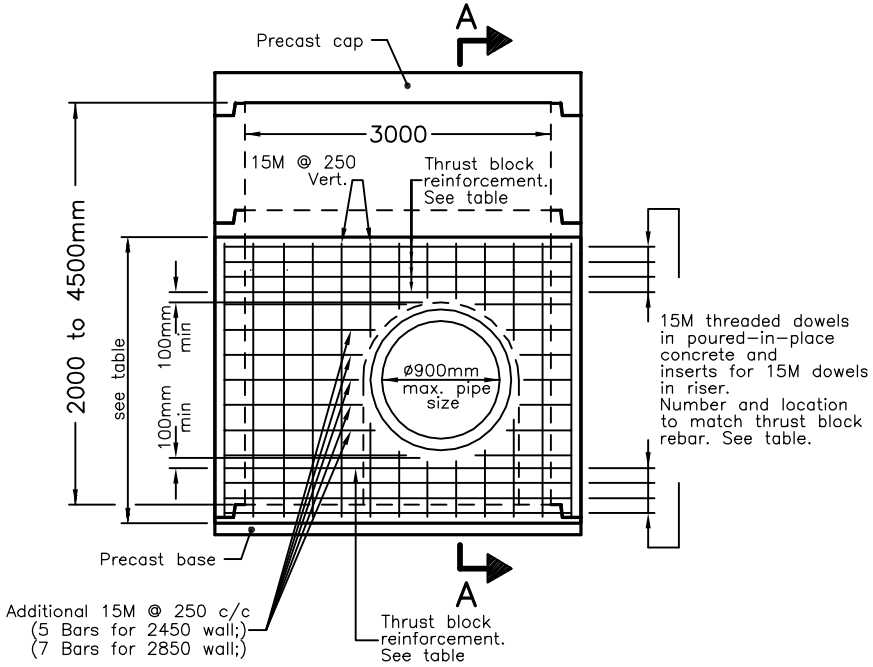
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 1101.031




SECTION A–A




ELEVATION OF THRUST BLOCK

| Nominal Watermain Size | Thrust Block Height | Thrust Block Thickness | Thrust Block Reinforcement | Total Inserts |
|---|---|---|---|---|
| ≤ø900 | 2450 | 500 | 8–25M each face | 16 |

## NOTES:

1 Threaded inserts for the attachment of thrust block shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

B Thrust blocks shall be poured–in–place concrete as specified.

C Thrust block concrete requirements are:
–Strength 30MPa
–Air content 5 to 7%
–Slump 70mm ±20mm.

D Clear cover to reinforcing steel:
–100mm ±25mm to bottom of thrust block
–70mm ±20mm to remainder of thrust block.

E This OPSD shall be read in conjunction with OPSD 1101.030, 1101.031, and 1101.033.

F All dimensions are in millimetres unless otherwise shown.

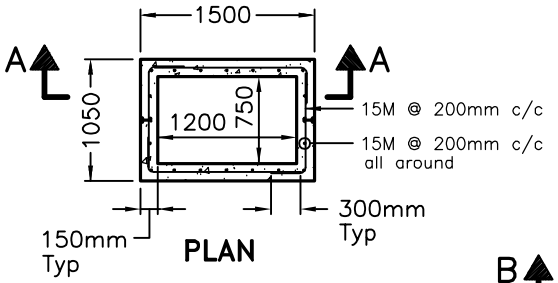
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3000 x 3000mm THRUST BLOCKS

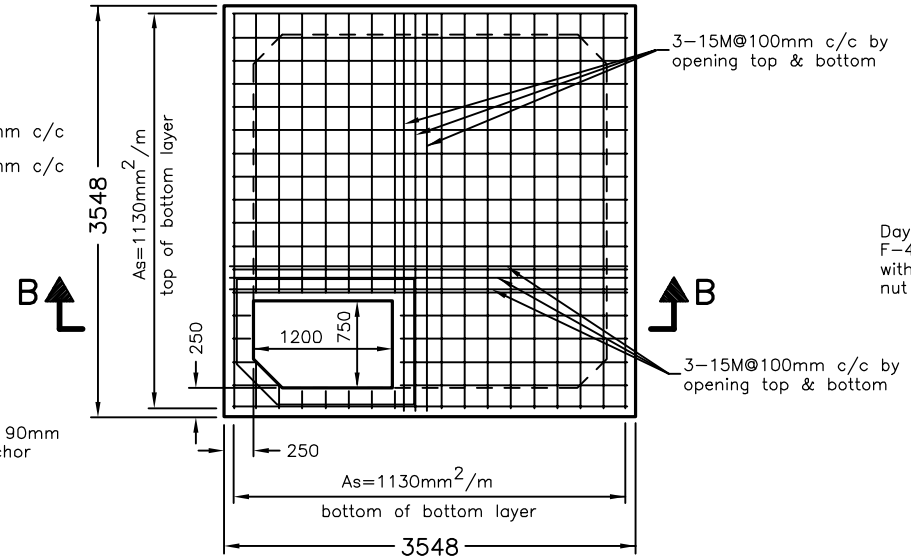
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSD

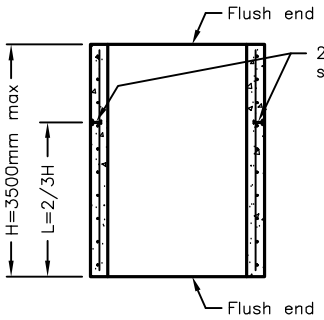
OPSD 1101.032



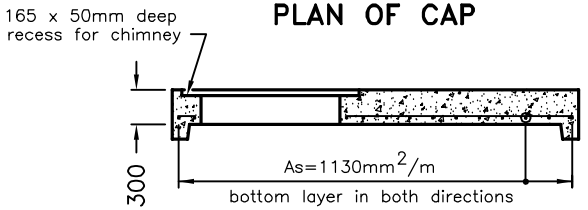

PLAN



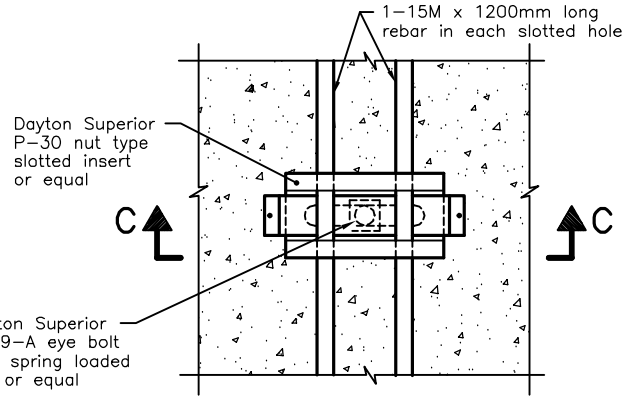

PLAN OF CAP



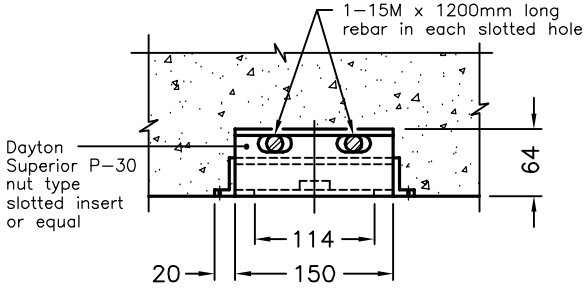

SECTION A–A



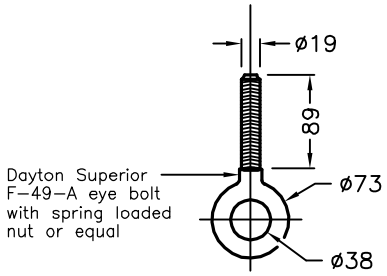

SECTION B–B




PLAN




SECTION C–C




EQUIPMENT LIFTING SYSTEM

## NOTES:

1 Equipment lifting system shall be installed on underside of precast concrete cap, when required.

A Precast concrete strength shall be 40MPa.

B Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

C Main reinforcing shall be welded wire fabric, fy=500Mpa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.

D Clear cover to reinforcing steel in precast shall be a minimum of 40mm and a maximum of 50mm.

E This OPSD shall be read in conjunction with OPSD 1101.030, 1101.031, and 1101.032.

F All dimensions are nominal.

G All dimensions are in millimetres unless otherwise shown.

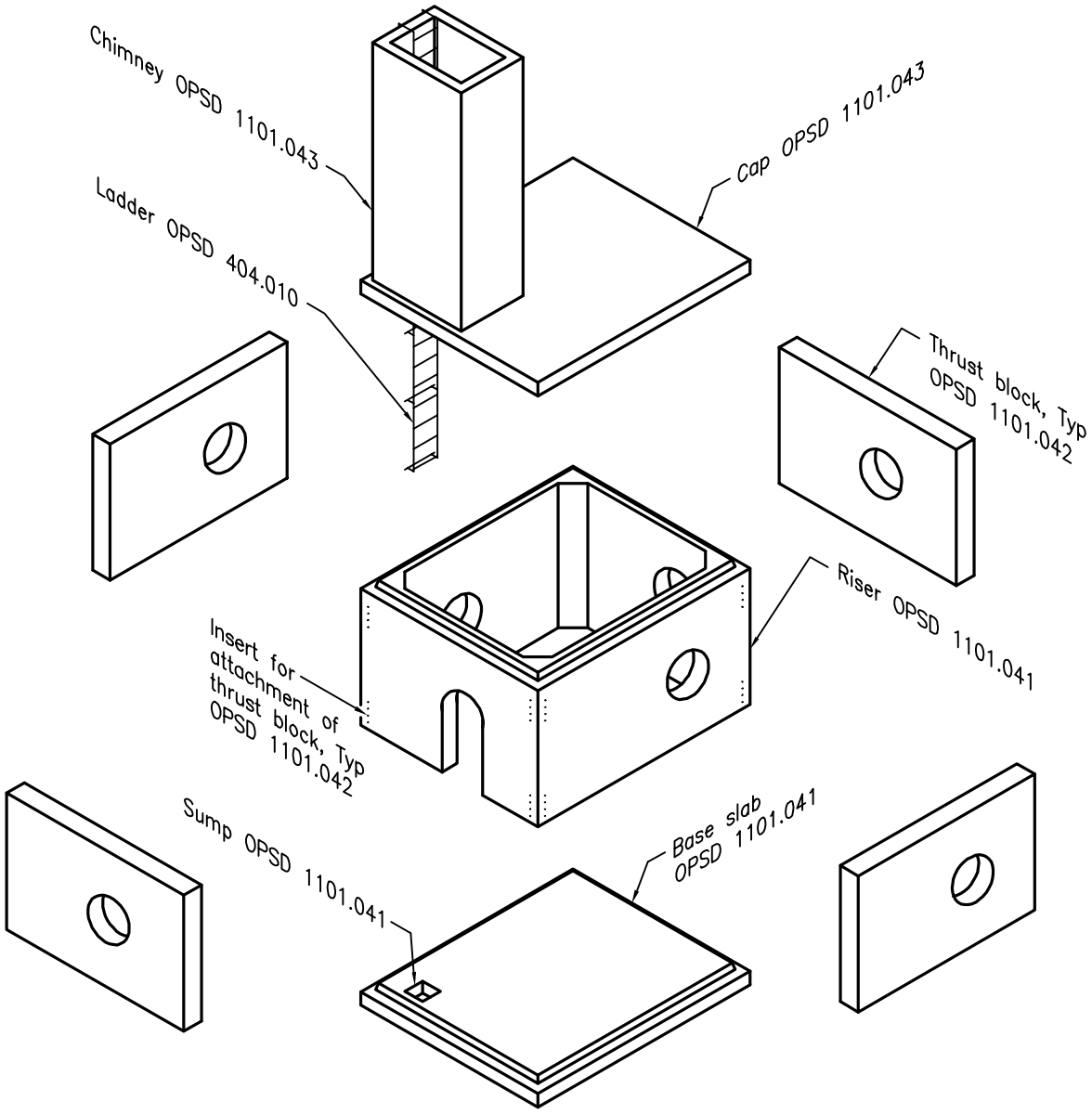
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3000 x 3000mm CHIMNEY AND CAP

Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

OPSD 1101.033




NOTES:

A Design according to CAN/CSA S6 and Ministry of Transportation of Ontario Structural Manual, Division 1, for minimum 0.5m and maximum 4.0m of earth cover. The maximum buried depth to bottom of chamber is 7.5m.

B The valve chamber may be buoyant. Measures required to counteract buoyancy shall be as specified.

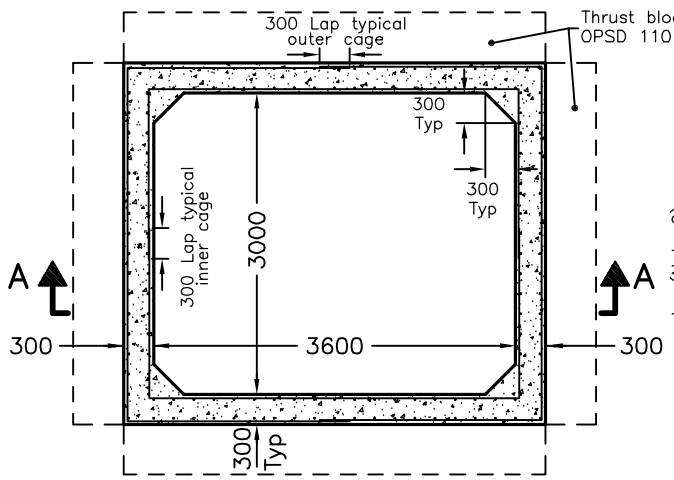
C When the combined height of chamber and chimney is 5.0m or greater, provide safety platform according to OPSD 404.010.

D Standing water shall not be allowed to accumulate during construction to within 1.7m of top of chamber when chamber is not backfilled to grade.

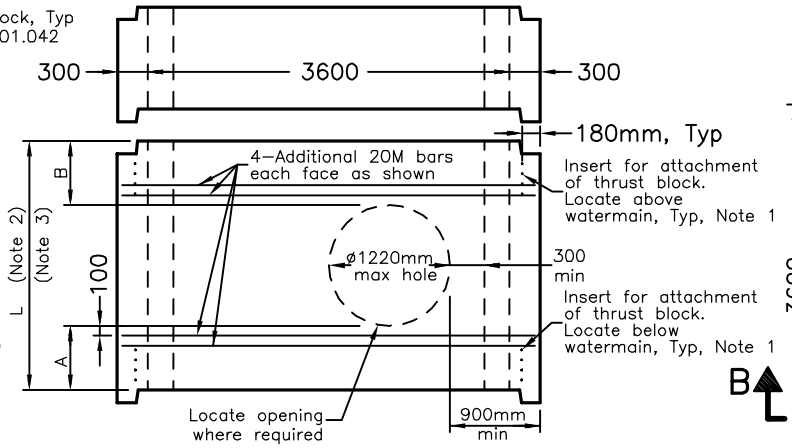
E Thrust blocks designed for a maximum water surge pressure of 1.72 MPa and a maximum opening size of 1220mm diameter. If thrust blocks are required, they shall be placed on the outside of the chamber on the side or sides specified.

F All dimensions are in millimetres unless otherwise shown.

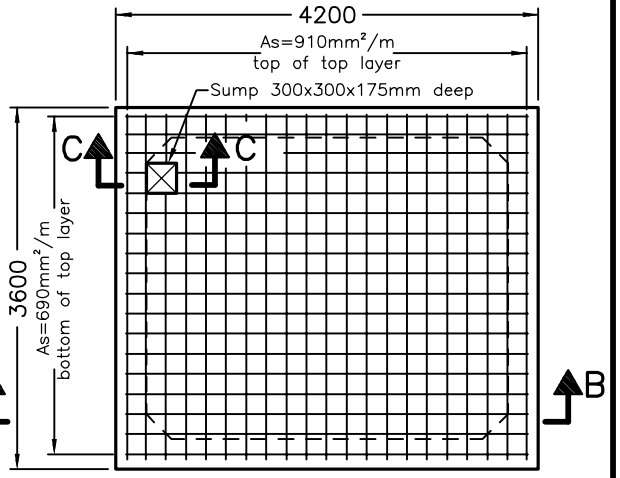
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| PRECAST CONCRETE VALVE CHAMBER WITH POURED-IN-PLACE THRUST BLOCKS 3600 x 3000mm COMPONENTS | | | |
| | OPSD 1101.040 | | |



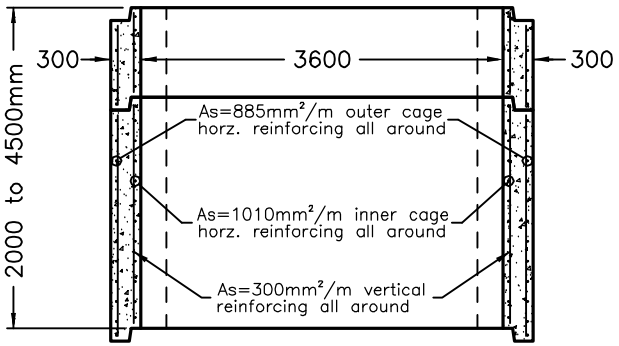

PLAN OF RISER



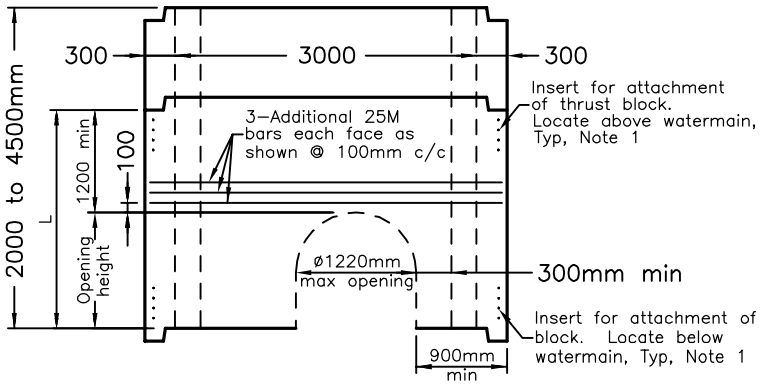

VIEW OF SIDES WITH CIRCULAR OPENING



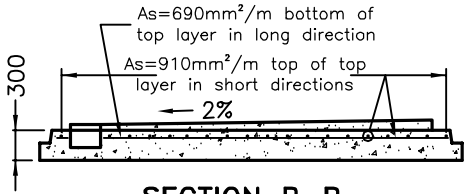

PLAN OF BASE



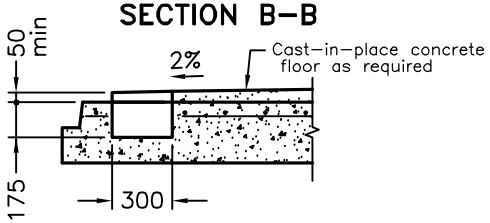

SECTION A–A




VIEW OF SIDES WITH SLOTTED OPENING




SECTION B–B




SECTION C–C

## NOTES:

1 Threaded inserts for the attachment of thrust blocks shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar. For location and number of inserts see OPSD 1101.042.
2 If no opening in a single riser, the height of that riser may be 2000 to 4500mm.
3 A+B shall be a minimum of L/2 or 1200mm.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.
B Main reinforcing shall be welded wire fabric, fy=500MPa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.
C Precast concrete strength shall be 40MPa.
D Clear cover to reinforcing in precast shall be a minimum of 40mm and a maximum of 50mm.
E This OPSD shall be read in conjunction with OPSD 1101.040, 1101.042, and 1101.043.
F All dimensions are nominal.
G All dimensions are in millimetres unless otherwise shown.

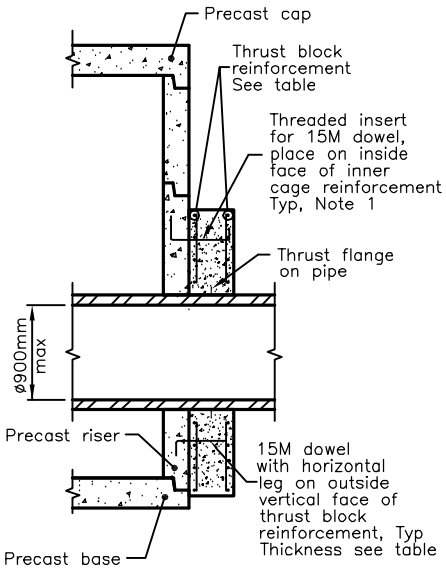
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3600 x 3000mm RISER AND BASE

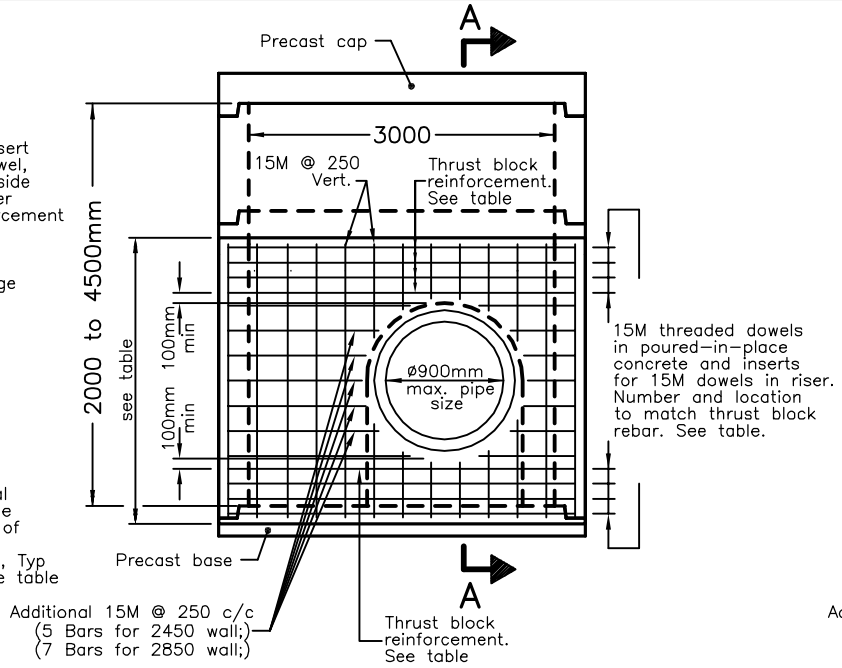
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

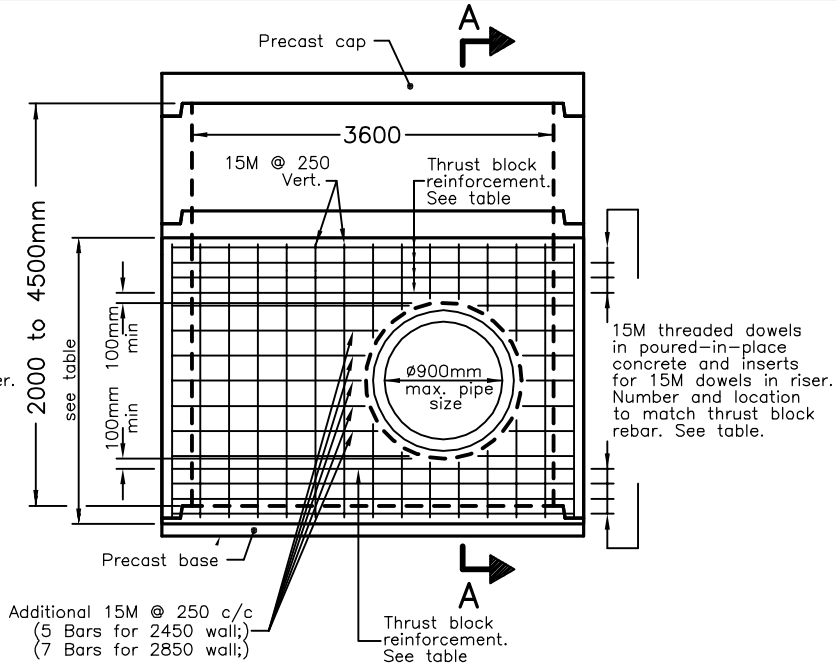
OPSD 1101.041




SECTION A–A




ELEVATION OF SHORT WALL THRUST BLOCK




ELEVATION OF LONG WALL THRUST BLOCK

| Nominal Watermain Size | Thrust Block Height | Thrust Block Thickness | Thrust Block Reinforcement | Total Inserts |
|---|---|---|---|---|
| ≤ø900 | 2450 | 500 | 8–25M each face | 16 |

## NOTES:

1 Threaded inserts for the attachment of thrust block shall be 15M equivalent and Dayton Superior DBR system or equal with strength of 125% of yield strength of coupled rebar.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W.
Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

B Thrust blocks shall be poured–in–place concrete as specified.

C Thrust block concrete requirements are:
–Strength 30MPa
–Air content 5 to 7%
–Slump 70mm ±20mm.

D Clear cover to reinforcing steel:
–100mm ±25mm to bottom of thrust block
–70mm ±20mm to remainder of thrust block.

E This OPSD shall be read in conjunction with OPSD 1101.040, 1101.041, and 1101.043.

F All dimensions are in millimetres unless otherwise shown.

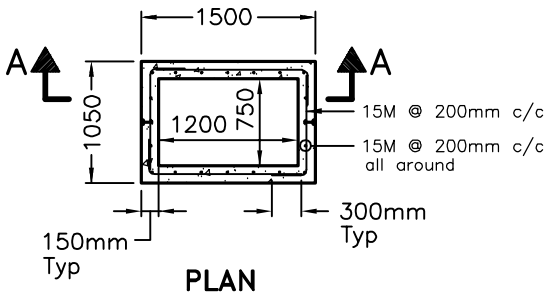
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3600 x 3000mm THRUST BLOCKS

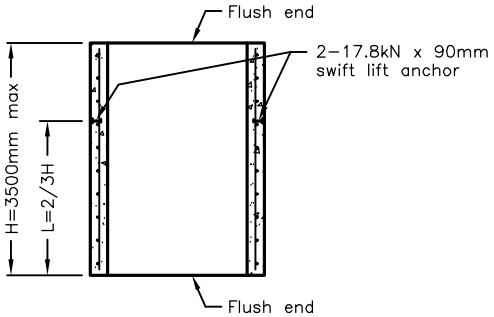
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPSS

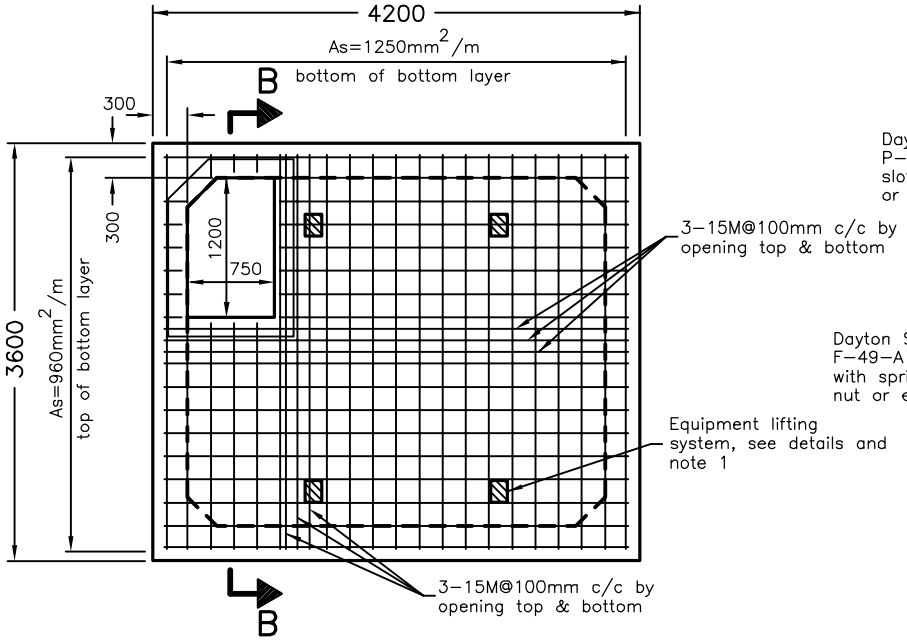
OPSD 1101.042



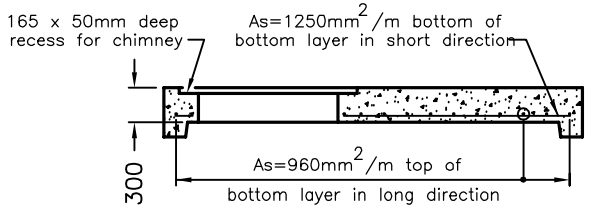

PLAN



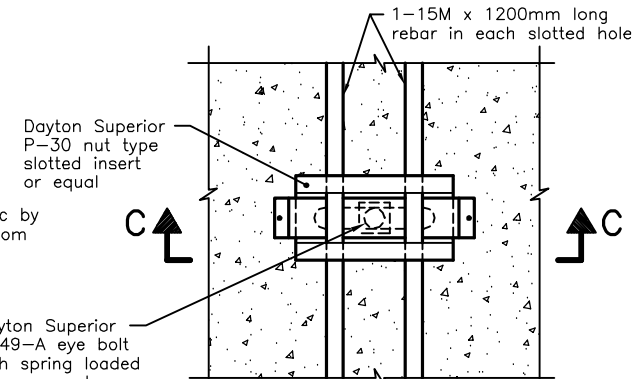

SECTION A–A



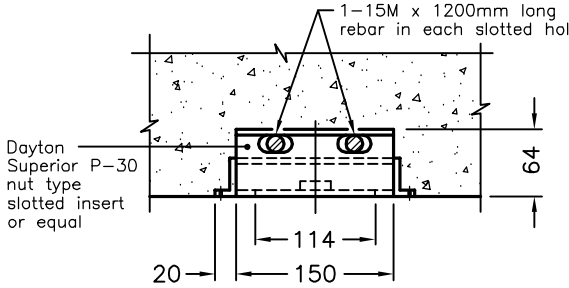

PLAN OF CAP



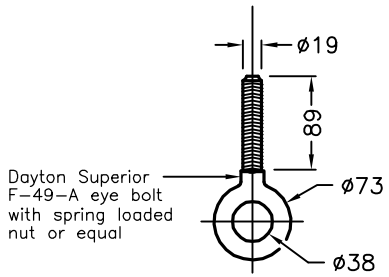

SECTION B–B




PLAN




SECTION C–C




EQUIPMENT LIFTING SYSTEM

## NOTES:

1 Equipment lifting system shall be installed on underside of precast concrete cap, when required.

A Precast concrete strength shall be 40MPa.

B Reinforcing steel shall be according to CSA G30.18, Grade 400W. Inside diameter of bends shall equal six bar diameters. Additional reinforcing shall be rebar Grade 400W.

C Main reinforcing shall be welded wire fabric, fy=500Mpa, according to ASTM A497M. Minimum bend shall be six bar or four wire diameters.

D Clear cover to reinforcing steel in precast shall be a minimum of 40mm and a maximum of 50mm.

E This OPSD shall be read in conjunction with OPSD 1101.040, 1101.041, and 1101.042.

F All dimensions are nominal.

G All dimensions are in millimetres unless otherwise shown.

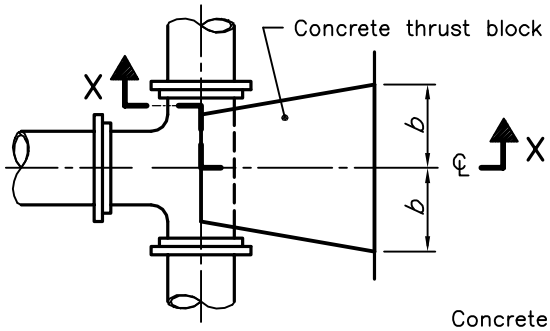
ONTARIO PROVINCIAL STANDARD DRAWING

# PRECAST CONCRETE VALVE CHAMBER WITH POURED–IN–PLACE THRUST BLOCKS 3600 x 3000mm CHIMNEY AND CAP

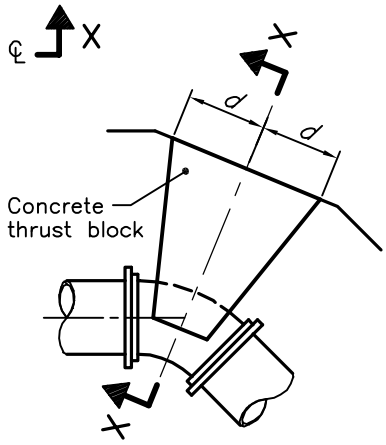
Nov 2013 | Rev 0

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

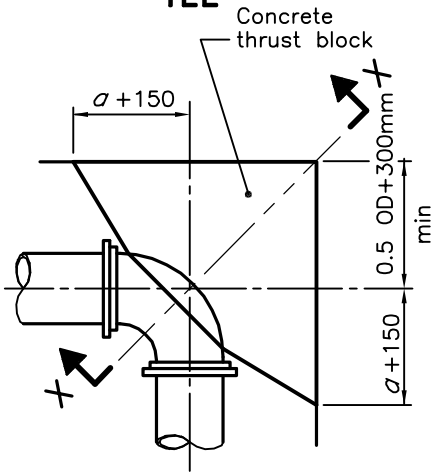
OPSD 1101.043



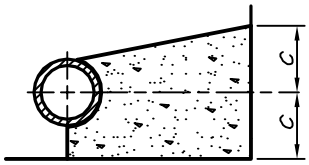

PLAN
TEE



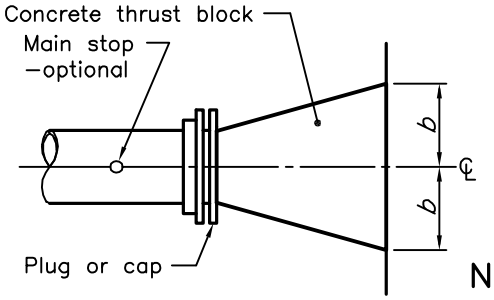

PLAN
TYPICAL BEND



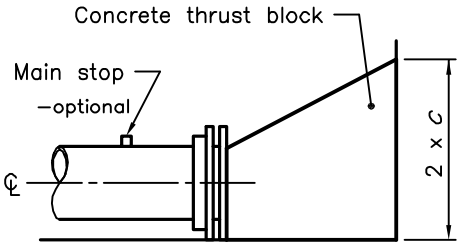

PLAN
90 BEND




SECTION X–X




PLAN
DEAD END




ELEVATION
DEAD END

**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 |

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.

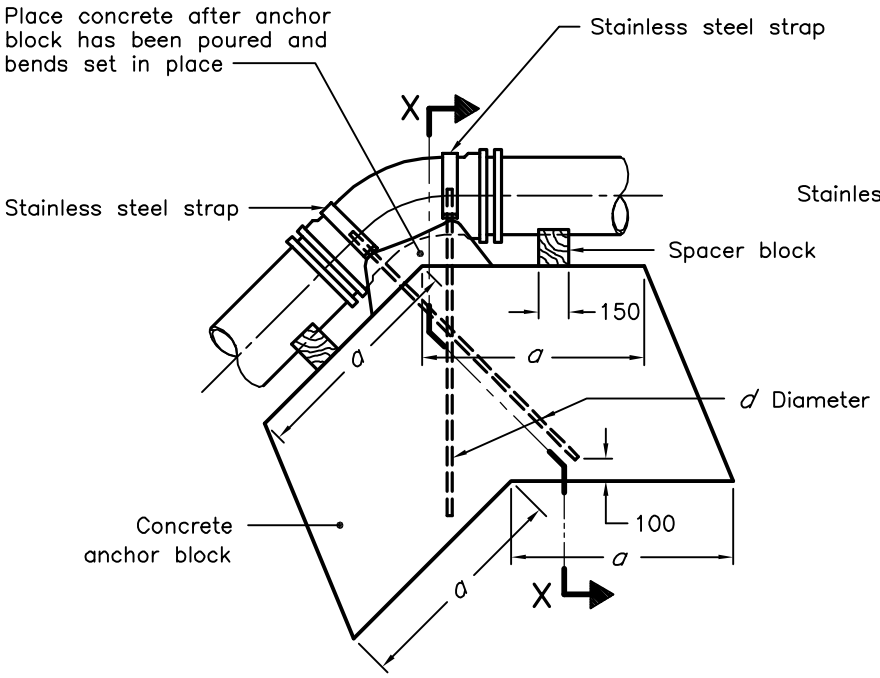
C The above thrust block dimensions meet or exceed the MOE Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit.

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.

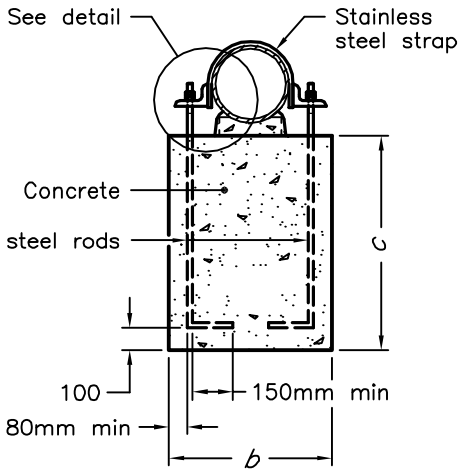
E The tables apply to both ductile iron and PVC pipe. When one length exceeded the other, the longer length was used.

F All dimensions are in millimetres unless otherwise shown.

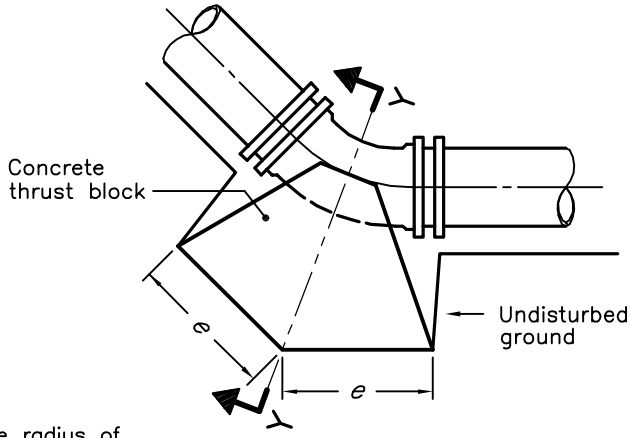
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| CONCRETE THRUST BLOCKS FOR TEES, PLUGS, AND HORIZONTAL BENDS | _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 1103.010 | | |



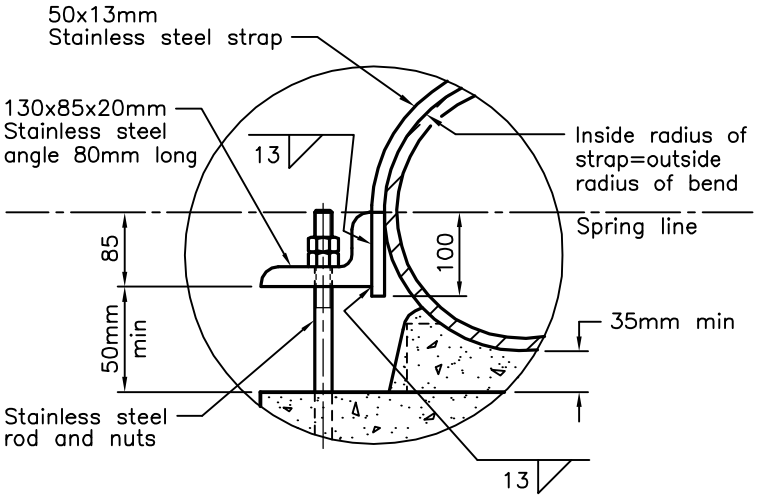

UP–THRUST BLOCK ELEVATION



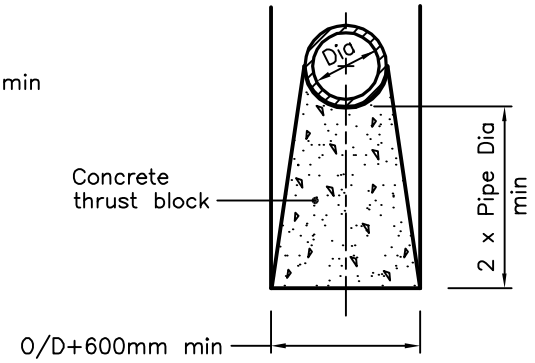

UP–THRUST BLOCK SECTION X–X




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 | | |

## SOILS WITH TYPICAL BEARING STRENGTH OF 100 TO 199 kPa

| PIPE DIA | Note 1 | | | | |
|---|---|---|---|---|---|
| | *a* | *b* | *c* | *d* | *e* |
| 100 | 450 | 600 | 750 | 13 | 150 |
| 150 | 600 | 900 | 900 | 13 | 300 |
| 200 | 600 | 900 | 1500 | 13 | 450 |
| 250 | 900 | 900 | 1500 | 20 | 600 |
| 300 | 1200 | 900 | 1650 | 20 | 800 |
| 350 | 1200 | 1200 | 1650 | 25 | 1000 |
| 400 | 1300 | 1300 | 1750 | 30 | 1000 |

## SOILS WITH TYPICAL BEARING STRENGTH OF 200 TO 299 kPa

| PIPE DIA | Note 1 | | | | |
|---|---|---|---|---|---|
| | *a* | *b* | *c* | *d* | *e* |
| 100 | 450 | 600 | 750 | 13 | 150 |
| 150 | 600 | 900 | 900 | 13 | 300 |
| 200 | 600 | 900 | 1500 | 13 | 450 |
| 250 | 900 | 900 | 1500 | 20 | 600 |
| 300 | 1200 | 900 | 1650 | 20 | 800 |
| 350 | 1200 | 1200 | 1650 | 25 | 1000 |
| 400 | 1300 | 1300 | 1750 | 30 | 1000 |

## SOILS WITH TYPICAL BEARING STRENGTH OF 300 kPa AND OVER

| PIPE DIA | Note 1 | | | | |
|---|---|---|---|---|---|
| | *a* | *b* | *c* | *d* | *e* |
| 100 | 450 | 600 | 750 | 13 | 150 |
| 150 | 600 | 900 | 900 | 13 | 300 |
| 200 | 600 | 900 | 1500 | 13 | 450 |
| 250 | 900 | 900 | 1500 | 20 | 600 |
| 300 | 1200 | 900 | 1650 | 20 | 800 |
| 350 | 1200 | 1200 | 1650 | 25 | 1000 |
| 400 | 1000 | 1300 | 1750 | 30 | 1000 |

NOTES:

1 The dimensions are as specified in OPSD 1103.020.

A The above thrust block dimensions meet or exceed the MOE Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit.

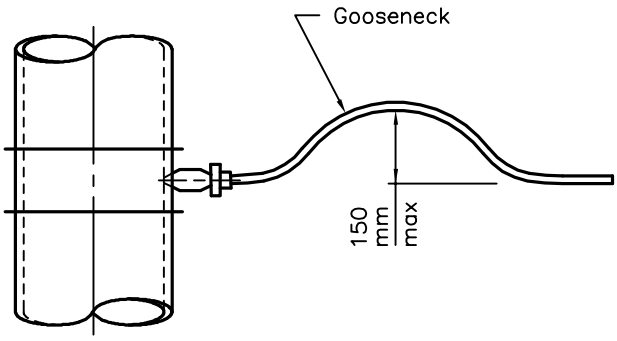
B The assumptions made for the above calculations are as follows:
- Maximum operating pressure of 690 kPa,
- Maximum surge pressure with a flow velocity change of 0.6 m/s of 790 kPa for Class 52 DI pipe and 240 kPa for PVC pipe.

C The tables apply to both ductile iron and PVC pipe. When one length exceeded the other, the longer length was used.

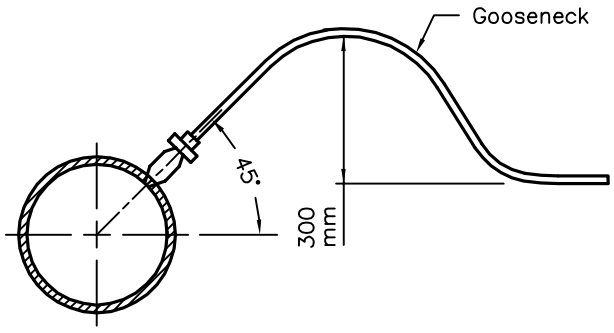
D This OPSD shall be read in conjunction with OPSD 1103.020.

E All dimensions are in millimetres unless otherwise shown.

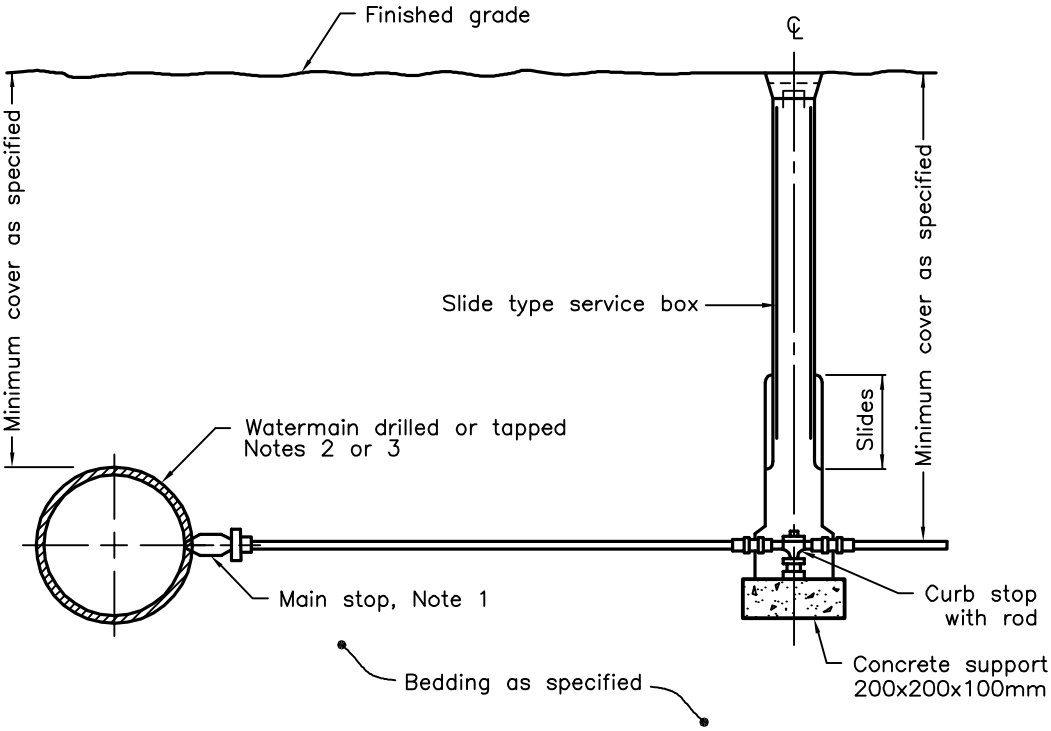
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 0 |
|---|---|---|---|
| DIMENSION TABLES FOR CONCRETE THRUST BLOCKS FOR VERTICAL BENDS | | | |
| | OPSD 1103.021 | | |




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.

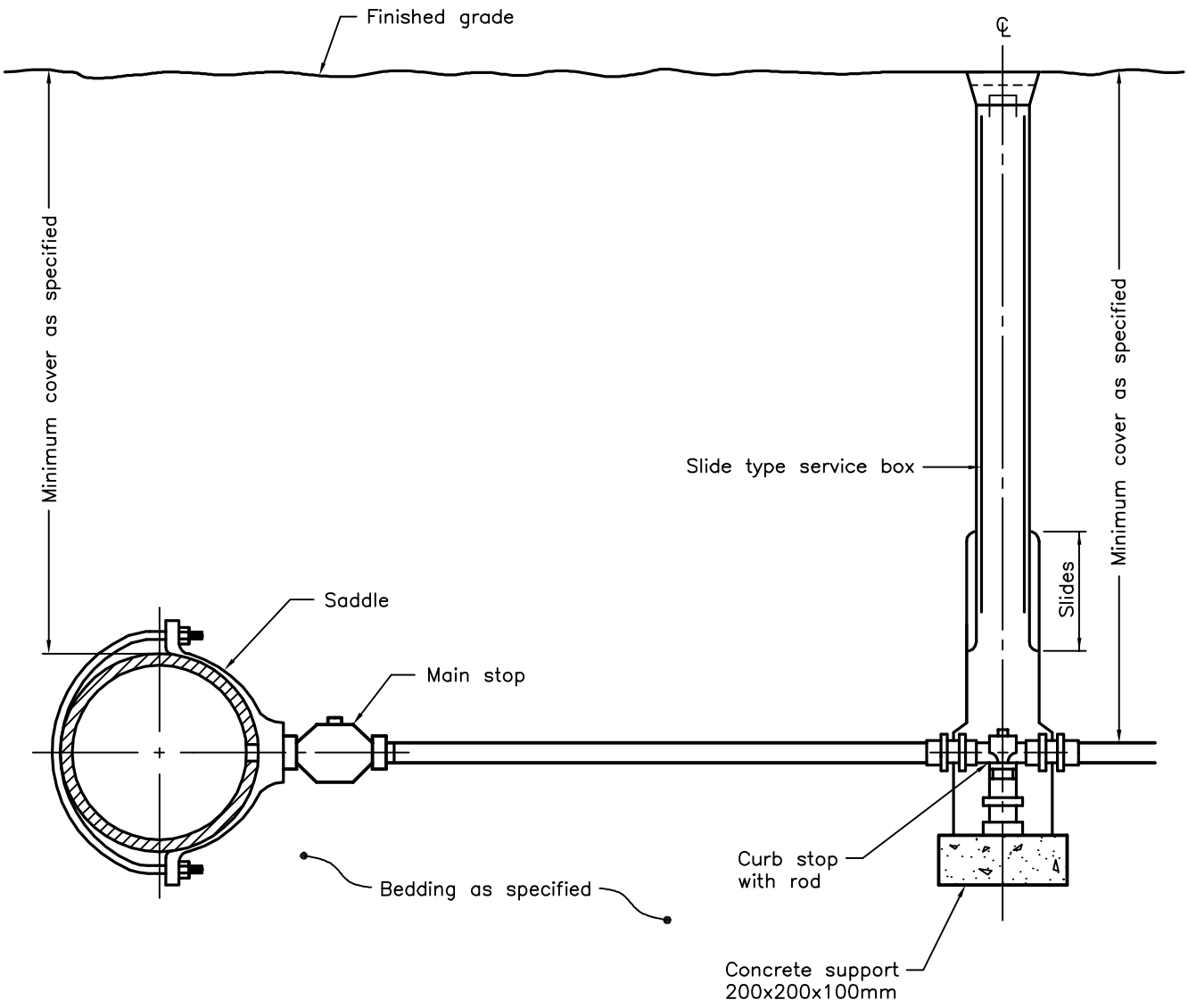
B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.

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**<br>19 and 25mm DIAMETER SIZES | | | |
| | **OPSD 1104.010** | | |




NOTES:

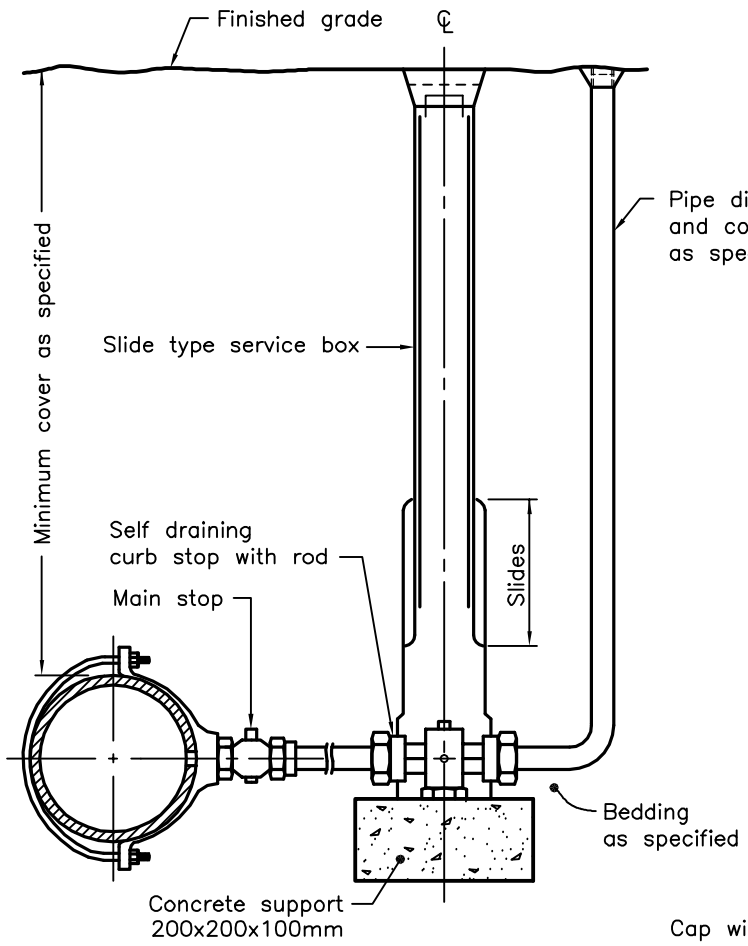
A Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.

B All water services shall be installed 90° to the longitudinal axis of the watermain.

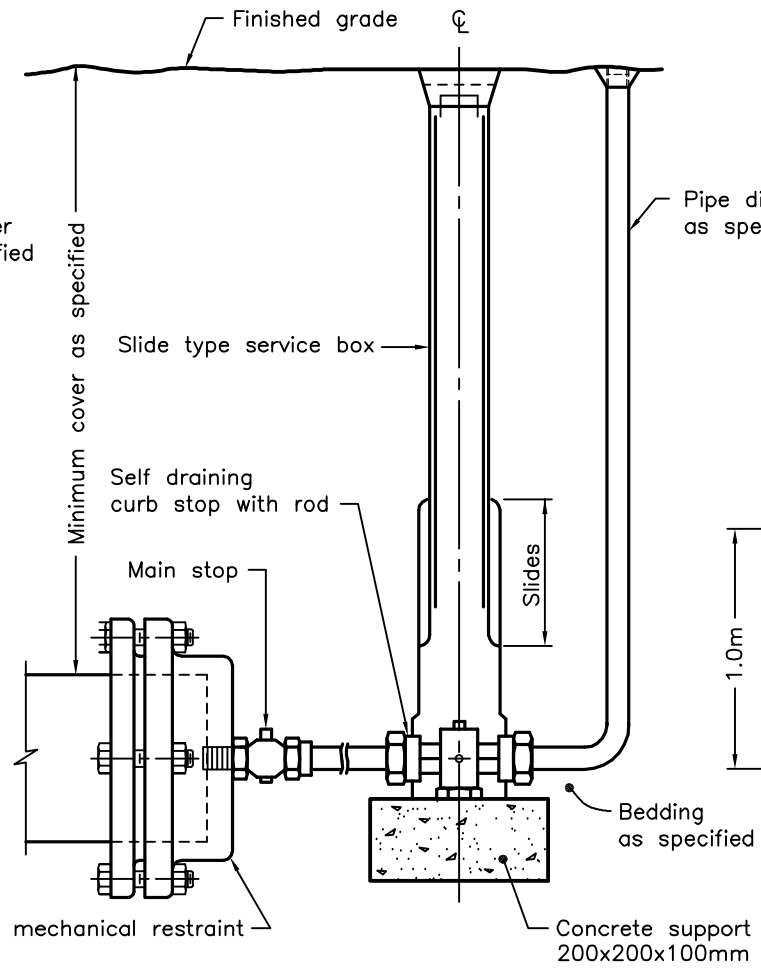
C Backfill material within 500mm of service box shall be native or imported, as specified.

D All dimensions are in millimetres unless otherwise shown.

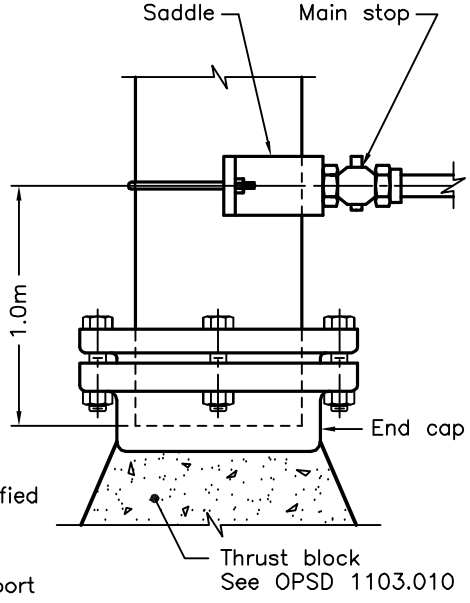
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| **WATER SERVICE CONNECTION**<br>32, 38, and 50mm DIAMETER SIZES | | | |
| | **OPSD 1104.020** | | |




PIPE CONNECTION




END CAP CONNECTION OPTION




PLAN OF
WATERMAIN END

NOTES:

A Backfill material within 500mm of service box shall be native or imported, as specified.

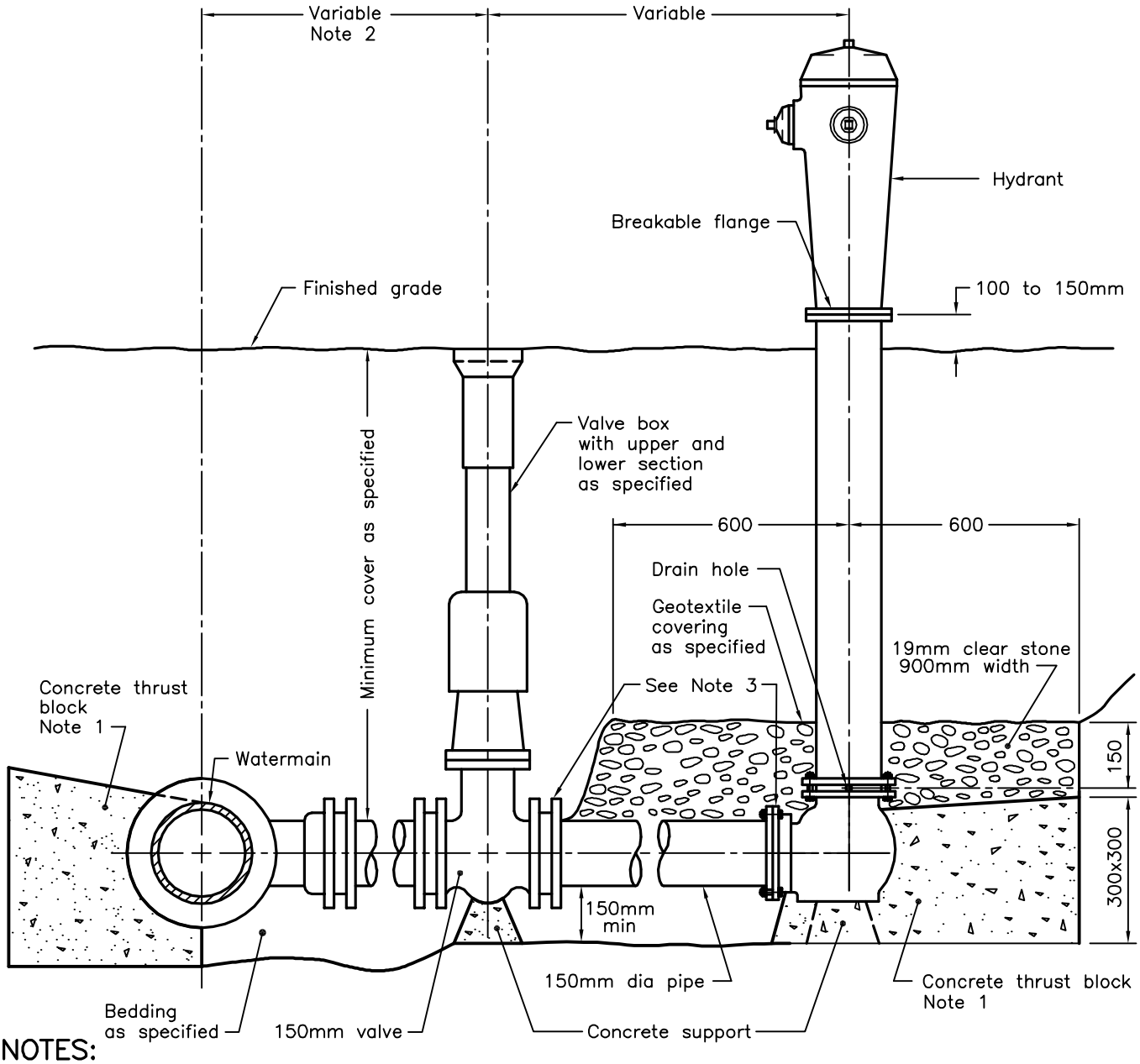
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# BLOW OFF INSTALLATION

Nov 2013 | Rev 2

OPSD 1104.030




NOTES:

1 All concrete thrust blocks shall be poured against undisturbed ground.

2 When specified, for watermains 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermains 600mm and over, bolt valve with flanged end directly to flanged tee.

3 When specified, retaining and restraining devices shall be utilized, in addition to thrust blocks.

A Bond breaker shall be used between the concrete and the fittings and appurtenances.

B Bolts and nuts for buried flange to flange connections shall be stainless steel.

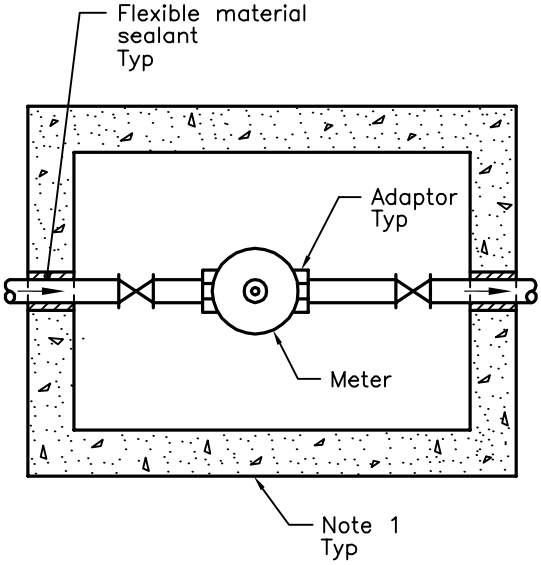
C When required, flange of standpipe extensions shall not be in frost zone.

D This OPSD shall be read in conjunction with OPSD 1103.010 and 1103.020.

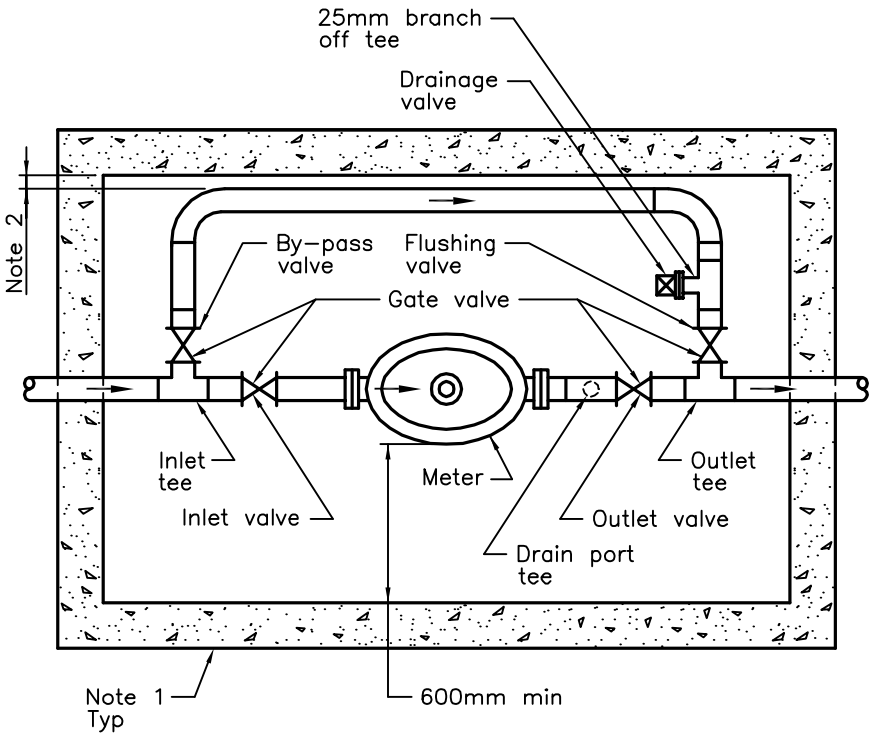
E Backfill material within 500mm of service box shall be native or imported, as specified.

F All dimensions are in millimetres unless otherwise shown.

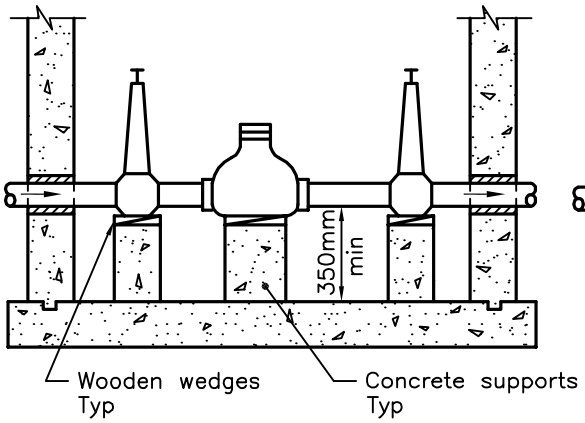
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| HYDRANT INSTALLATION | | | |
| | OPSD 1105.010 | | |



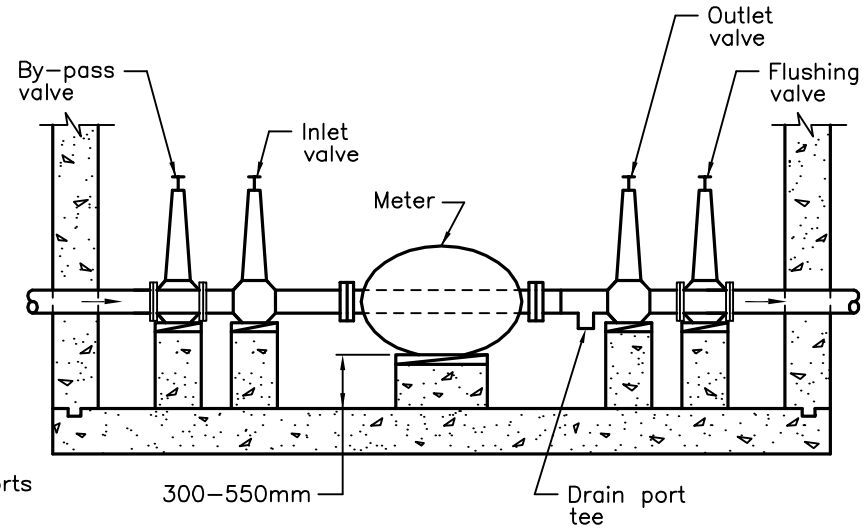

**PLAN**
**NO BY–PASS**




**PLAN**
**WITH BY–PASS**




**ELEVATION**




**ELEVATION**

NOTES:

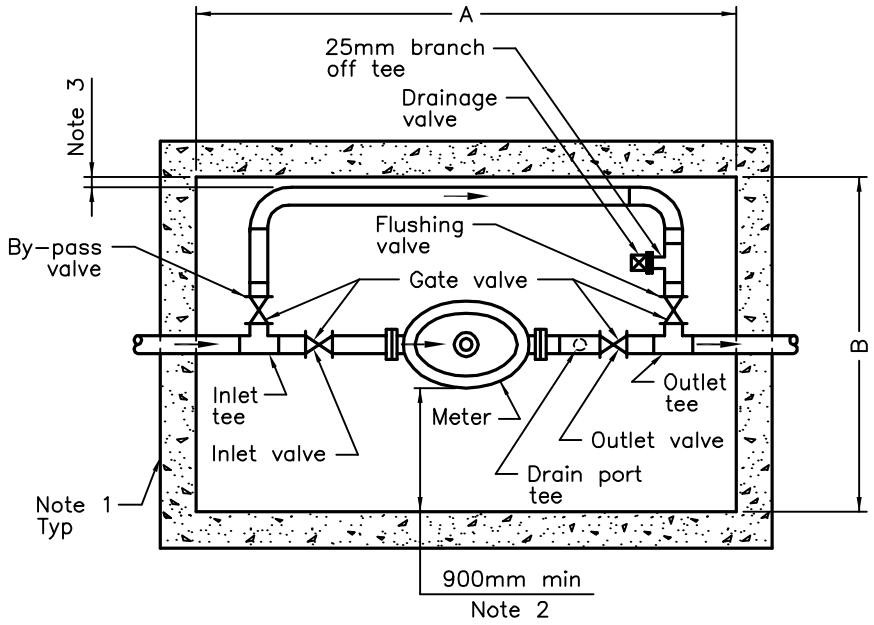
1 Circular chambers may be used, such that 100mm minimum clearances from any pipe to wall shall be maintained.

2 By–pass piping shall be installed with a minimum 300mm unobstructed clearance from the outside wall of the bypass pipe to the nearest wall.

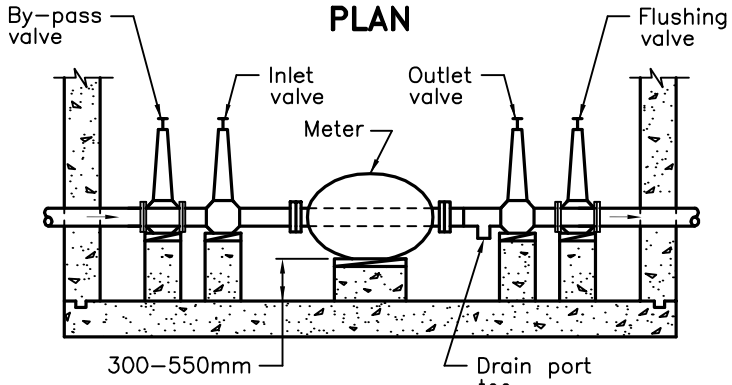
A By–pass line size shall be same size as the meter line.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| PIPING LAYOUT FOR WATER METERS 50mm AND SMALLER IN CHAMBERS | | | |
| | OPSD 1107.010 | | |




**PLAN**




**ELEVATION**

| Pipe and Chamber Size | | |
|---|---|---|
| Private water service pipe size mm | Minimum A m | Minimum B m |
| 75–100 | 3.5 | 2.3 |
| 150 | 4.3 | 2.5 |
| 200 | 5.0 | 2.7 |
| 250 | 6.0 | 3.0 |
| 300 | 6.6 | 3.2 |

NOTES:

1 Circular chambers may be used if clearances are maintained.

2 Water meters shall be installed with a minimum 900mm unobstructed clearance in front of water meter to the nearest wall.

3 By–pass piping shall be installed with a minimum 300mm unobstructed clearance from the outside wall of the bypass pipe to the nearest wall.

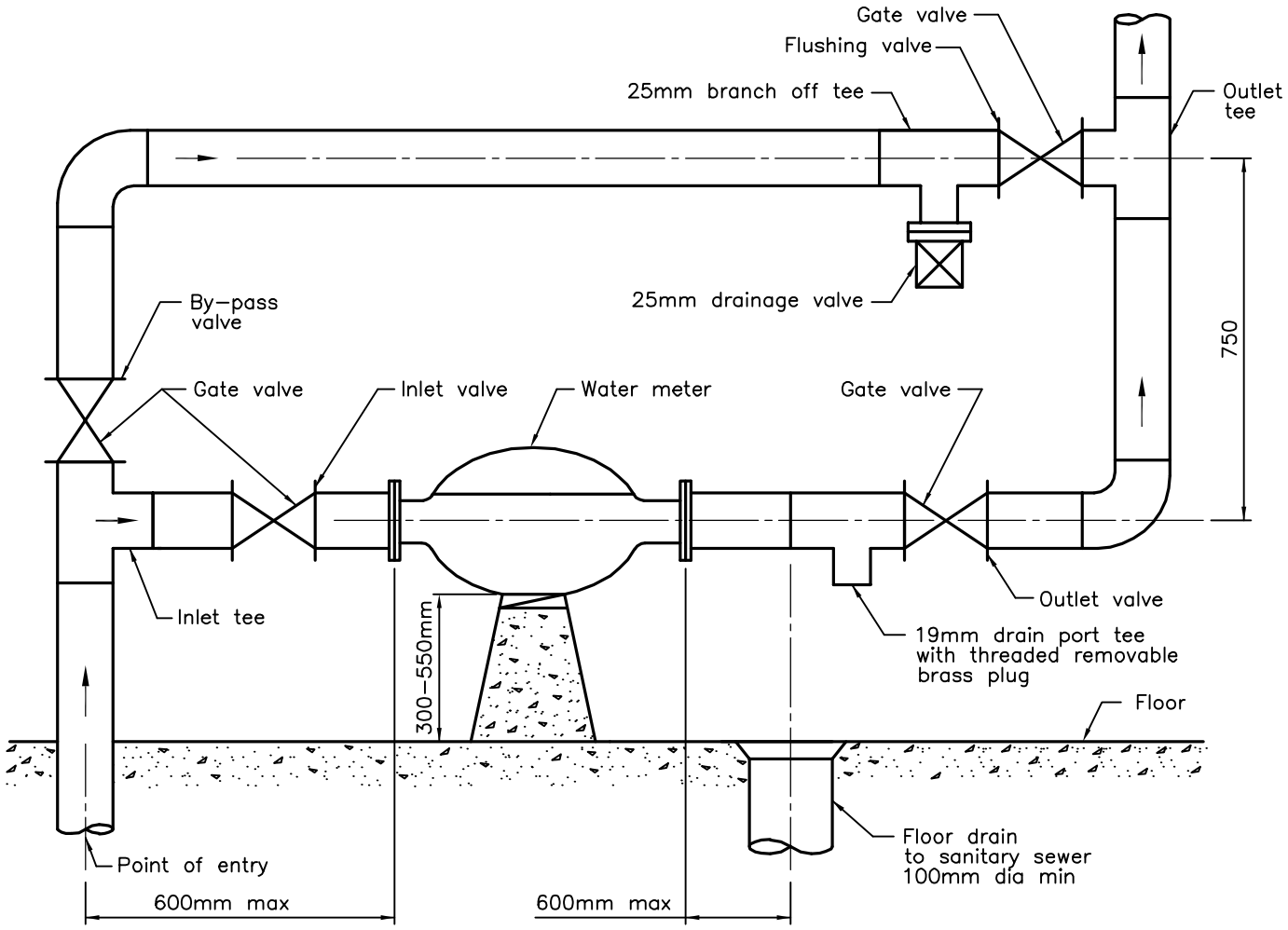
A A 75mm meter shall have 75mm to 100mm increasers on each side.

B By–pass line size shall be same size as the meter line.

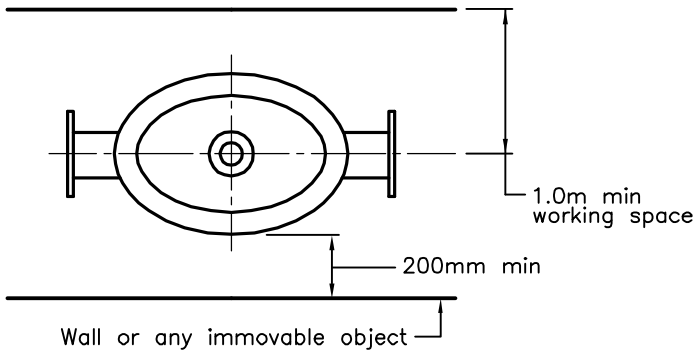
C All joints shall be restrained.

D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| PIPING LAYOUT FOR WATER METERS 75 TO 250mm IN CHAMBERS WITH BY–PASS | | | |
| | OPSD 1107.020 | | |




**SIDE VIEW**




**TOP VIEW OF METER**

NOTES:

A All joints shall be restrained. Pipes and valves shall be supported.

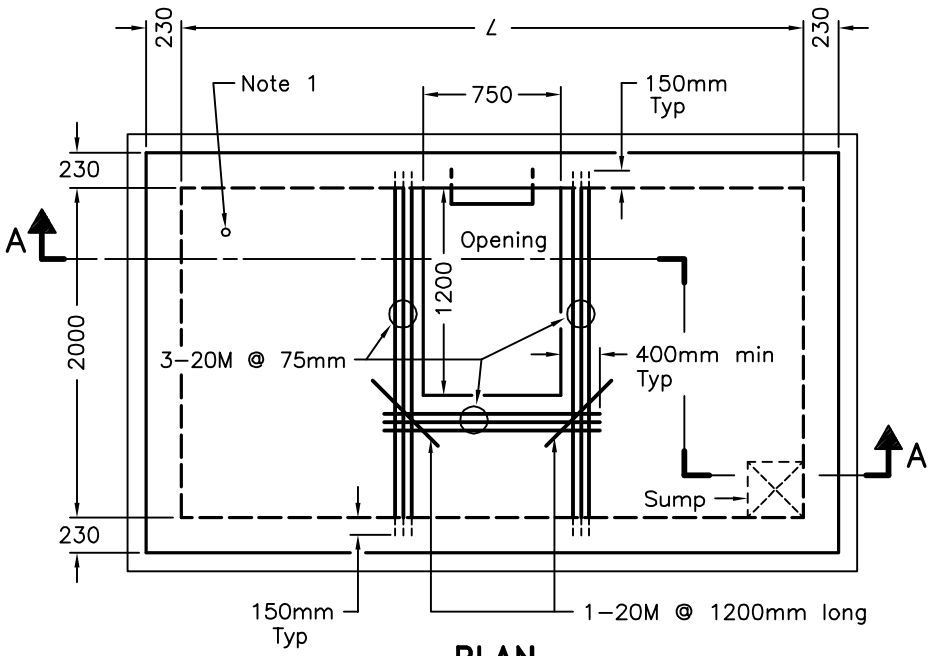
B Flanged fittings are required for all compound meters.

C By–pass line size shall be same size as the meter line.

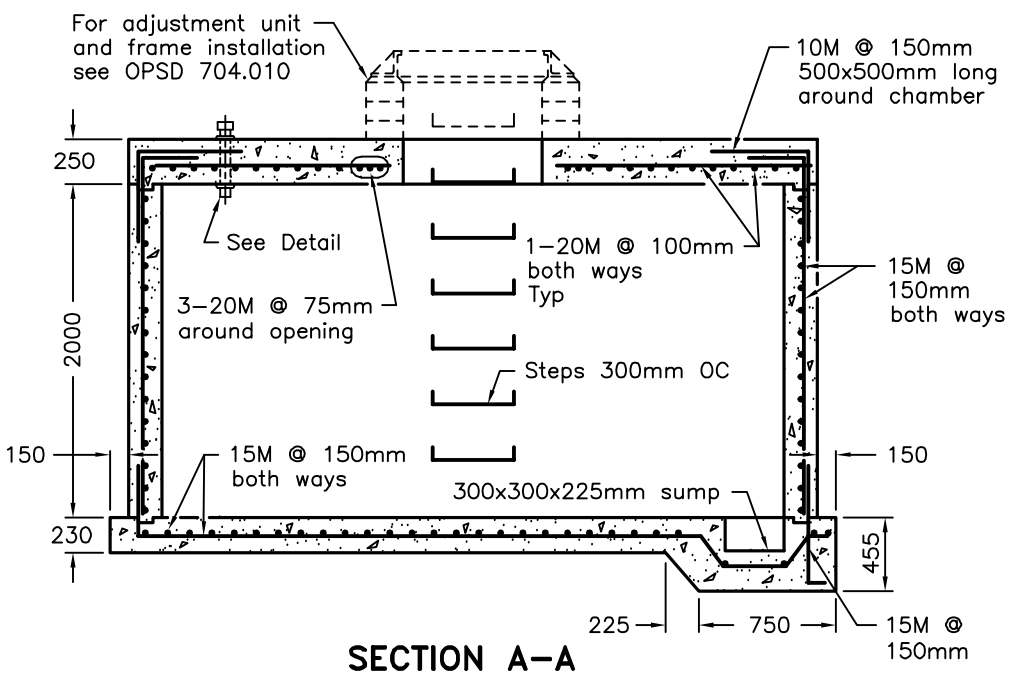
D Working space at the meter shall be a minimum of 2.0m in height.

E All dimensions are in millimetres unless otherwise shown.

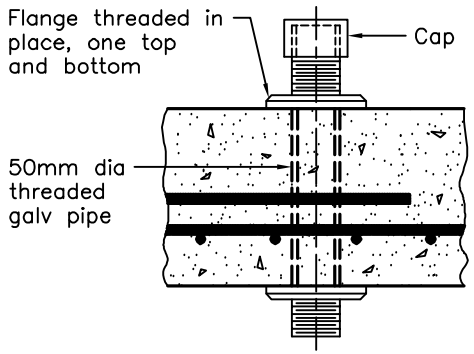
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| PIPING LAYOUT FOR WATER METERS IN BUILDING WITH BY–PASS | | | |
| | OPSD 1107.030 | | |




PLAN




SECTION A–A




DETAIL
REMOTE READER CABLE SLEEVE

| METER SIZE | L |
|---|---|
| 75 and 100 | 3400 |
| 150 | 3700 |
| 200 | 4100 |
| 250 | 4600 |

NOTES:

1 When specified, location of remote reader cable sleeve according to the Contract Documents.

A Reinforcing bars shall have minimum 50mm cover.

B Frame and cover shall be according to OPSD 402.030.

C Flexible sealant shall be used where pipe goes through the wall.

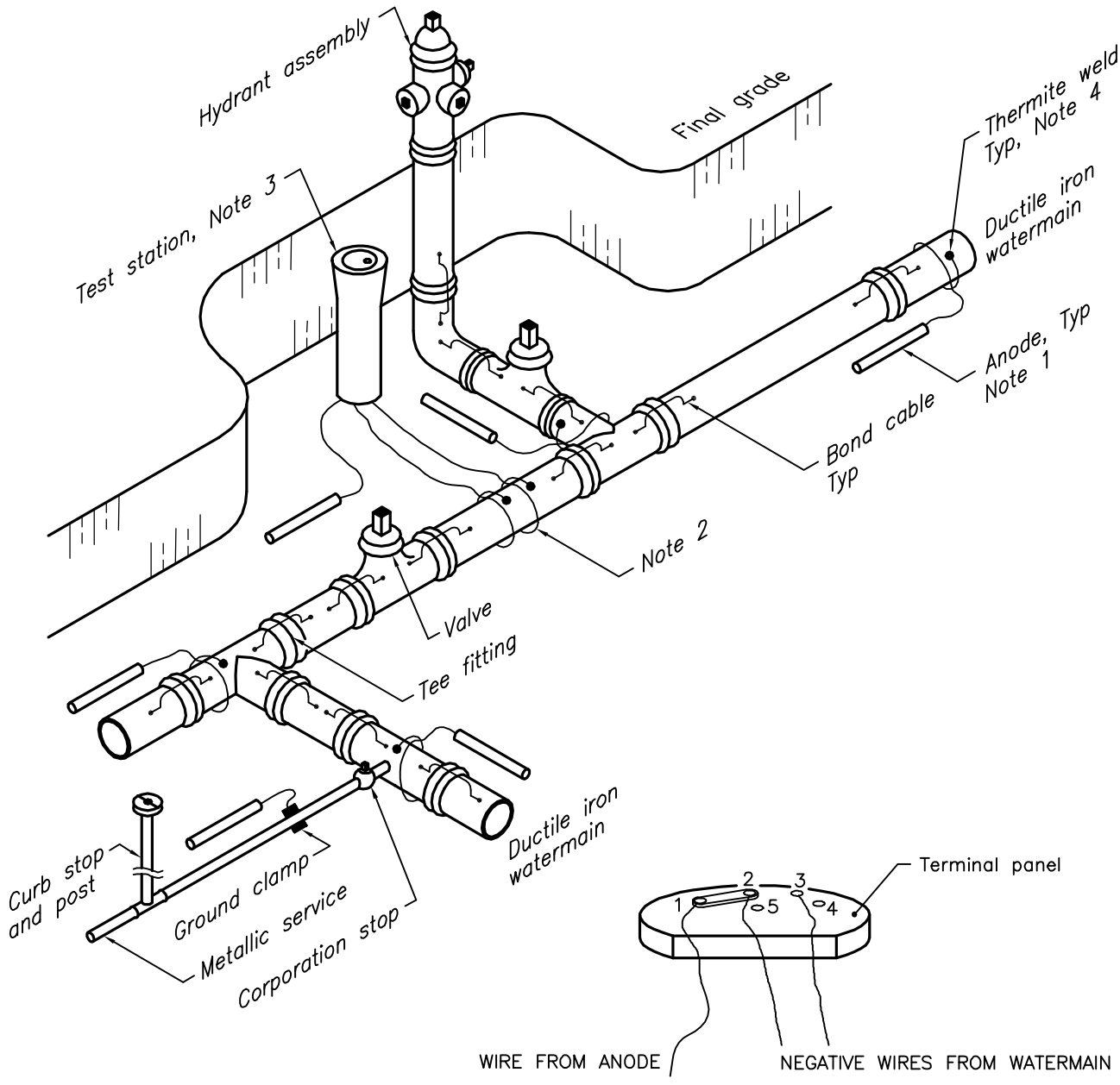
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# CAST–IN–PLACE WATER METER CHAMBER FOR 75 TO 250mm METERS

Nov 2013 | Rev 2

OPSD 1108.010

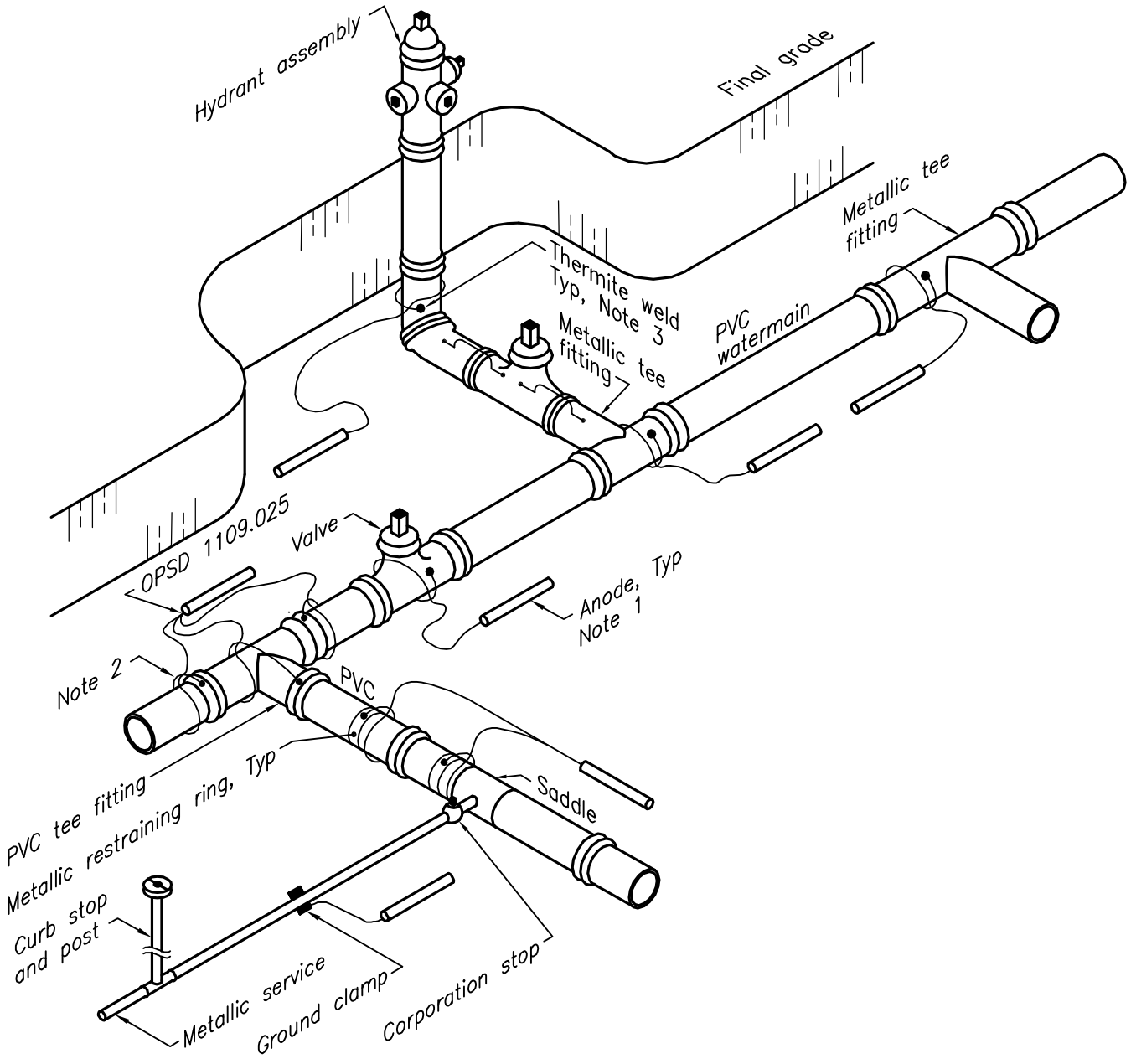



**WIRING DETAIL**
**IN TEST STATION**

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 wires shall be loosely wrapped around pipes and fittings and knotted.
3 The test station shall be set flush with the final grade as shown or post–mounted.
4 Protective coating shall be applied to all thermite welds.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| **CATHODIC PROTECTION FOR METALLIC WATERMAIN SYSTEMS** | | | |
| | **OPSD 1109.010** | | |



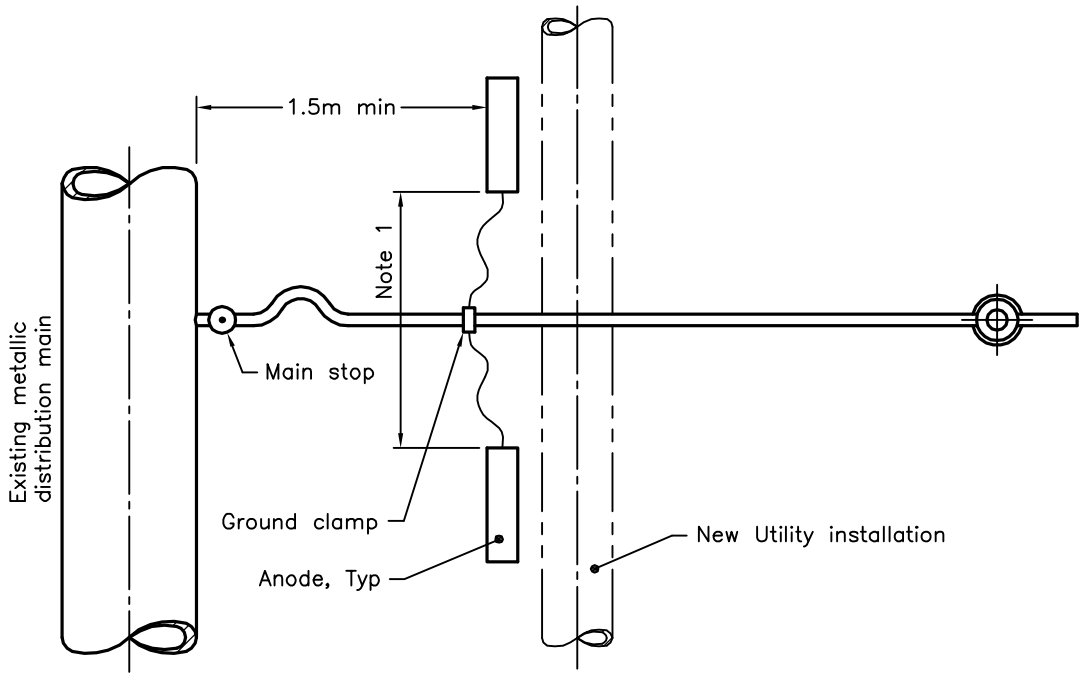

NOTES:

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.

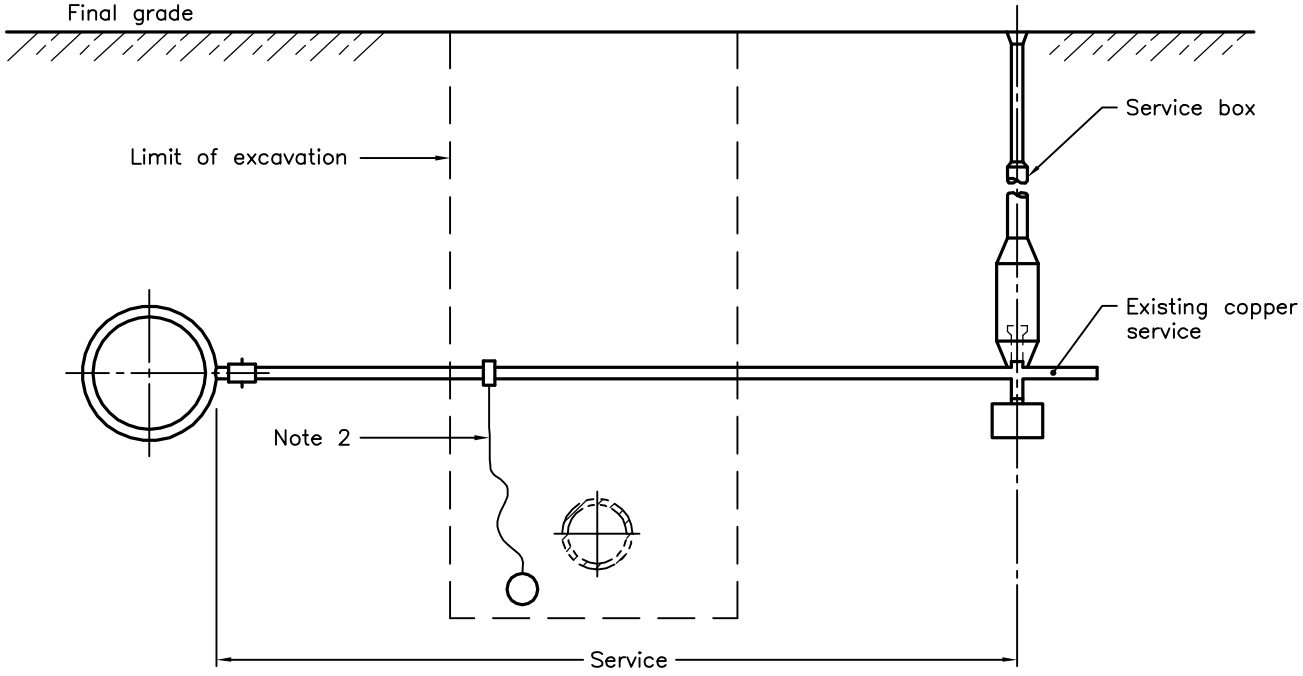
2 Anode connecting wire shall be loosely wrapped around pipes and fittings and knotted.

3 Protective coating shall be applied to all thermite welds.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS | | | |
| | OPSD 1109.011 | | |




**PLAN**




**ELEVATION**

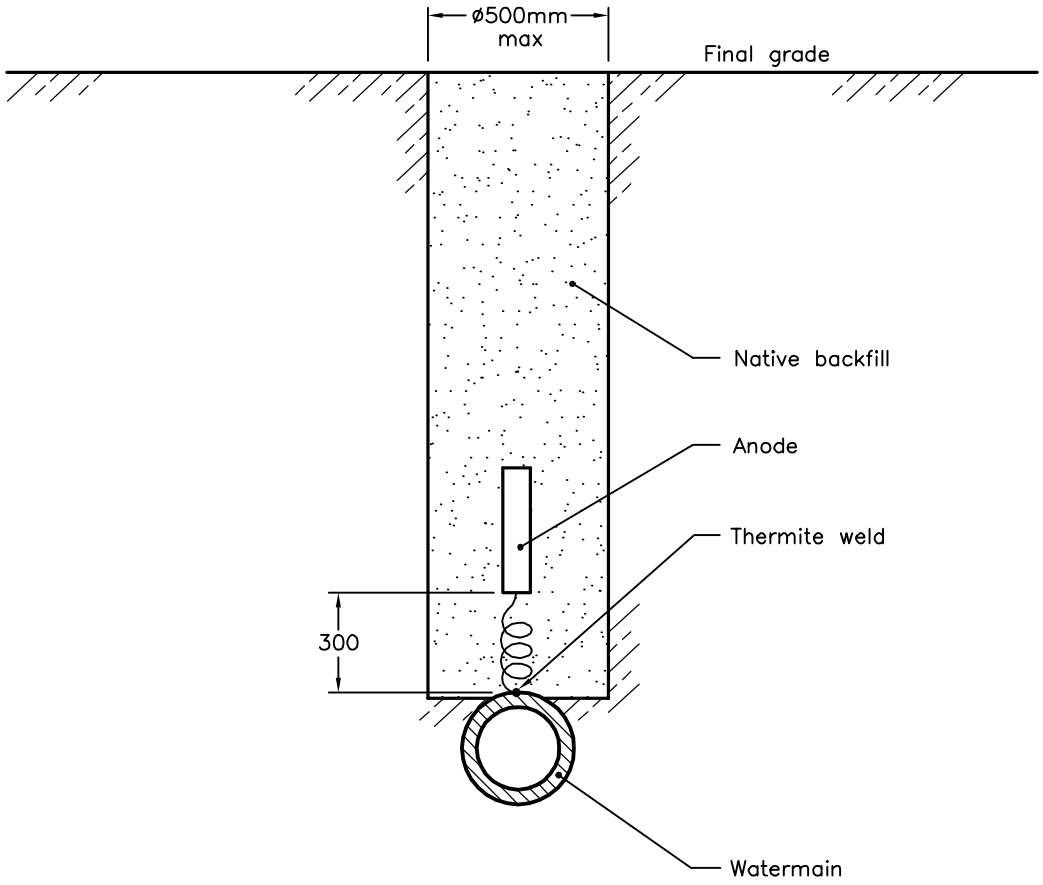
NOTES:

1 Anodes shall be spaced as far apart as anode wires and excavation permit.

2 When the watermain is exposed, the connection may be made with a thermite weld on the existing watermain.

A All dimensions are in metres unless otherwise shown.

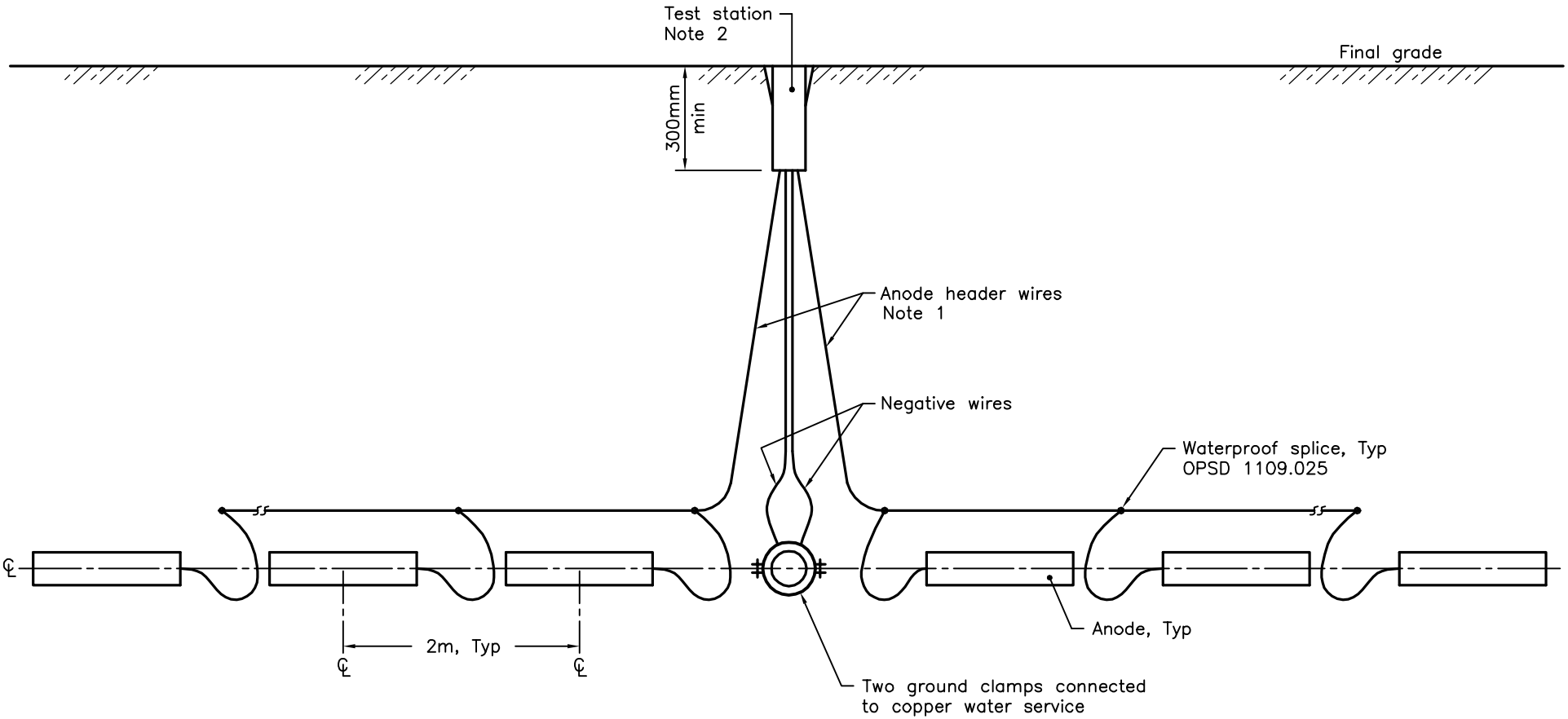
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| CATHODIC PROTECTION OF EXISTING METALLIC WATERMAINS EXPOSED SERVICE OR PIPE METHOD | | | |
| | OPSD 1109.012 | | |




NOTES:

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| ANODE INSTALLATION<br>OVER PIPE METHOD<br>FOR EXISTING METALLIC WATERMAINS | | | |
| | OPSD 1109.013 | | |




NOTE:

1 Header wire shall not be cut during splicing.

2 Test station shall be flush–mounted or pole–mounted, as specified.

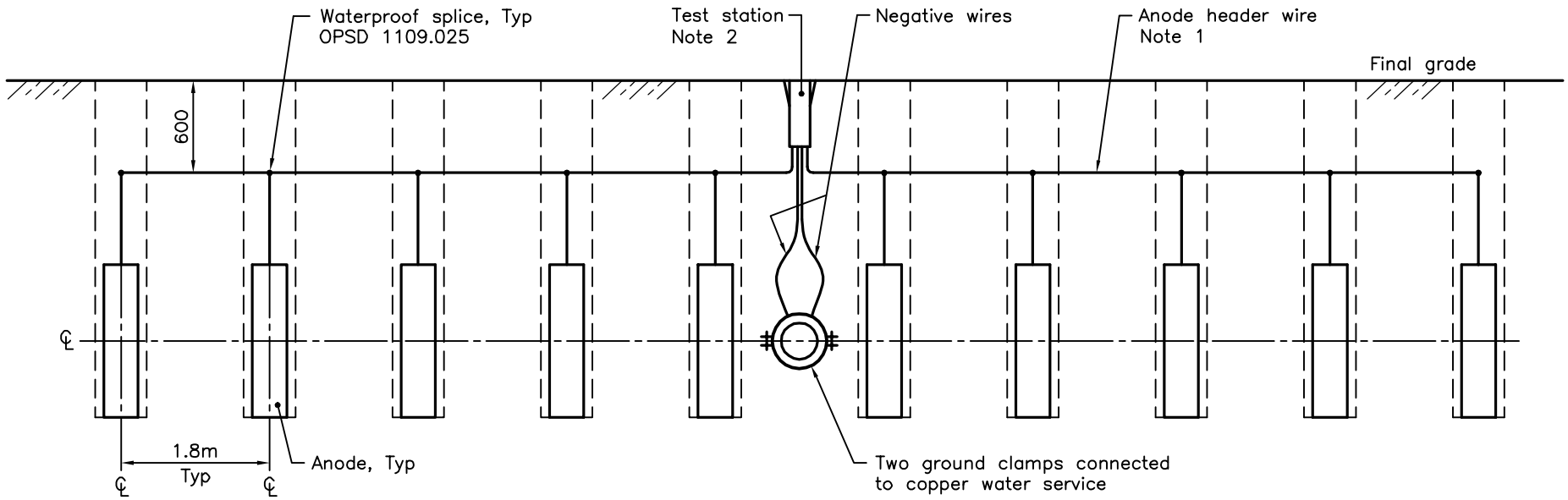
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

# HORIZONTAL ANODE BANK AT SERVICE

Nov 2015 | Rev 1

OPSD 1109.014



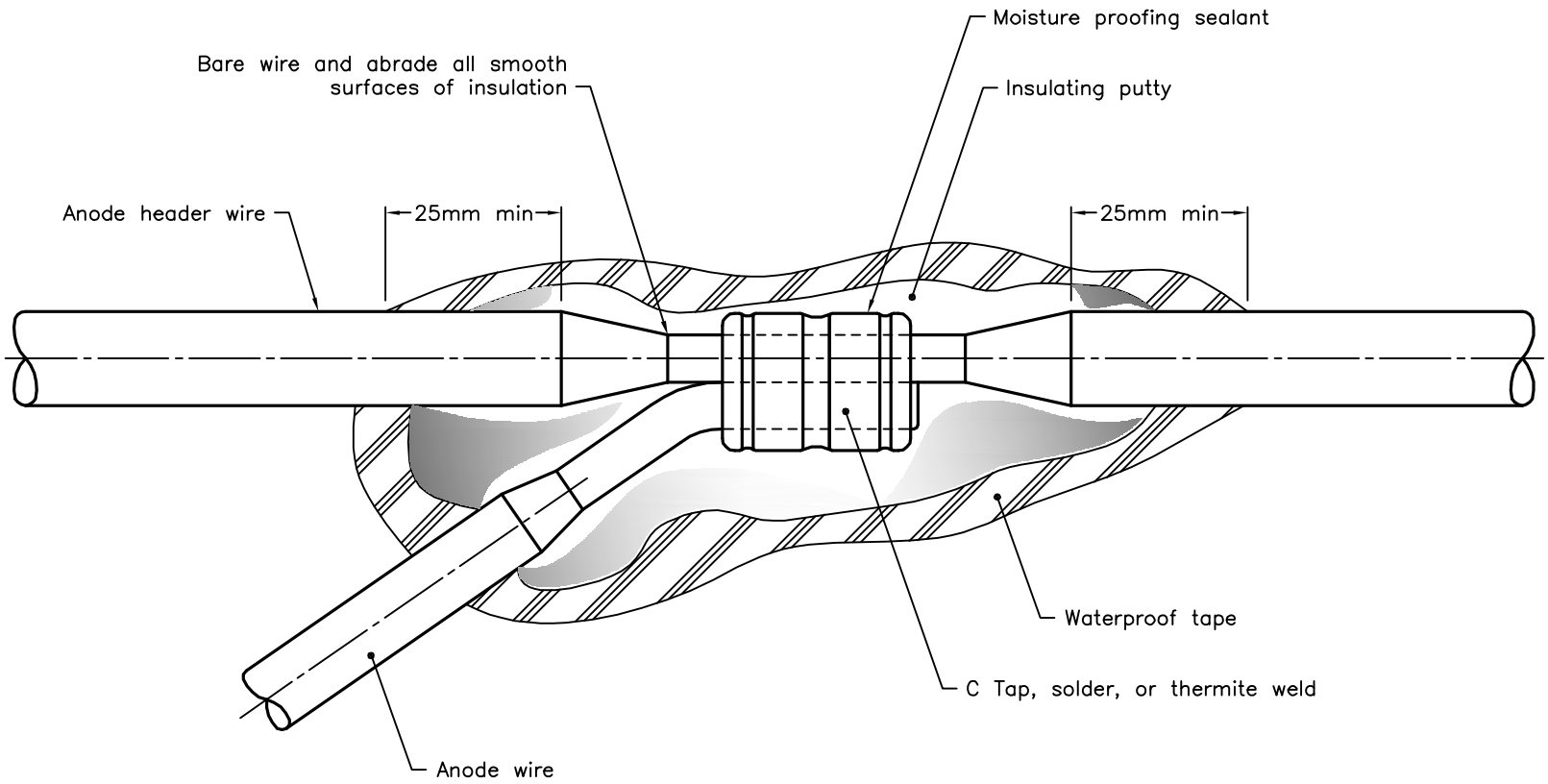

NOTE:

1 Header wire shall not be cut during splicing.

2 Test station shall be flush–mounted or pole–mounted, as specified.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 1 |
|---|---|---|---|
| VERTICAL ANODE BANK AT SERVICE | | | |
| | OPSD 1109.015 | | |



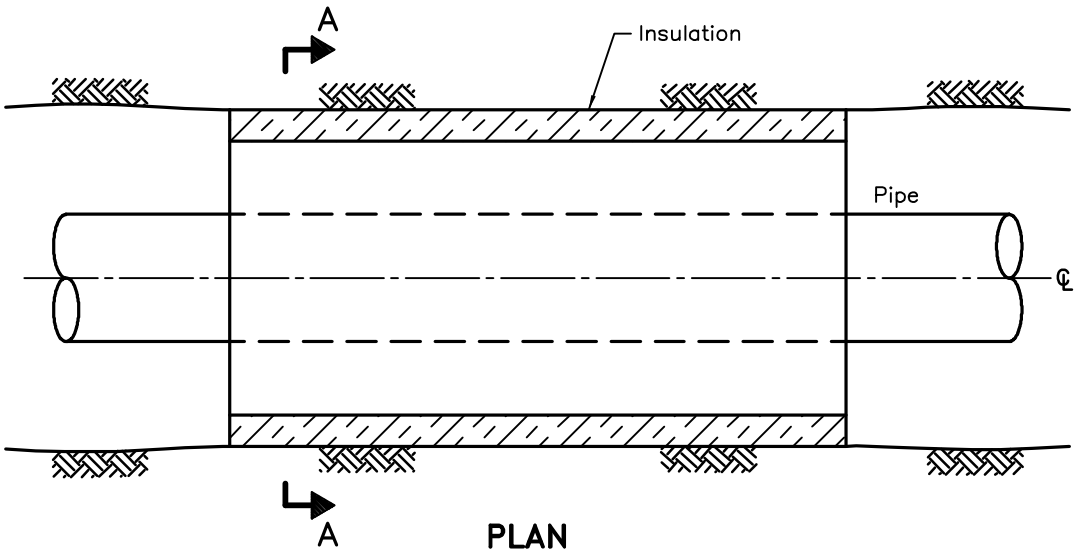

NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

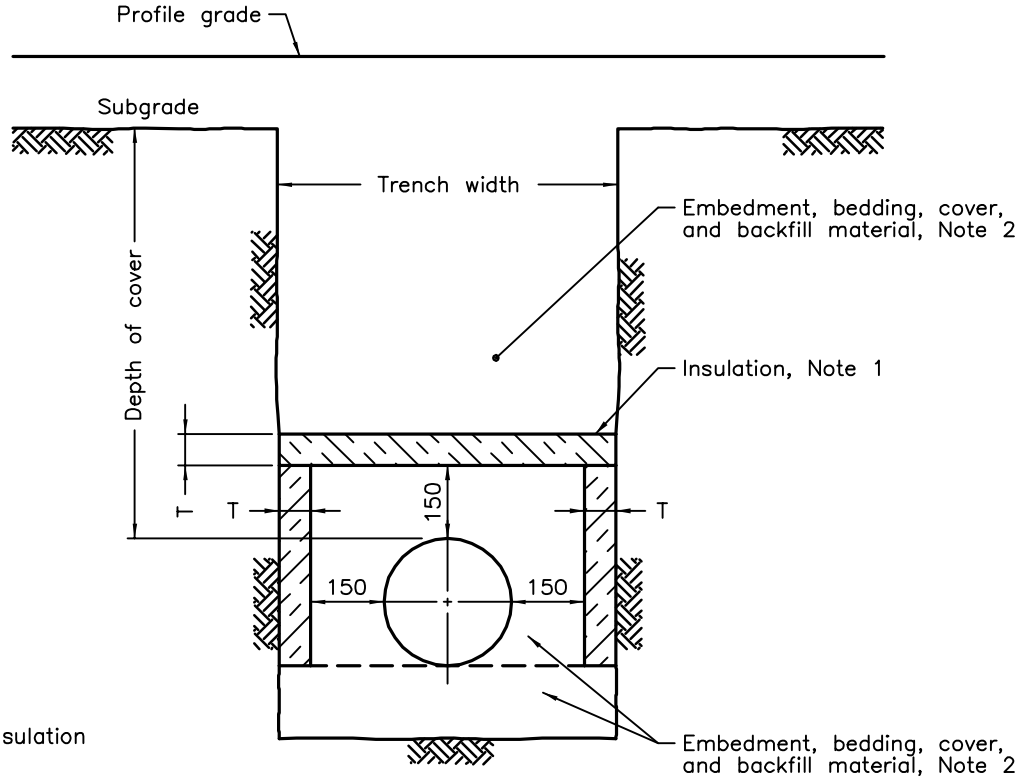
# WATERPROOFING OF SPLICES

Nov 2015 | Rev 1

OPSD 1109.025




PLAN




T = thickness of insulation

SECTION A–A
TYPICAL PIPE INSULATION DETAIL

NOTES:

1 The insulation material shall be extruded polystyrene according to OPSS 1605 with a minimum compressive strength of 275 kPa.

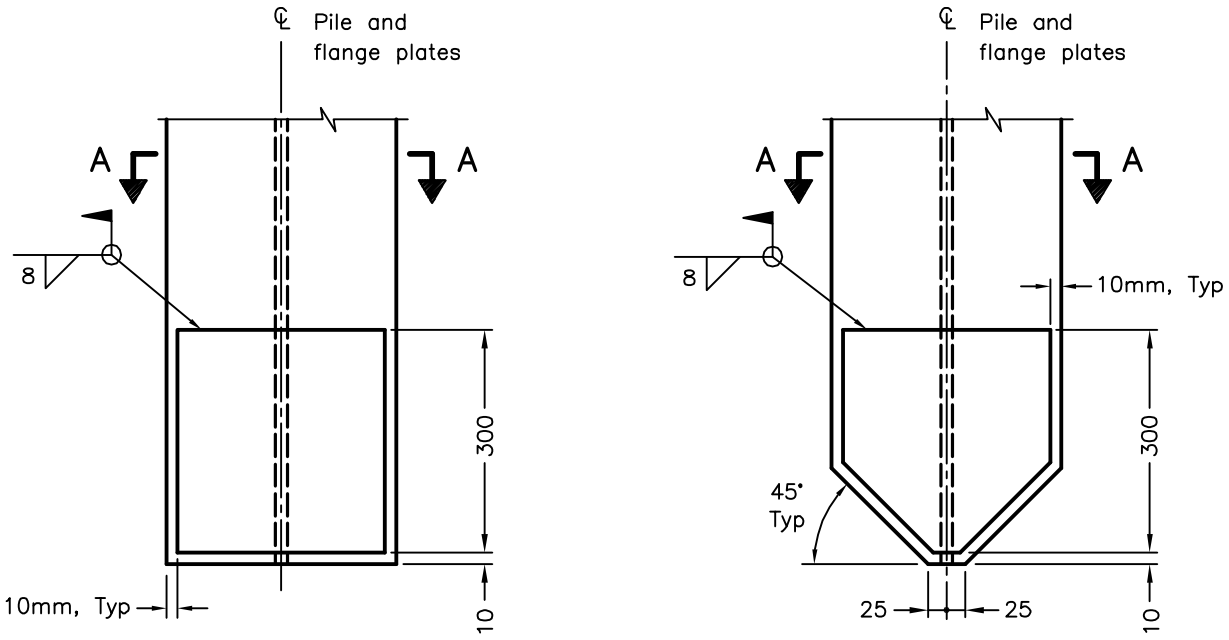
2 Pipe embedment or bedding, cover, and backfill shall be according to:
a) Flexible OPSD 802.010, 802.013, 802.020, and 802.023.
b) Rigid – OPSD 802.030, 802.031, 802.032, 802.033, 802.050, 802.051, 802.052, and 802.053.

A Minimum insulation thickness shall be 50mm.

B Joints shall be staggered for multiple insulation sheets.

C All dimensions are in millimetres unless otherwise shown.

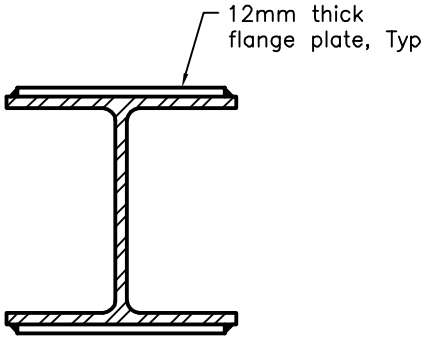
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| INSULATION FOR SEWERS AND WATERMAINS IN SHALLOW TRENCHES | | | |
| | OPSD 1109.030 | | |




TYPE I

TYPE II

**ELEVATION**




**PILE DRIVING SHOE**

**SECTION A–A**

NOTES:

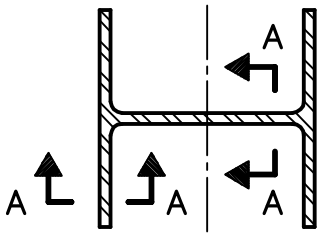
A Flange plates shall be according to CSA G40.20/G40.21, Grade 300W.

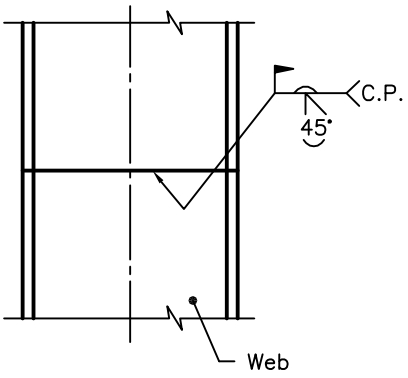
B Welding shall be according to CSA W59.

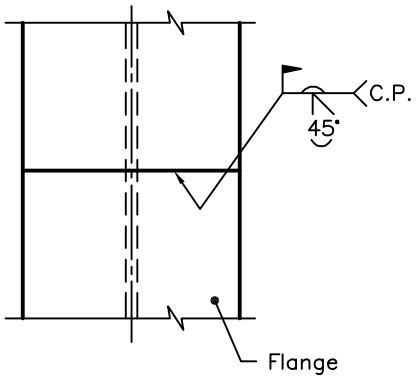
C Driving shoe Type I shall be used unless Type II is specified.

D All dimensions are in millimetres unless otherwise shown.

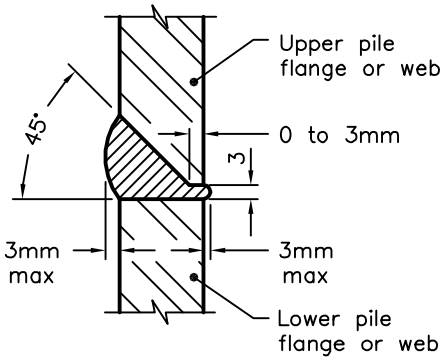
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| FOUNDATION<br>PILES<br>STEEL H–PILE DRIVING SHOE | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 3000.100 | | |



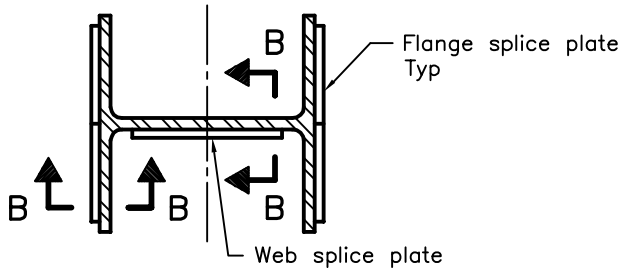



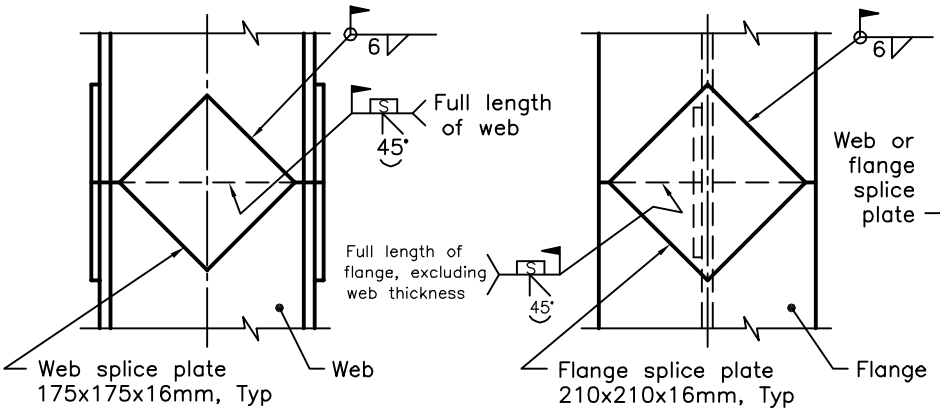




**BUTT WELD**

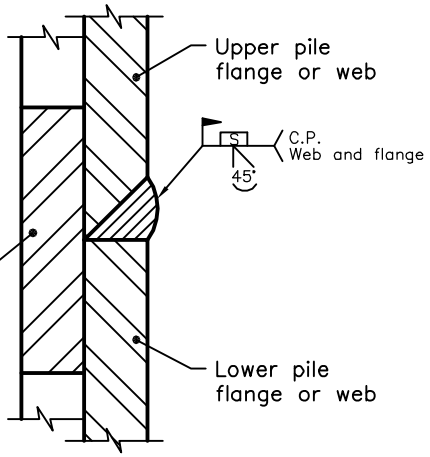



**SECTION A–A**




**BUTT WELD WITH SPLICE PLATES**

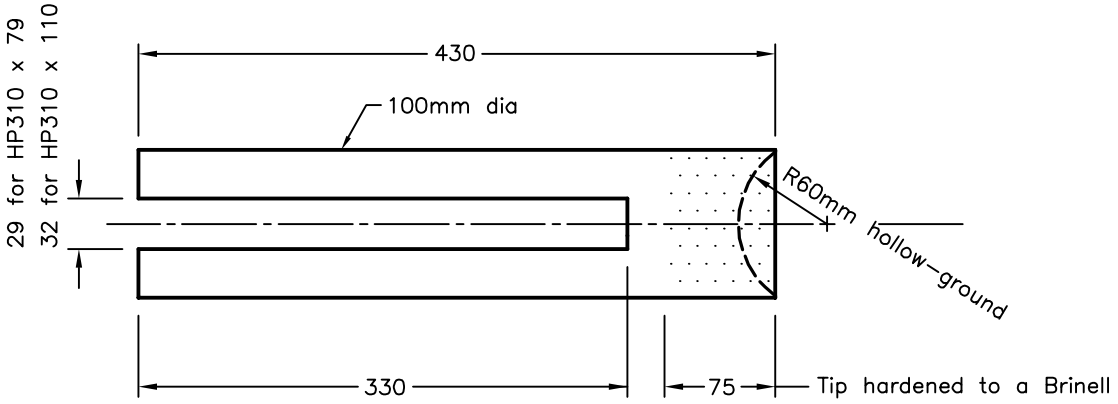



**SECTION B–B**

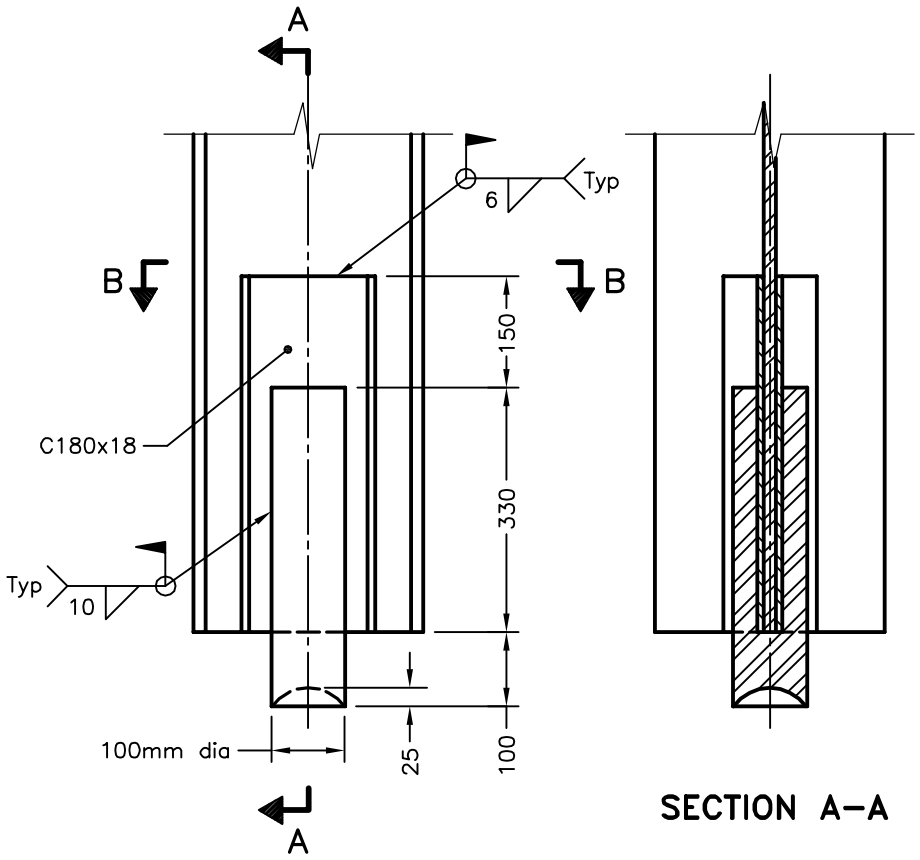
NOTES:

A The pile splice shall be perpendicular to the centreline of pile.
B Splice plates shall be according to CSA G40.20/G40.21, Grade 300W.
C Welding shall be according to CSA W59.
D Splice plate alternative is only applicable to H–pile sizes HP310x79, HP310x110, and HP310x132.
E All dimensions are in millimetres unless otherwise shown.

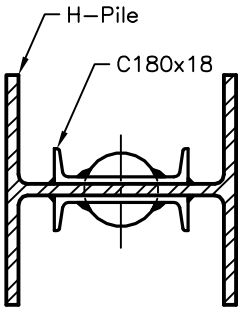
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| **FOUNDATION**<br>**PILES**<br>**STEEL H–PILE SPLICE** | | | |
| | **OPSD 3000.150** | | |




**PILE POINT**




**SECTION A–A**




**SECTION B–B**

NOTES:

A Material for the 100mm dia pile point shall be according to ASTM A 576 UNS designation G10450.

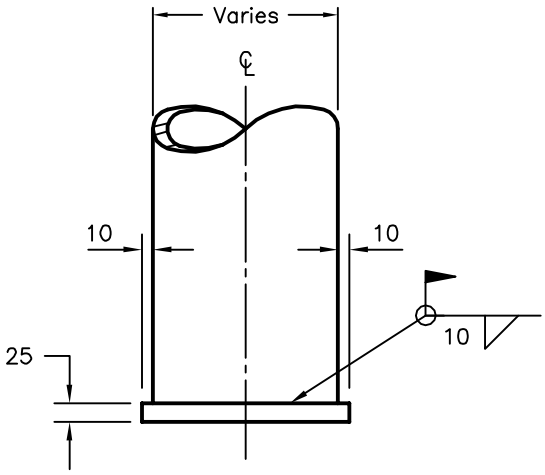
B Welding shall be according to CSA W59.

C Each pile point tip shall be pre–tested by an approved testing laboratory to establish the Brinell hardness and a certificate stating the hardness shall be affixed to each point.

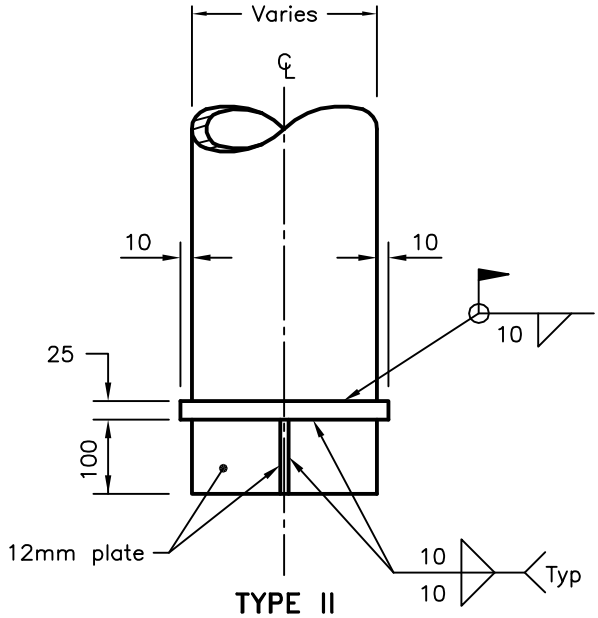
D C180x18 shall be according to CSA G40.20/G40.21, Grade 300W.

E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| FOUNDATION<br>PILES<br>STEEL HP 310 OSLO POINT | | | |
| | OPSD 3000.201 | | |

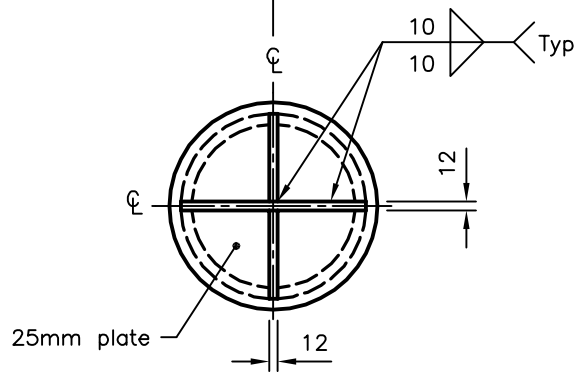



TYPE I




TYPE II

## SHOE DETAILS

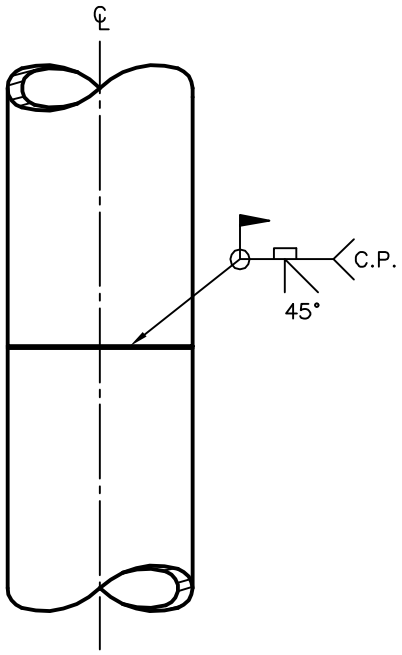



BOTTOM VIEW

NOTES:

A Driving shoe Type I or II as specified.
B Welding shall be according to CSA W59.
C Steel plates shall be according to CSA G40.20/G40.21, Grade 300W.
D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| FOUNDATION<br>PILES<br>STEEL TUBE PILE DRIVING SHOE | | | |
| | OPSD 3001.100 | | |

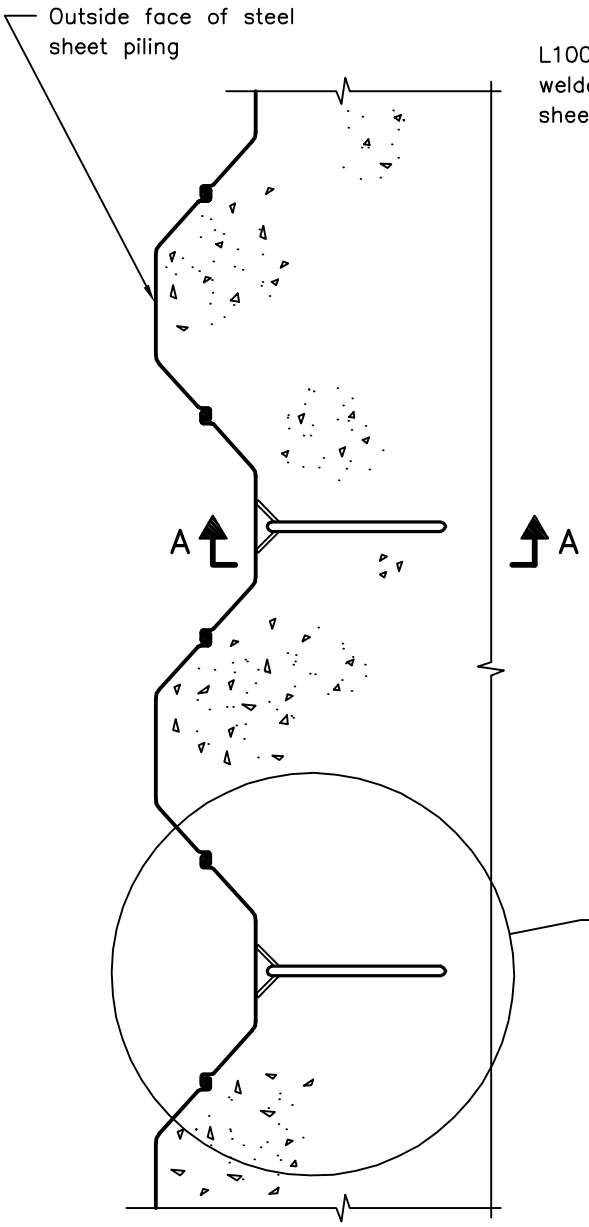



**SPLICE DETAILS**

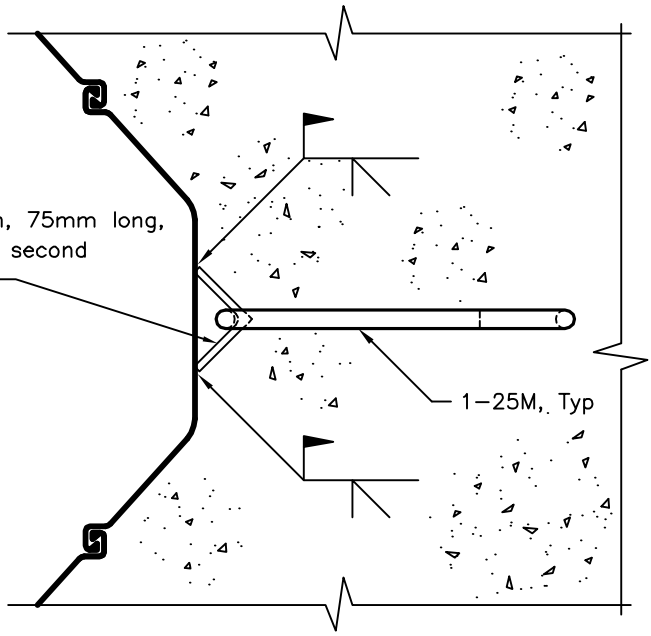
NOTES:

A Splice weld shall be full penetration butt weld perpendicular to centreline of pile.

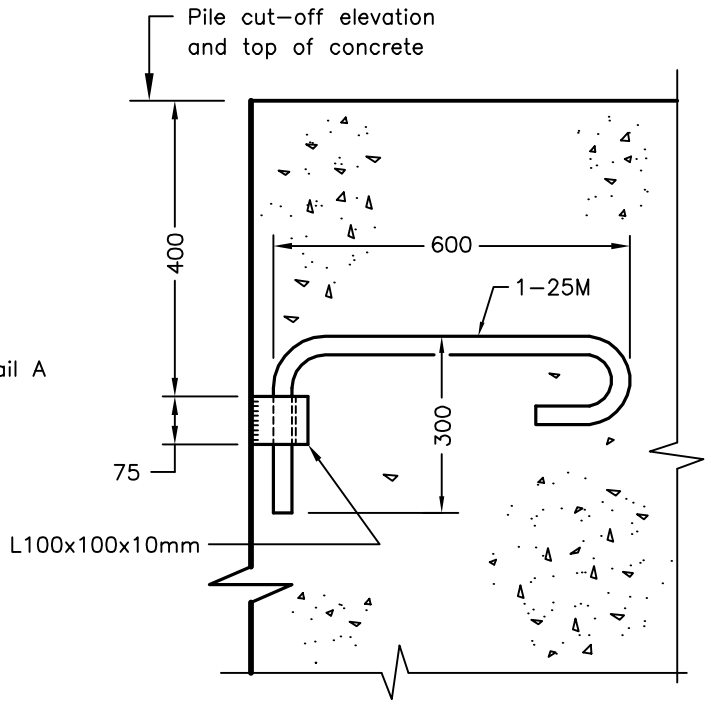
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| FOUNDATION<br>PILES<br>STEEL TUBE PILE SPLICE | | | |
| | OPSD 3001.150 | | |




PLAN




DETAIL A




SECTION A–A

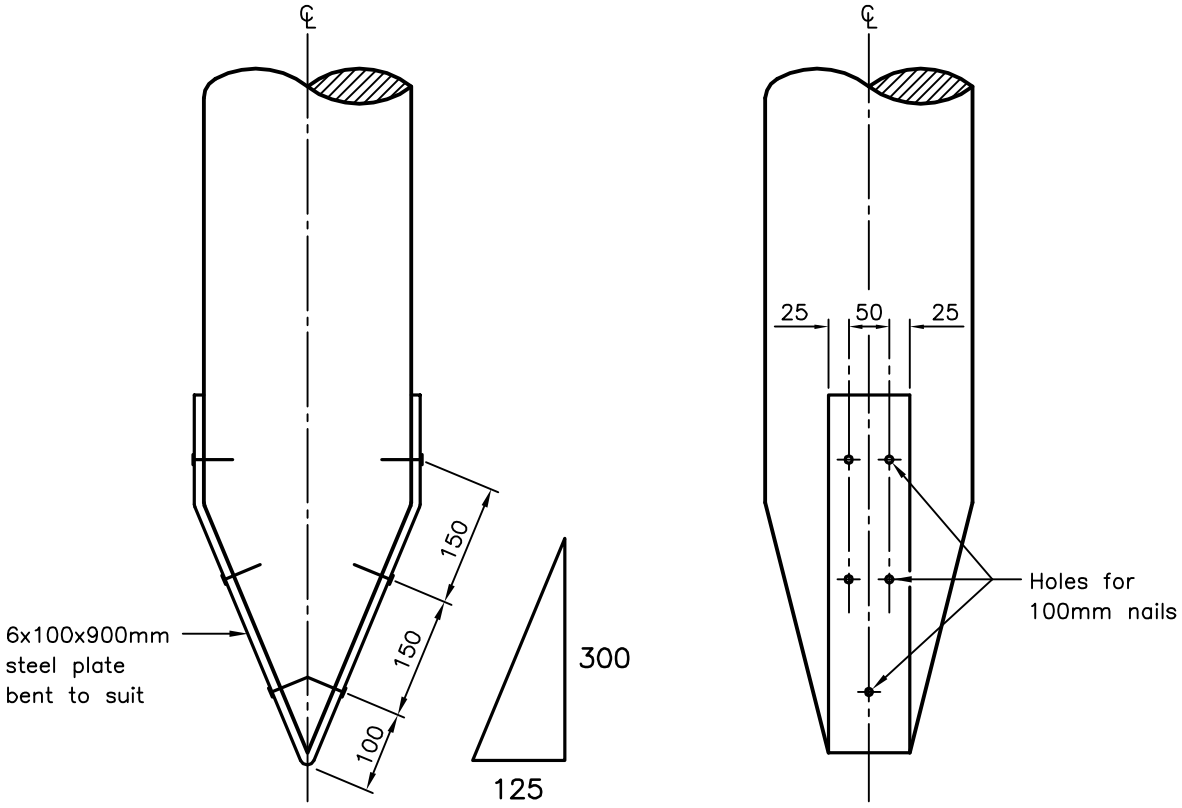
NOTES:

A Welding shall be according to CSA W59.

B Steel for structural angle shall be according to CSA G40.20/G40.21, Grade 300W.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| FOUNDATION<br>PILES<br>STEEL SHEET PILE ANCHORAGE | | | |
| | OPSD 3002.200 | | |

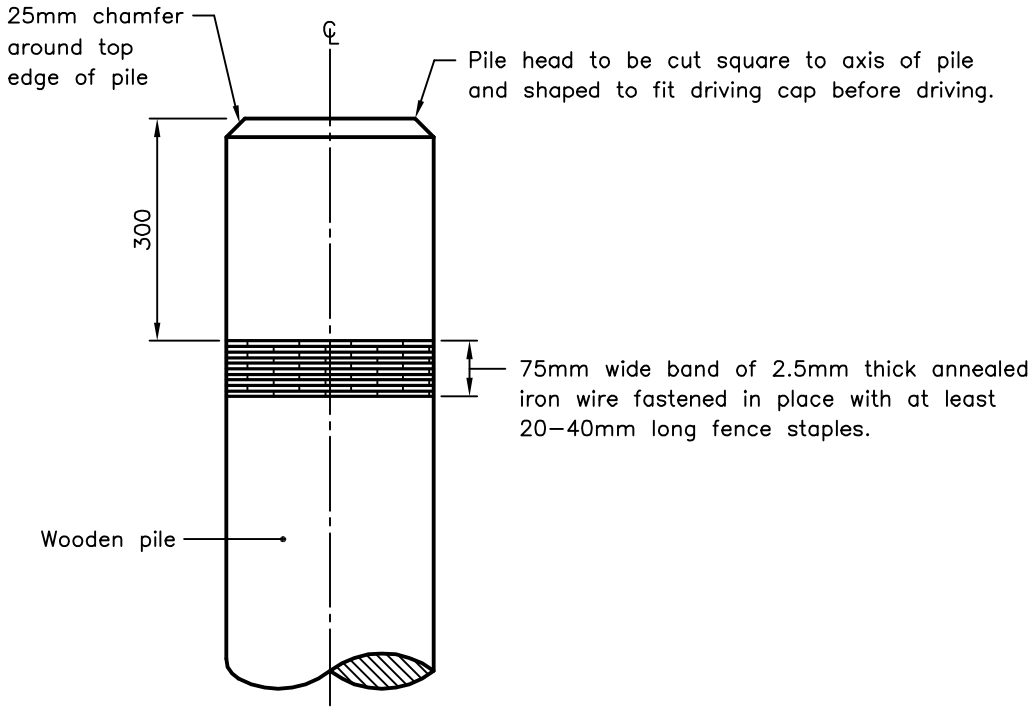



NOTE:

A Steel plate shall be according to CSA G40.20/G40.21, Grade 300W.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| FOUNDATION<br>PILES<br>WOODEN PILE DRIVING SHOE | | | |
| | OPSD 3003.100 | | |




NOTE:

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| FOUNDATION<br>PILES<br>WOODEN PILE HEAD PROTECTION | _ _ _ _ _ _ _ _ _ _<br>_ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 3003.150 | | |

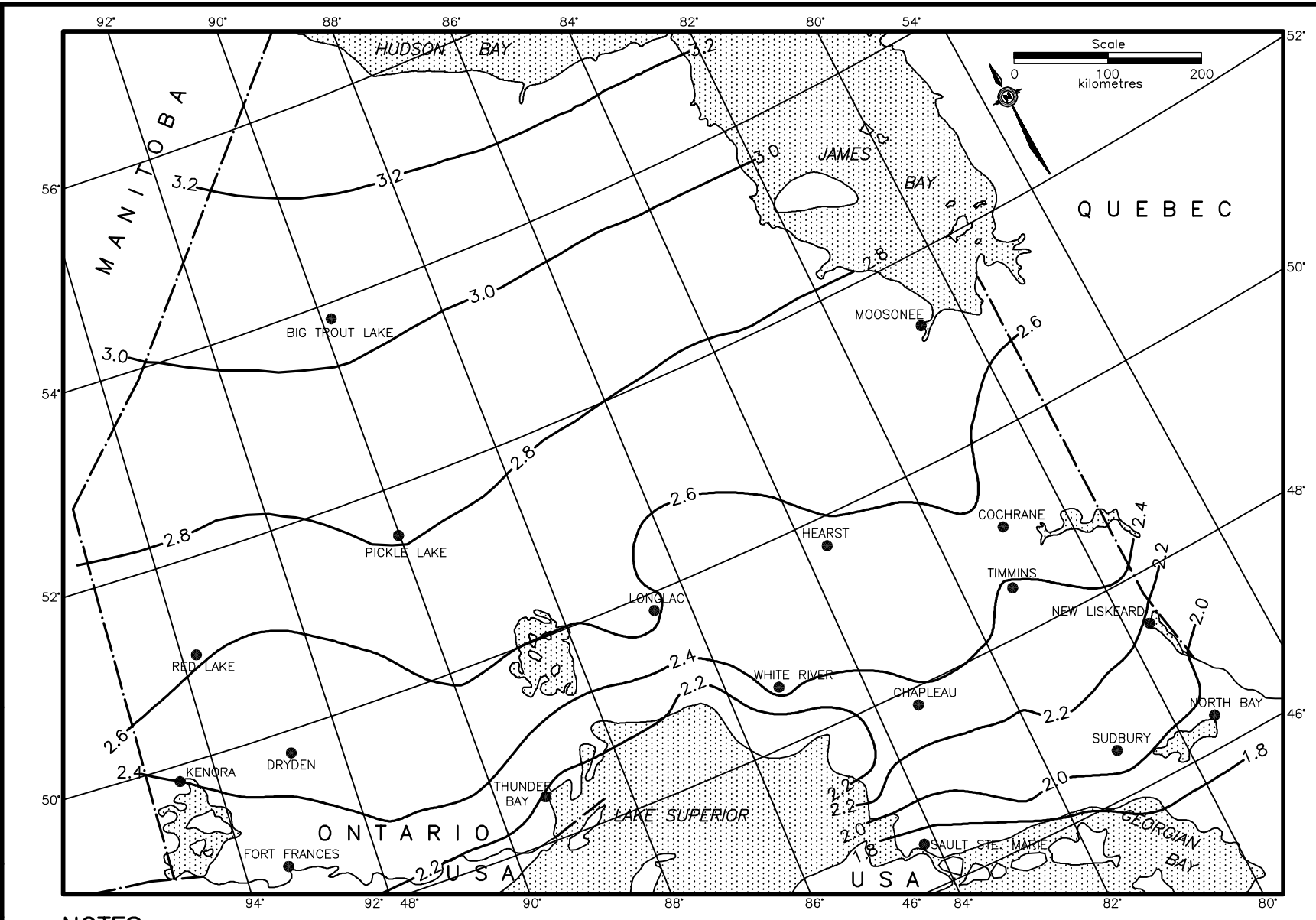
# FOUNDATION
# FROST PENETRATION DEPTHS
# FOR NORTHERN ONTARIO

ONTARIO PROVINCIAL STANDARD DRAWING

OPSD 3090.100

Nov 2010

Rev 1




## NOTES:

A These values are approximate and should only be used where the recommendations of a geotechnical engineer are not available.

B This information is based on the Ministry of Transportation and Communications Research Publication RR225 "Aspects of Prolonged Exposure of Pavements to Sub–Zero Temperatures" dated December 1981.

C Values between contours should be interpolated. If interpolation is not possible, use the adjacent contour with the greater depth.

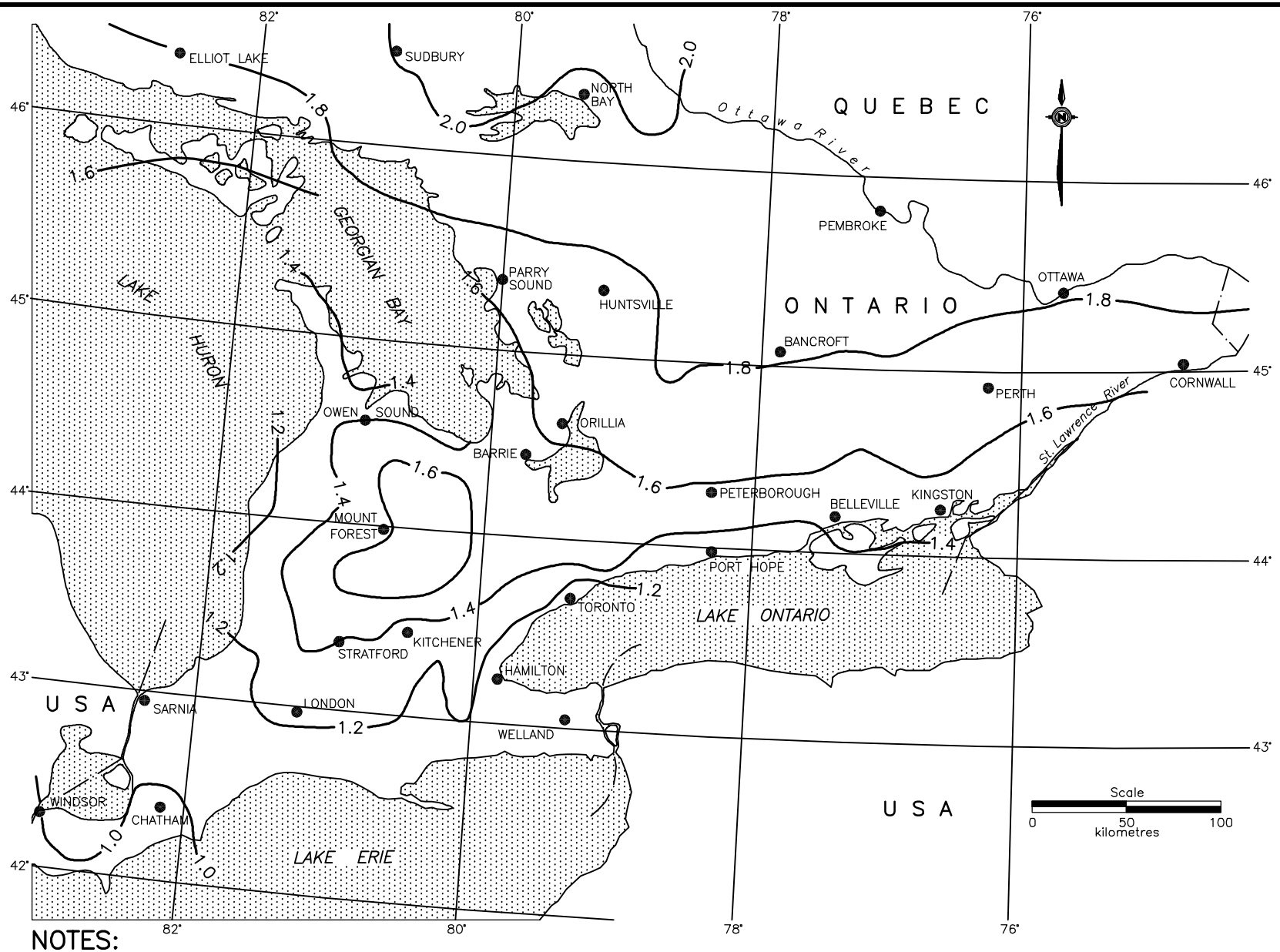
D Frost penetration depths are in metres.

# FOUNDATION
# FROST PENETRATION DEPTHS
# FOR SOUTHERN ONTARIO

ONTARIO PROVINCIAL STANDARD DRAWING

| Nov 2010 | Rev | 1 |
|---|---|---|

OPSD 3090.101



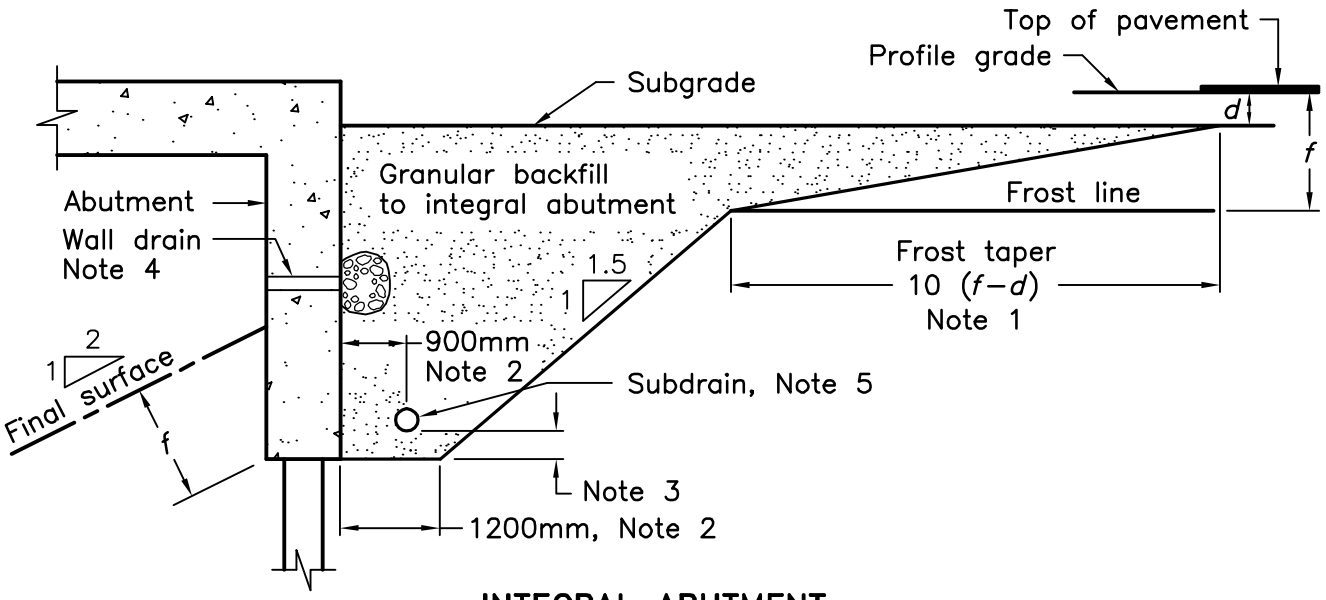

## NOTES:

A These values are approximate and should only be used where the recommendations of a geotechnical engineer are not available.

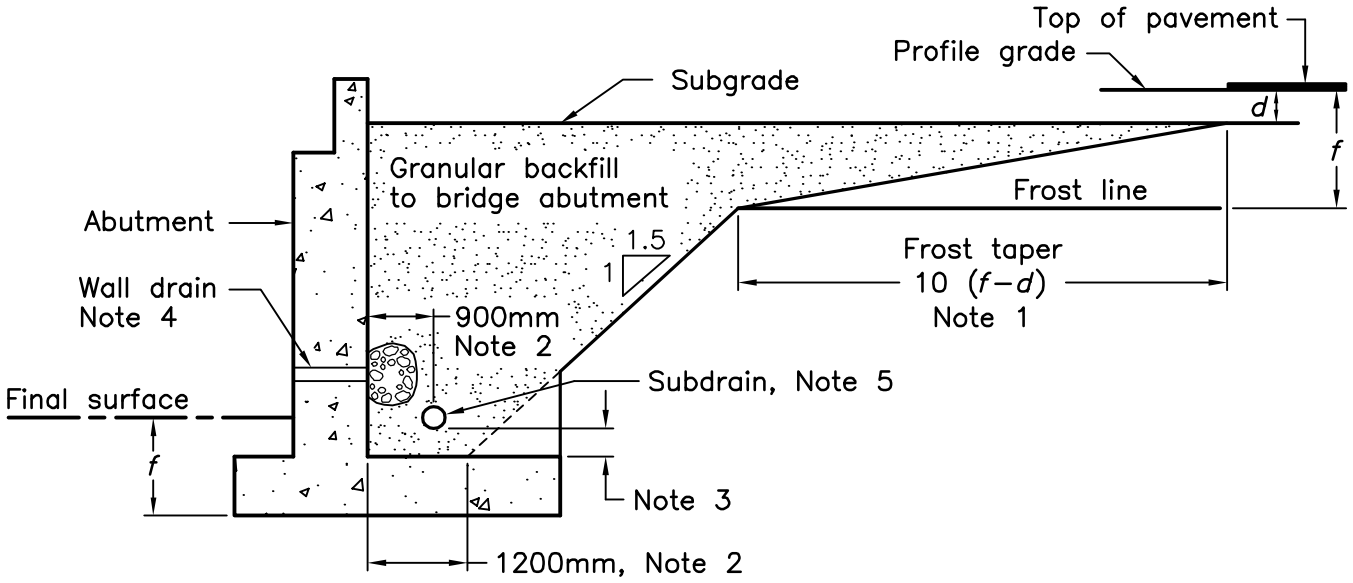
B This information is based on the Ministry of Transportation and Communications Research Publication RR225 "Aspects of Prolonged Exposure of Pavements to Sub–Zero Temperatures" dated December 1981.

C Values between contours should be interpolated. If interpolation is not possible, use the adjacent contour with the greater depth.

D Frost penetration depths are in metres.




**INTEGRAL ABUTMENT**




**ABUTMENT**

NOTES:

1 $d$ = depth of combined base and subbase courses
$f$ = frost penetration depth as specified

2 Dimensions perpendicular to back face of abutment.

3 Height to be consistent with positive drainage of subdrain as specified.

4 Where specified, wall drains shall be installed according to OPSD 3190.100.

5 150mm dia perforated pipe subdrain wrapped with geotextile.

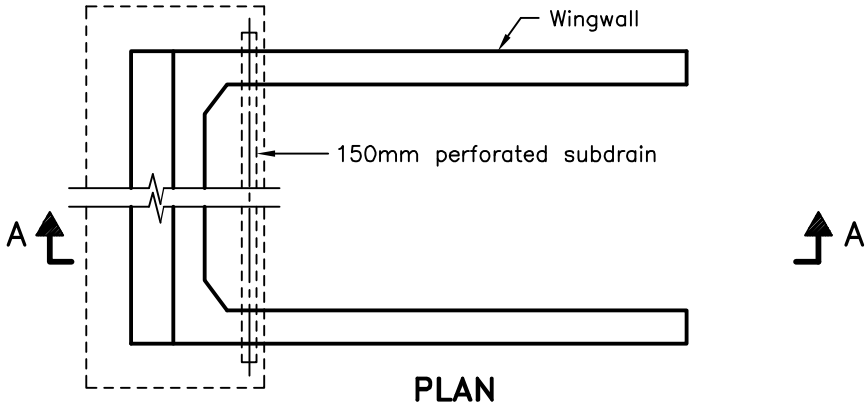
A Lateral limits of granular backfill to bridge abutment to be inside face to inside face of retaining wall or wingwall. Frost taper shall extend the full width of the backfill unless interrupted by the retaining wall or wingwall.

B Sections shown are parallel to centreline of roadway.

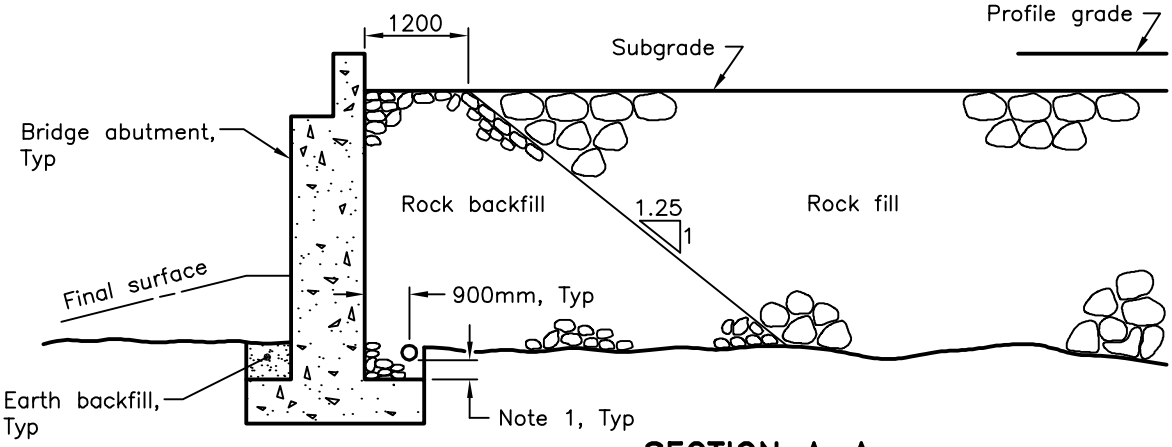
C Subdrain shall be installed with a 2% gradient behind wall.

D All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| **WALLS**<br>**ABUTMENT, BACKFILL**<br>**MINIMUM GRANULAR REQUIREMENT** | | | |
| | **OPSD 3101.150** | | |

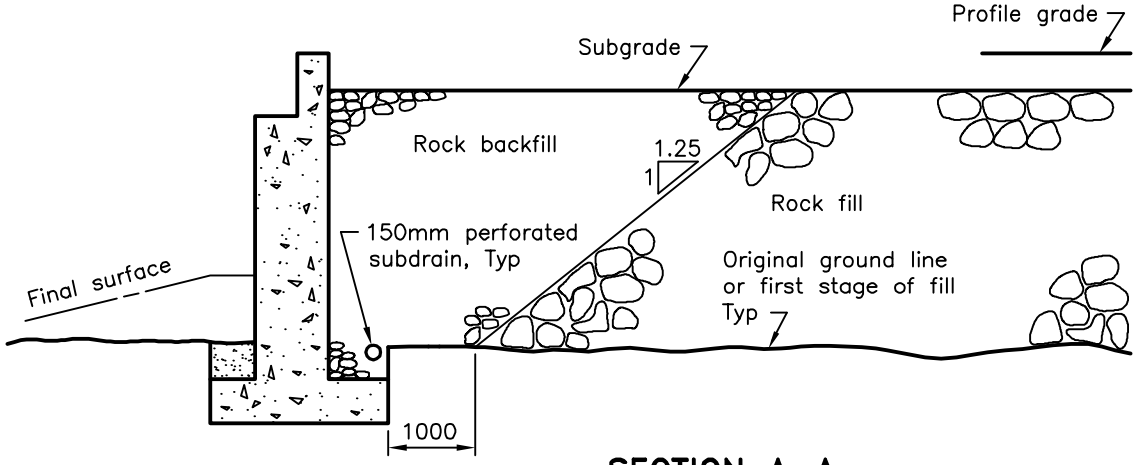



PLAN




SECTION A–A

ABUTMENT CONSTRUCTED BEFORE ROCK FILL




SECTION A–A

ABUTMENT CONSTRUCTED AFTER ROCK FILL

NOTES:

1 Height to be consistent with positive drainage of subdrain as specified.

A Dimensions perpendicular to back face of abutment.

B Grading and compaction of rock backfill and rock fill shall be as specified.

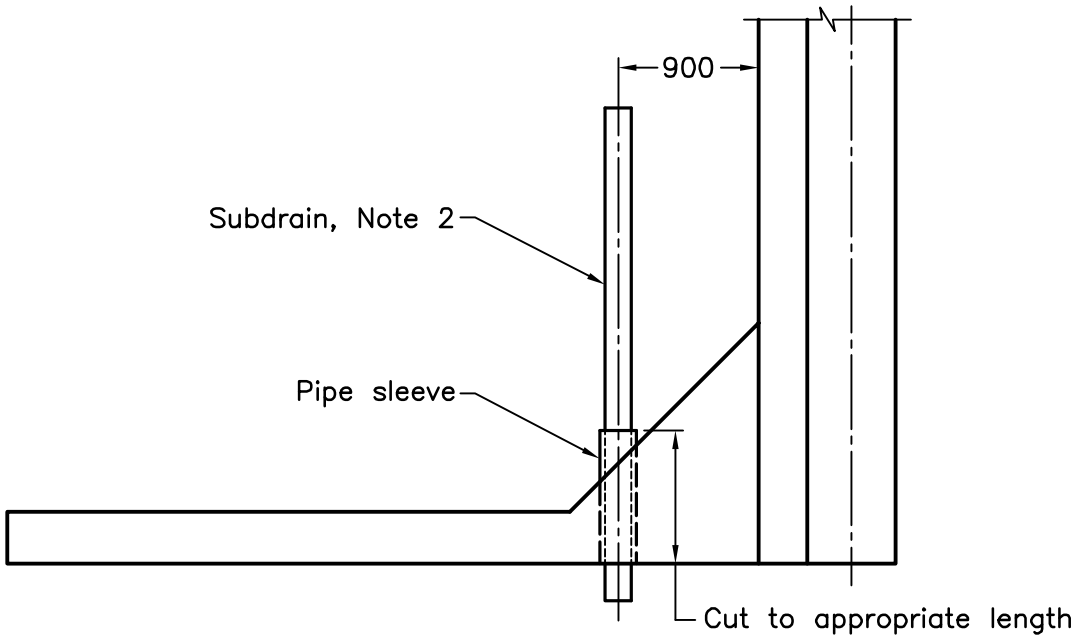
C Lateral limits of backfill to be inside face to inside face of wingwall.

D Section A–A parallel to centreline of roadway.

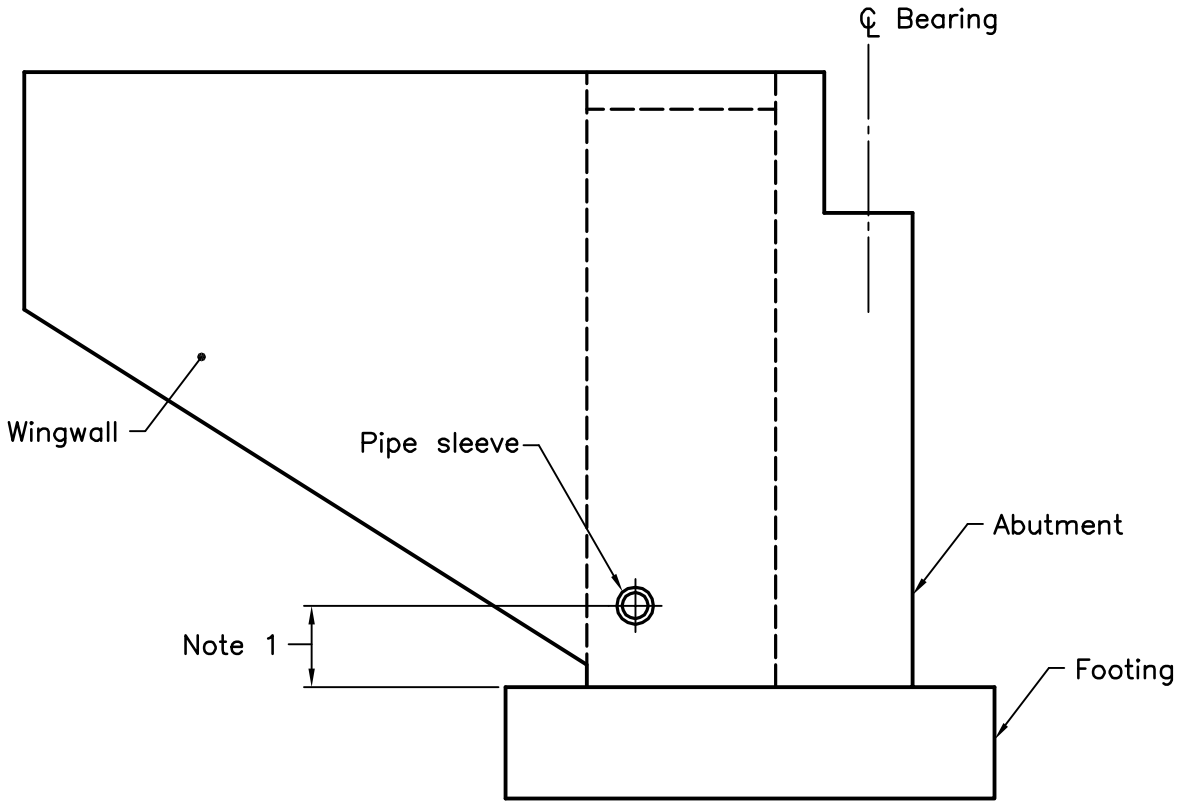
E Subdrain shall be installed with a 2% gradient behind wall.

F All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| WALLS<br>ABUTMENT, BACKFILL<br>ROCK | | | |
| | OPSD 3101.200 | | |




**PLAN**




**ELEVATION**

NOTE:

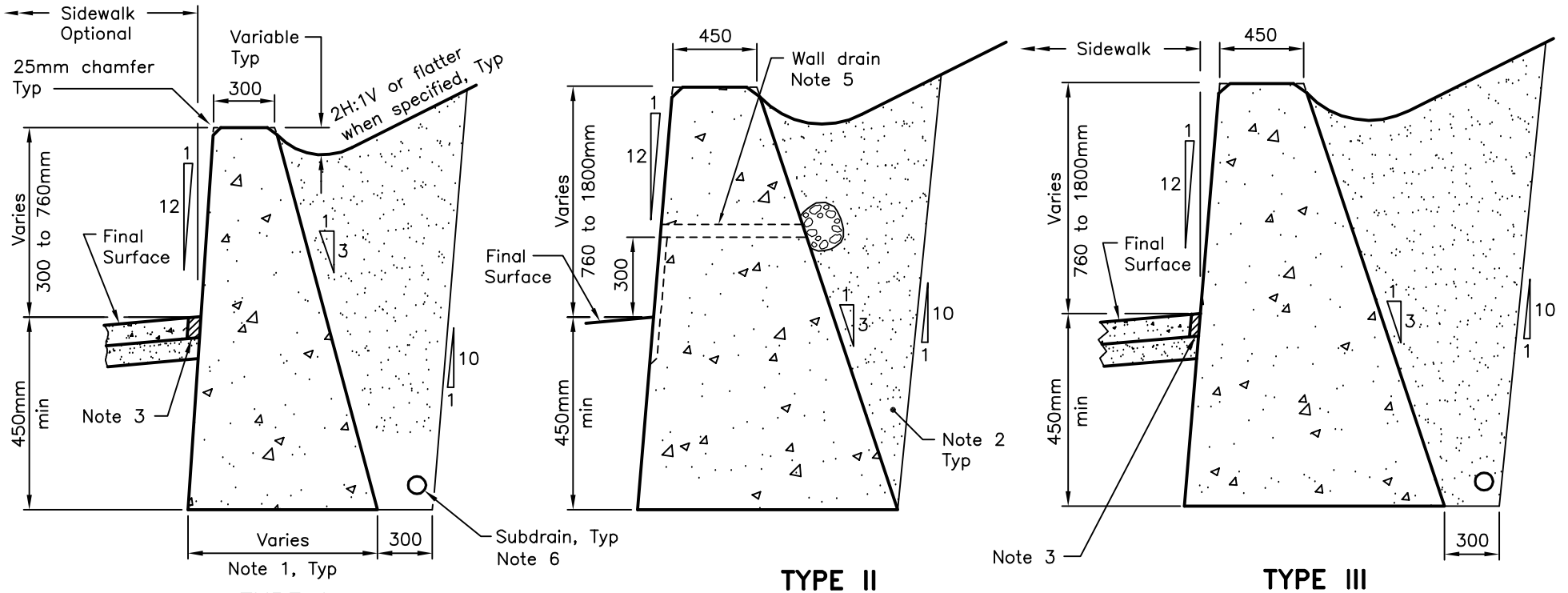
1 Height to be consistent with positive drainage of subdrain as specified.

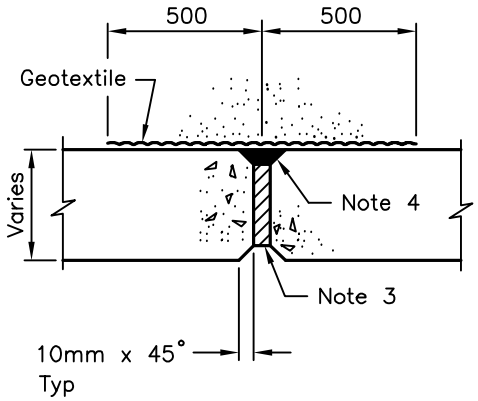
2 150mm dia perforated pipe subdrain wrapped with geotextile.

A Subdrain shall be installed with a 2% gradient behind wall.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| **WALLS**<br>**ABUTMENT**<br>**BACKFILL DRAIN** | | | |
| | **OPSD 3102.100** | | |



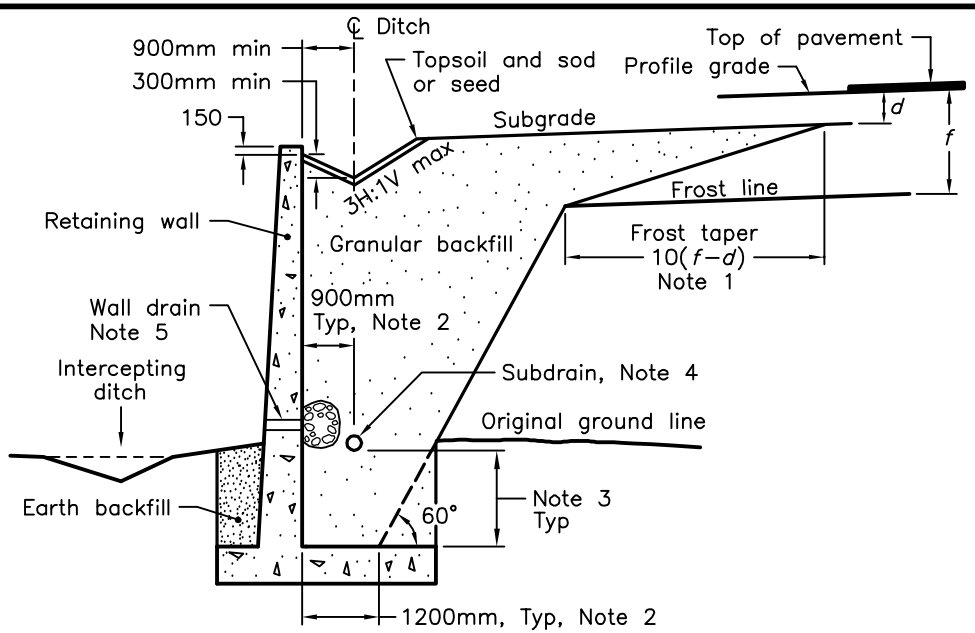

PLAN OF
JOINT DETAIL
IN CONCRETE TOE WALLS
AT 3.0m SPACING

NOTES:

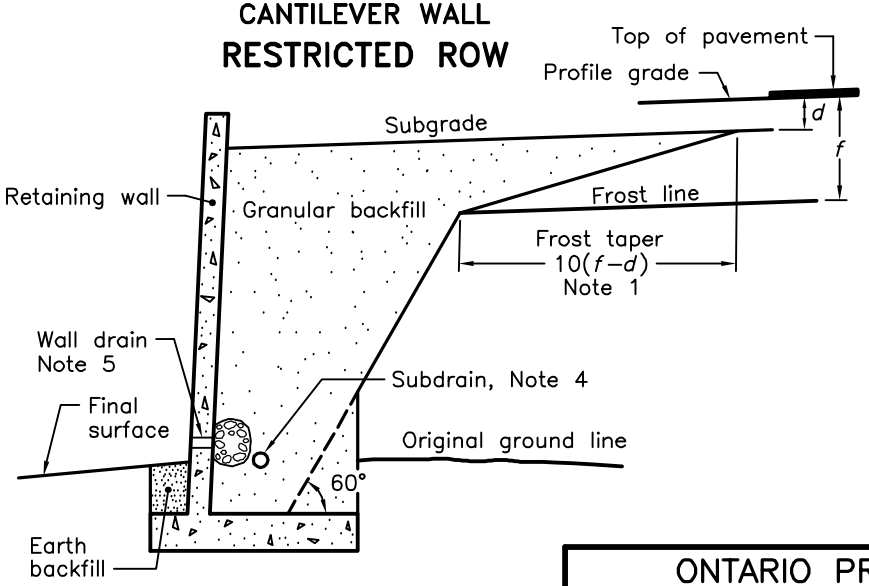
1 Walls shall be founded on undisturbed soil having a minimum bearing capacity at ultimate limit states of 200kPa for Type I and 300kPa for Type II and Type III.
2 Excavation for toe walls shall be backfilled with free draining granular material.
3 10mm preformed joint filler, Type A, non–extruding and 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.

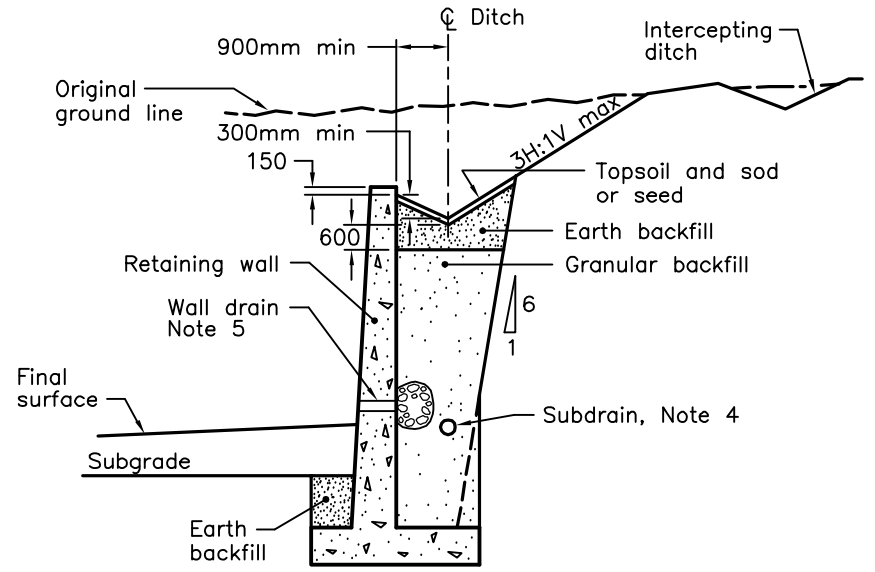
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| WALLS<br>RETAINING<br>CONCRETE TOE WALL | | | |
| | OPSD 3120.100 | | |




**CANTILEVER WALL**
**RESTRICTED ROW**




**COUNTERFORT AND CANTILEVER WALL**
**FILL TREATMENT**
**SHOULDER OVER RETAINING WALL BACKFILL**




**CANTILEVER WALL**
**CUT TREATMENT**

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.

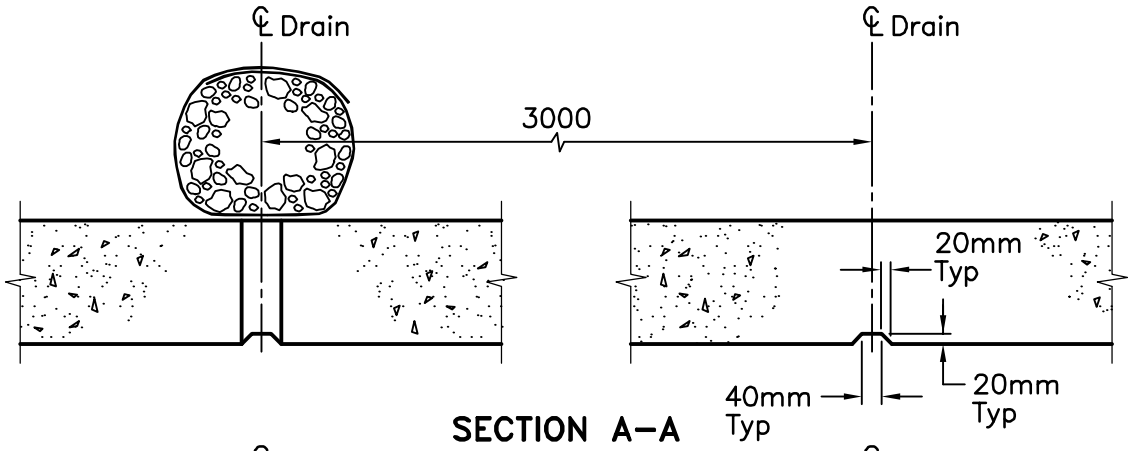
ONTARIO PROVINCIAL STANDARD DRAWING

# WALLS
# RETAINING, BACKFILL
# MINIMUM GRANULAR REQUIREMENT

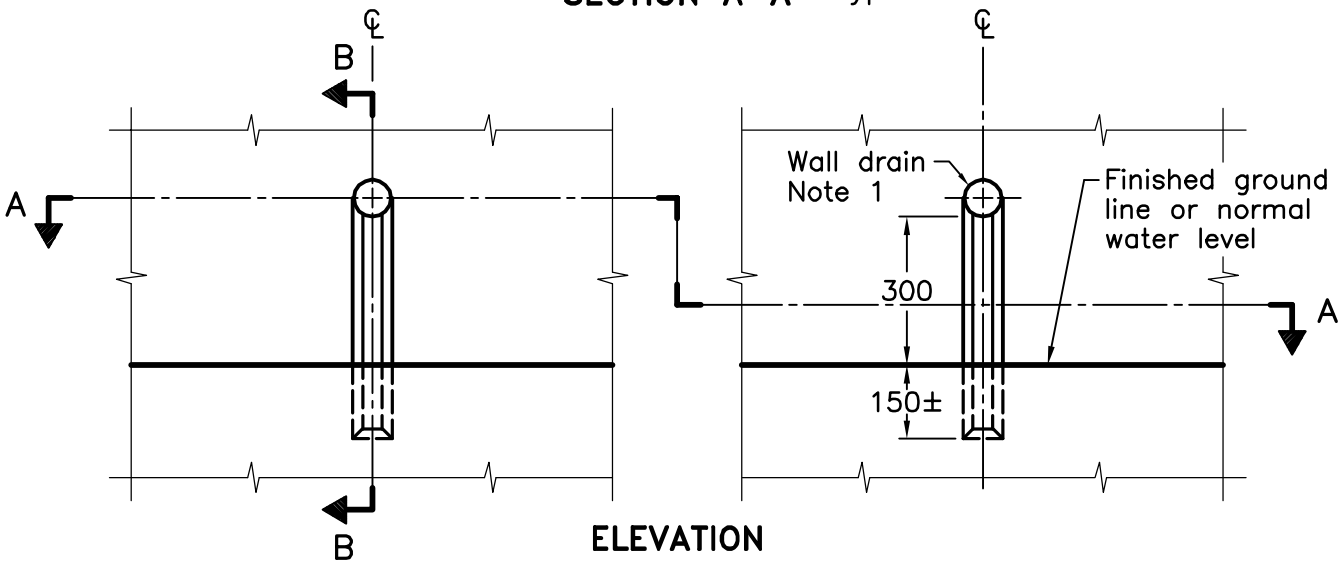
Nov 2010 | Rev 1

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

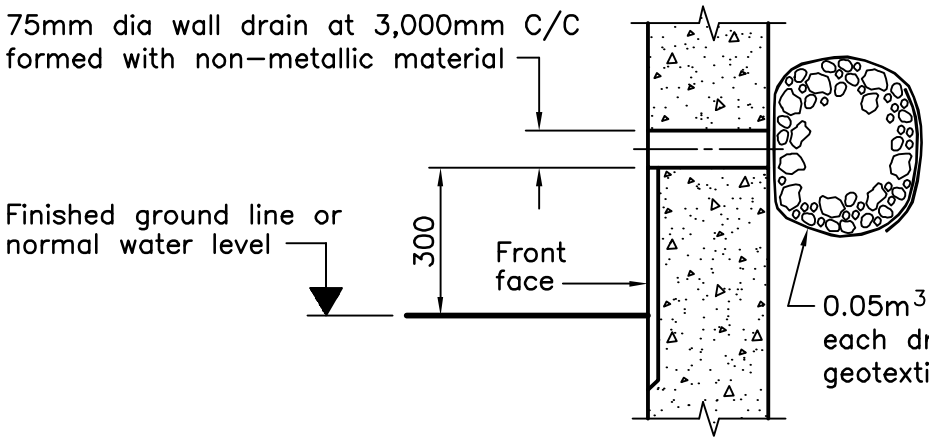
OPSD 3121.150




SECTION A–A




ELEVATION




SECTION B–B

NOTES:

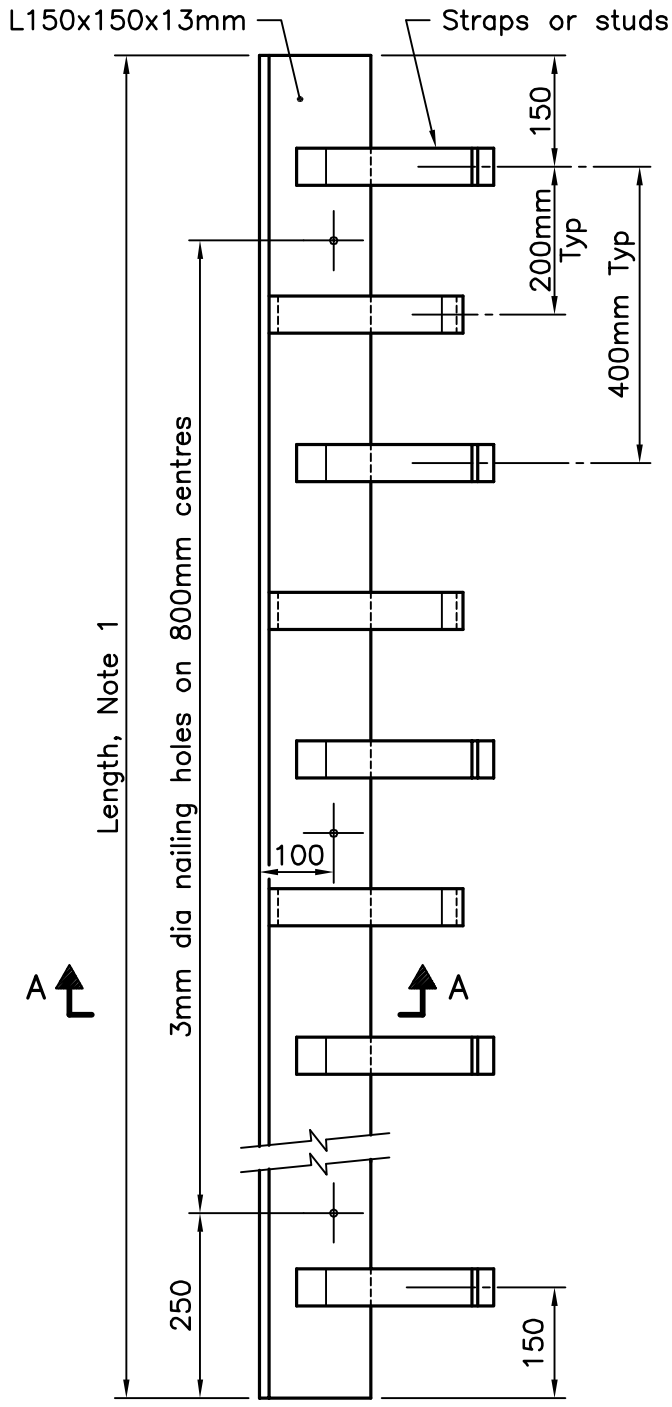
1 Bottom half of drain to be contoured to shape of vertical groove after removal of formwork.

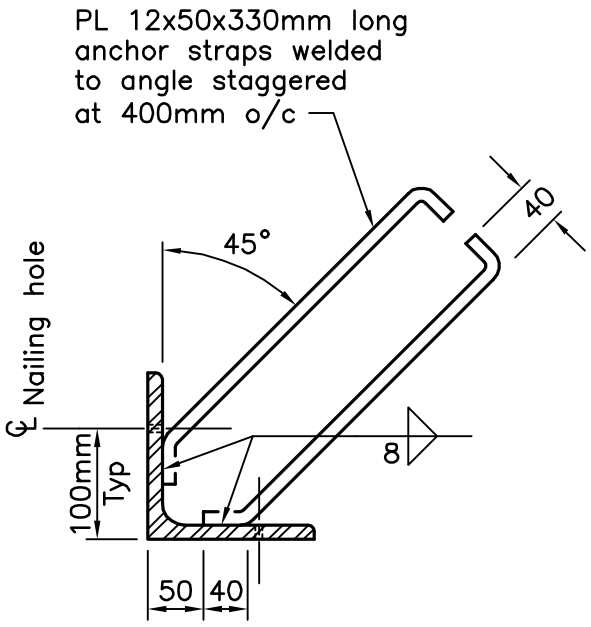
2 Geotextile shall be non–woven, Class II, with an FOS of 125–250 µm.

A Minimum cover to reinforcing bars shall be measured from the base of the groove.

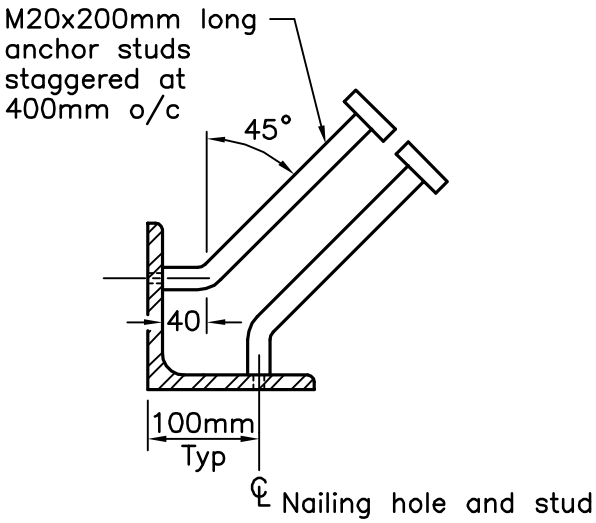
B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Apr 2011 | Rev | 2 |
|---|---|---|---|
| WALLS<br>RETAINING AND ABUTMENT<br>WALL DRAIN | | | |
| | OPSD 3190.100 | | |




ANCHORAGE DETAIL
SECTION A–A




ALTERNATIVE ANCHORAGE DETAIL
SECTION A–A

NOTES:

1 The length of L150x150x13mm shall be as specified.

A All steel shall be according to CSA G40.21, Grade 300W.

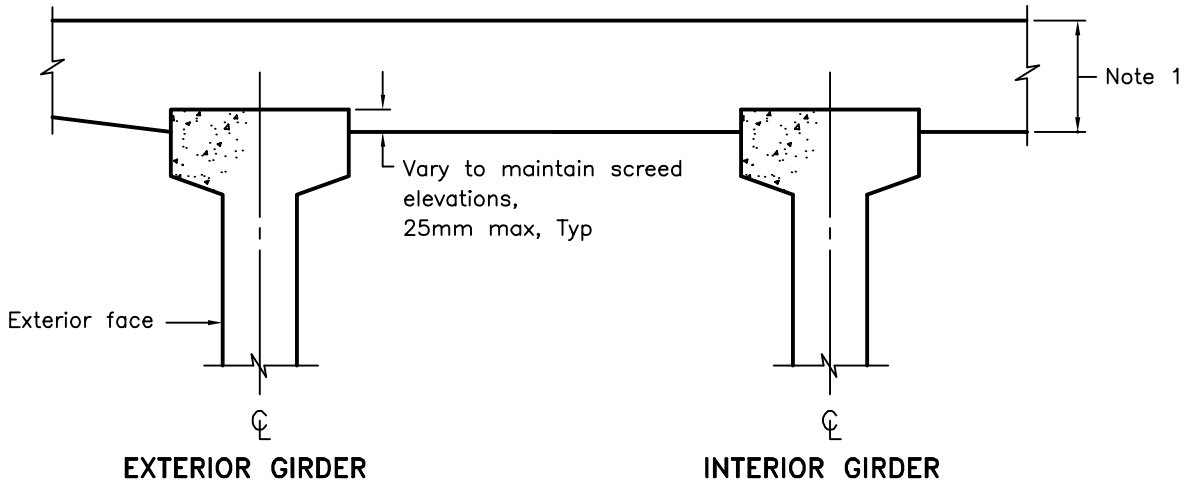
B Cutwater shall be hot dip galvanized after fabrication according to CAN/CSA G164M.

C Welding shall be of a low hydrogen classification and according to CSA W59 with E480xx electrodes.

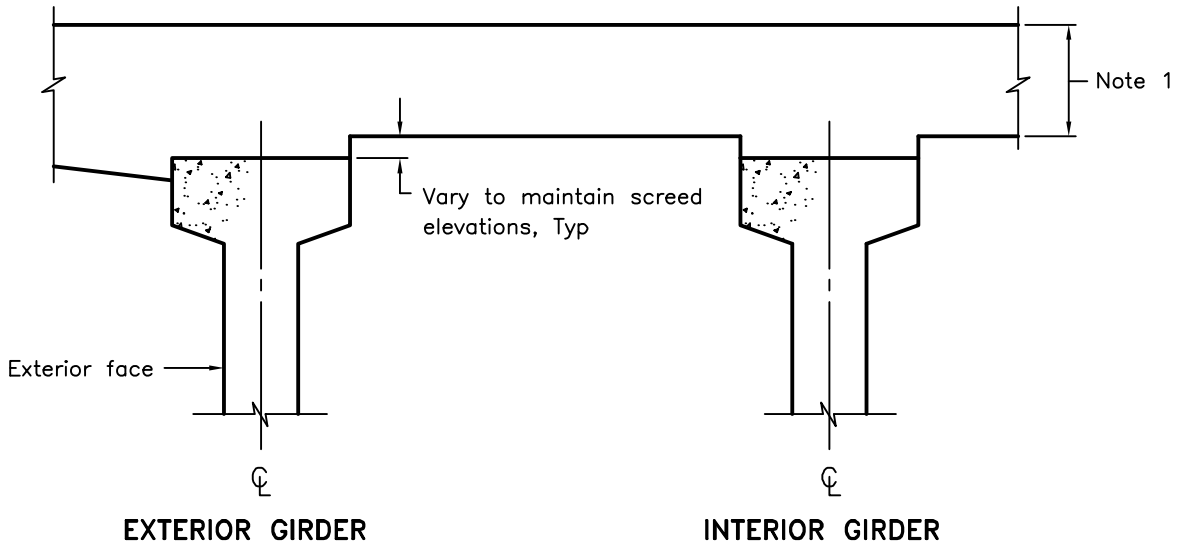
D Anchor studs shall be attached using fusion weld process.

E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev 1 |
|---|---|---|
| PIERS<br>CUTWATER ASSEMBLY | | OPSD 3290.100 |




**BOTTOM OF DECK BELOW TOP OF GIRDER**




**BOTTOM OF DECK ABOVE TOP OF GIRDER**

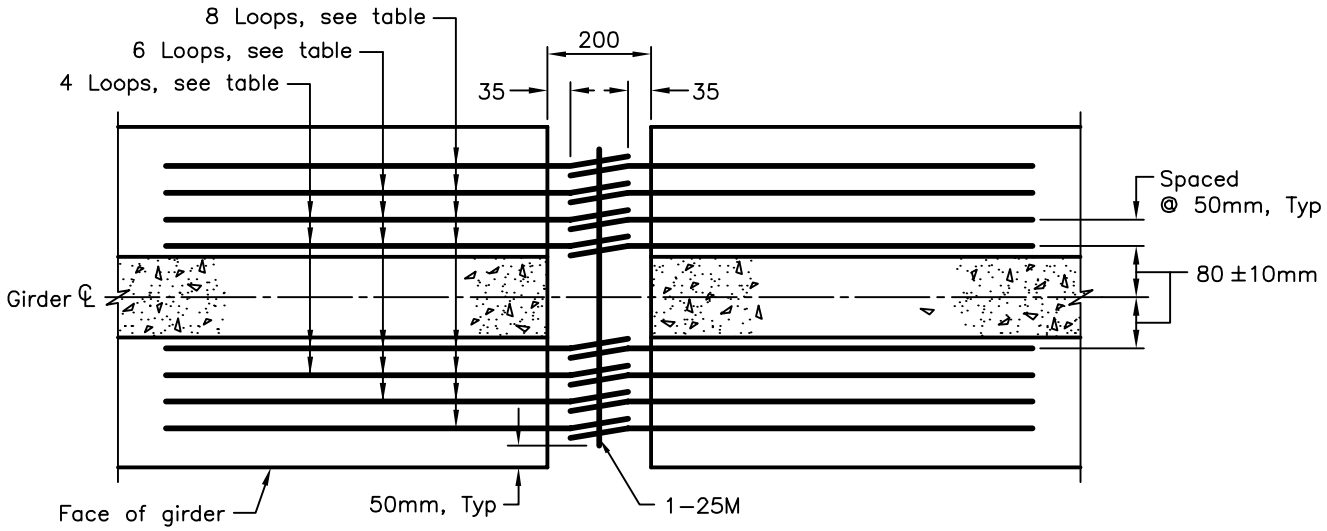
NOTES:

1 Dimension shall not be less than the specified slab thickness.

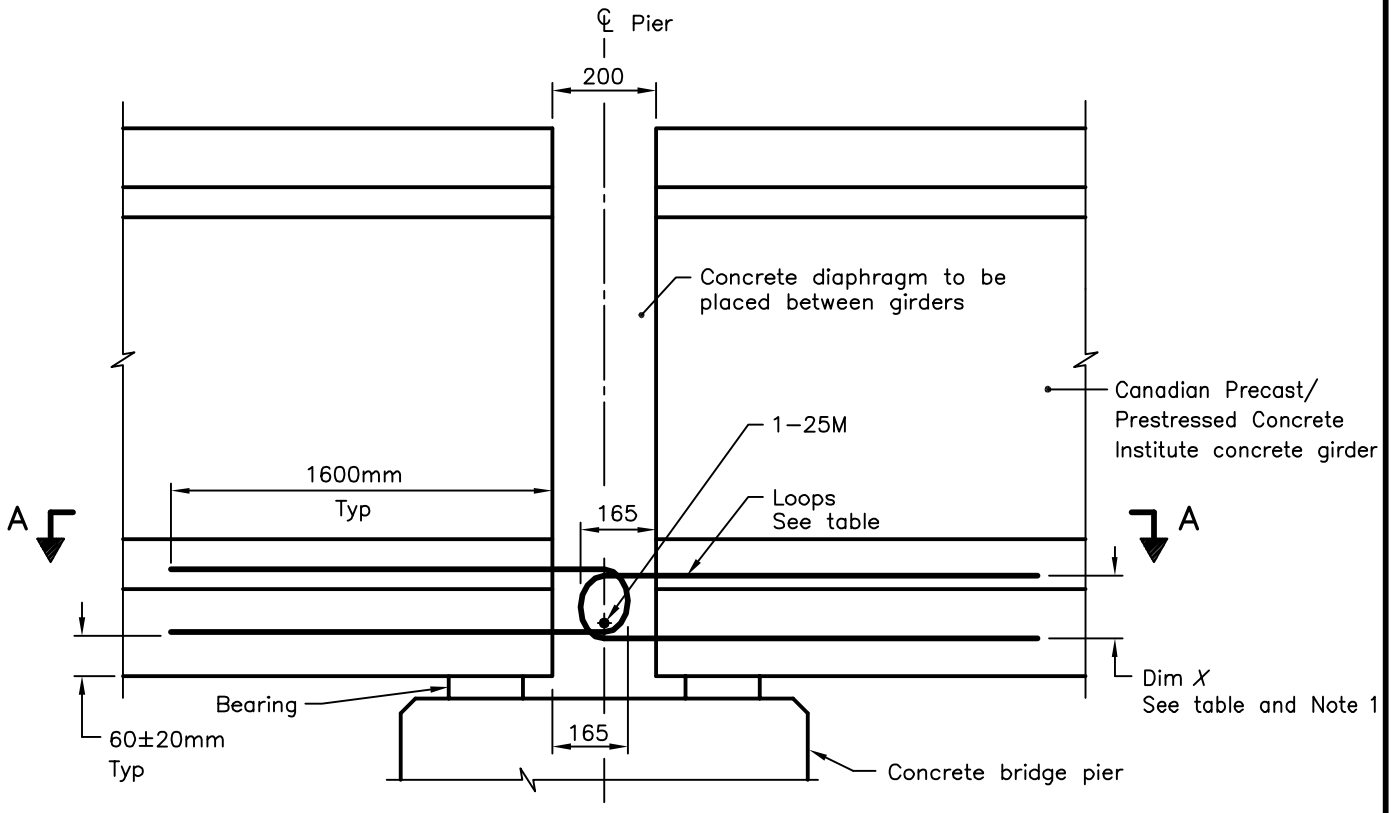
A This standard is also applicable to precast box girders.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| DECK<br>GIRDERS, CONCRETE<br>METHOD OF OBTAINING SCREED ELEVATIONS | | | |
| | OPSD 3310.100 | | |




**SECTION A–A**




| CPCI GIRDER | LOOPS PER GIRDER END | | |
|---|---|---|---|
| | No. REQ'D | SIZE | X mm |
| 900 | 4 | 15M | 90 |
| 1200 | 4 | 15M | 125 |
| 1400 | 6 | 15M | 125 |
| 1500 | 6 | 15M | 125 |
| 1600 | 6 | 15M | 125 |
| 1900 | 8 | 20M | 125 |
| 2300 | 8 | 20M | 125 |

NOTES:

1 This dimension is outside–to–outside of bar.

A Reinforcing steel shall be according to CSA G30.18, Grade 400W.

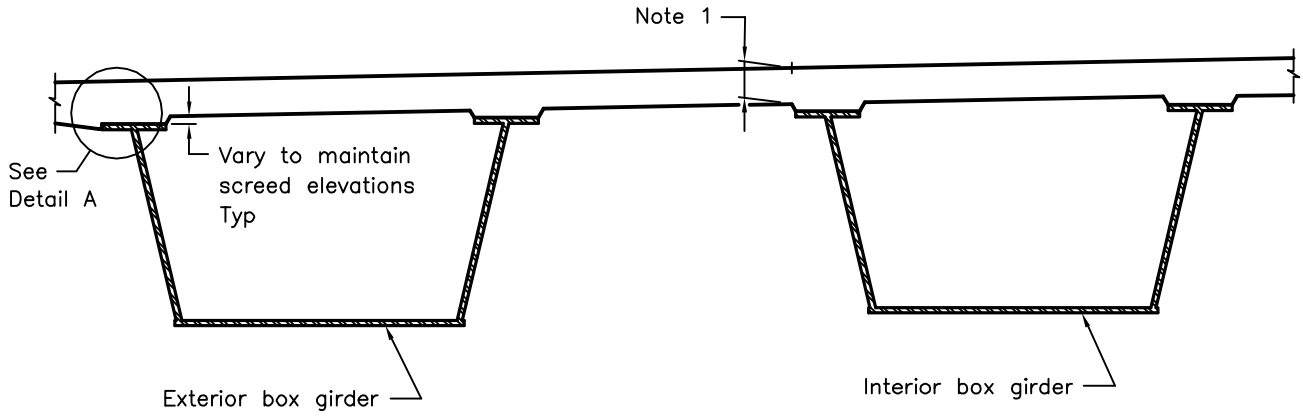
B This OPSD shall not be used at integral supports of integral abutment type structures.

C All dimensions are in millimetres unless otherwise shown.

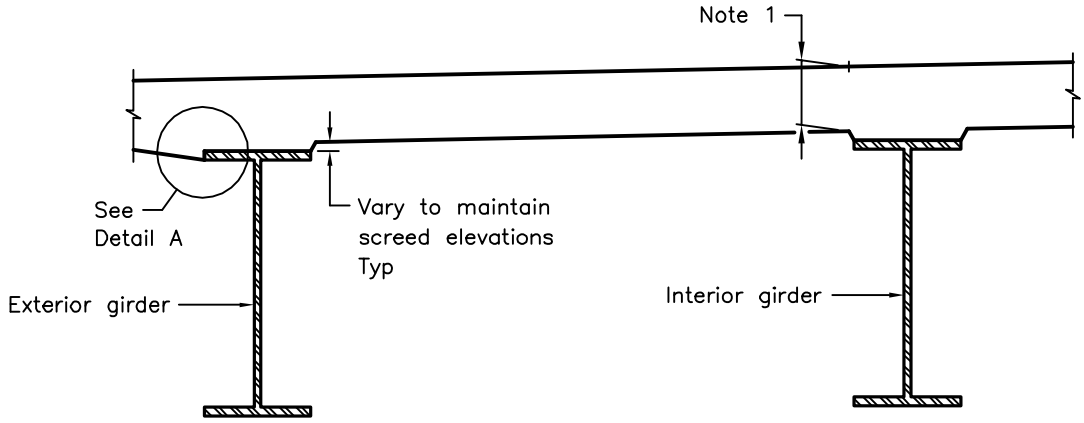
ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev 1

# DECK
# GIRDERS, CONCRETE
# POSITIVE MOMENT CONNECTION AT PIERS

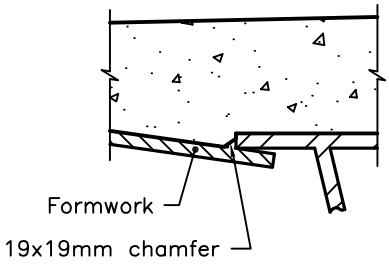
OPSD 3310.150




STEEL BOX GIRDER




STEEL I GIRDER



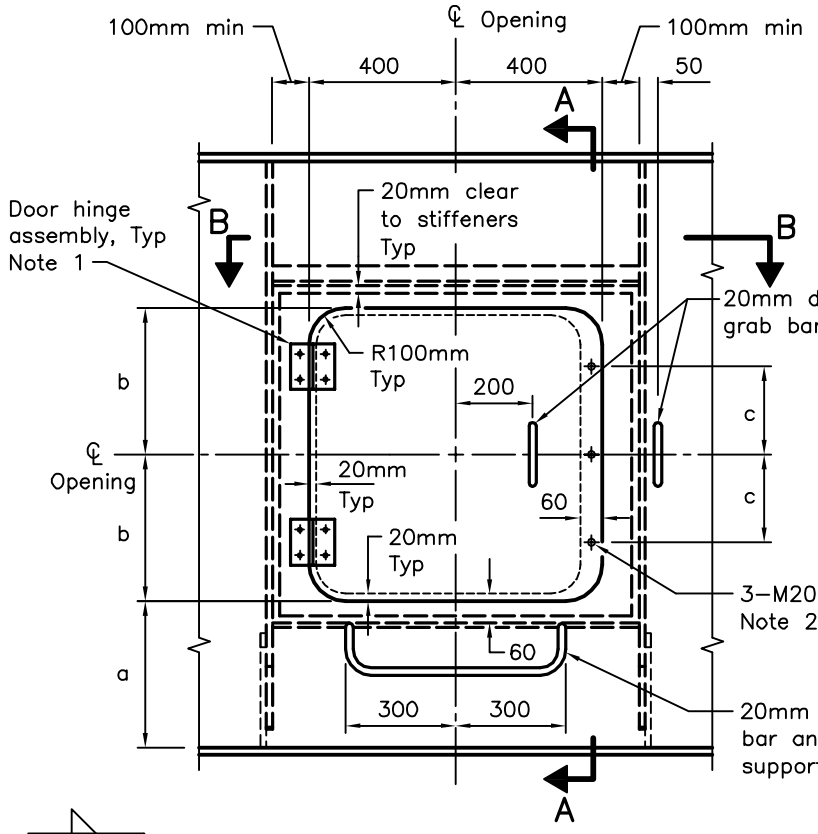

DETAIL A
FORMWORK IN PLACE

NOTE:

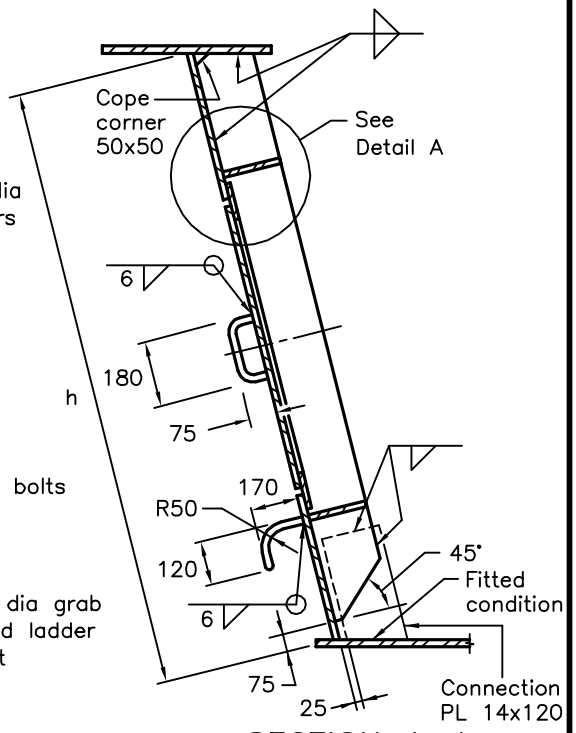
1 Dimension shall not be less than the specified slab thickness.

A All dimensions are in millimetres unless otherwise shown.

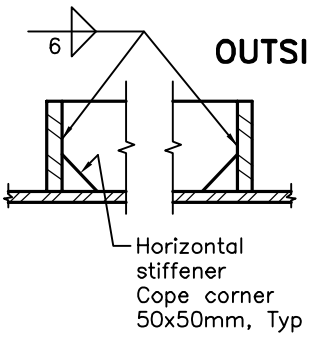
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| DECK<br>GIRDERS, STEEL<br>METHOD OF OBTAINING SCREED ELEVATIONS | | | |
| | OPSD 3311.100 | | |



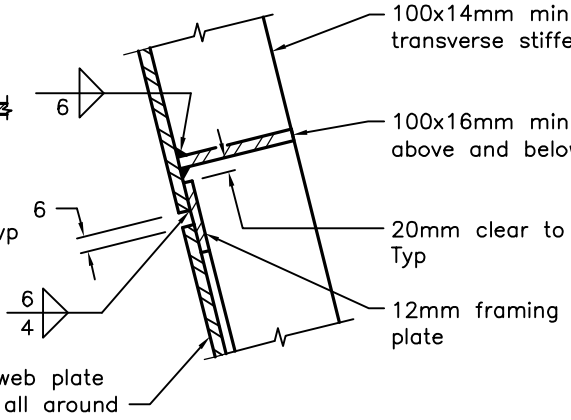

OUTSIDE FACE – ELEVATION




SECTION A–A




SECTION B–B




DETAIL A

DIMENSIONS:

a = h/4, Maximum 600mm
b = h/4, Maximum 400mm
c = b–175
h = designed web length

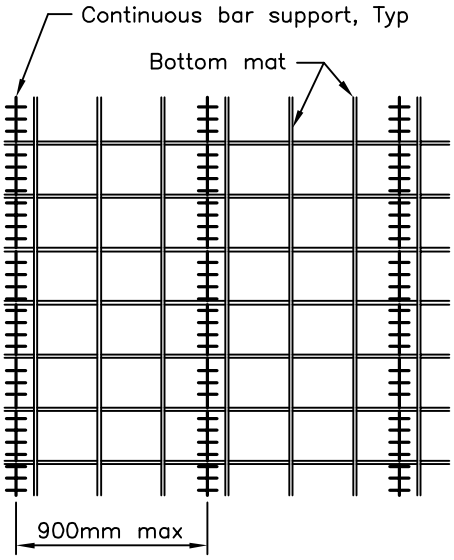
NOTES:

1 Door hinges shall be fabricated from 6mm thick plate minimum and hot–dip galvanized. The door hinge assembly shall be attached using M16 bolts.
2 Install M20 bolts with nuts accessible on exterior of web and weld bolt heads from the inside to the framing plate.
3 Bolts shall be ASTM A325M, Type 3.

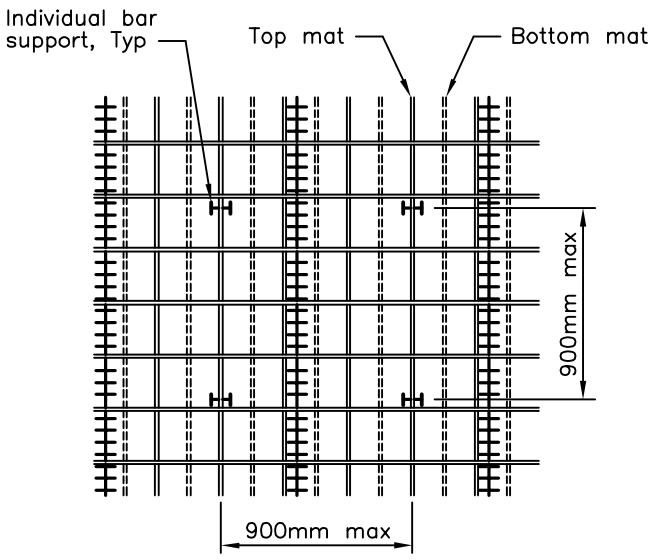
A Hinges and grab bars shall be according to CSA G40.20/G40.21, Grade 300W. The remainder of the steel shall be the same as for the box girder.
B Access hatch shall be placed on interior web of box girder only.
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 2 |
|---|---|---|---|
| DECK<br>GIRDERS, STEEL BOX<br>ACCESS HATCH | | | |

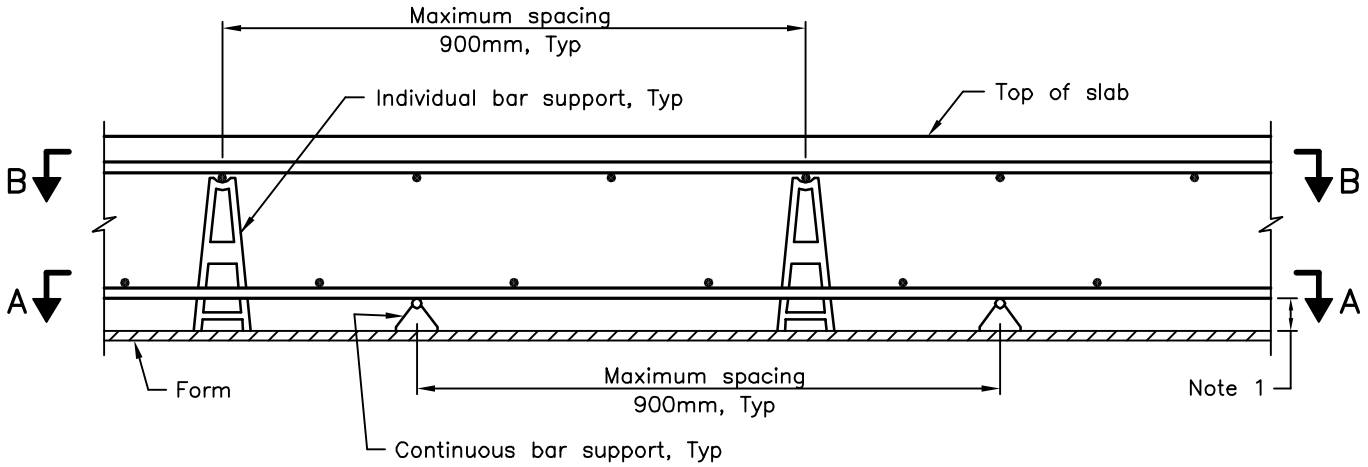
OPSD 3311.900




SECTION A–A




SECTION B–B




TYPICAL SLAB CROSS SECTION

NOTES:

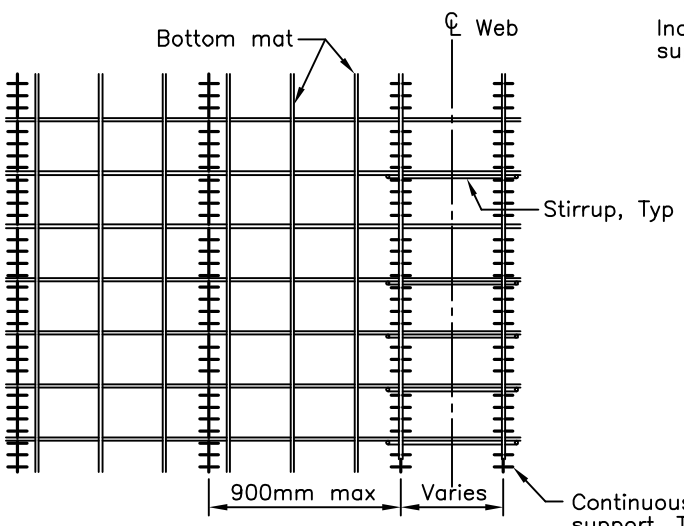
1 Dimension to suit specified nominal cover.

A Bar supports shall be Class D or Class E for maximum protection as detailed in the RSIC Reinforcing Steel Manual of Standard Practice.

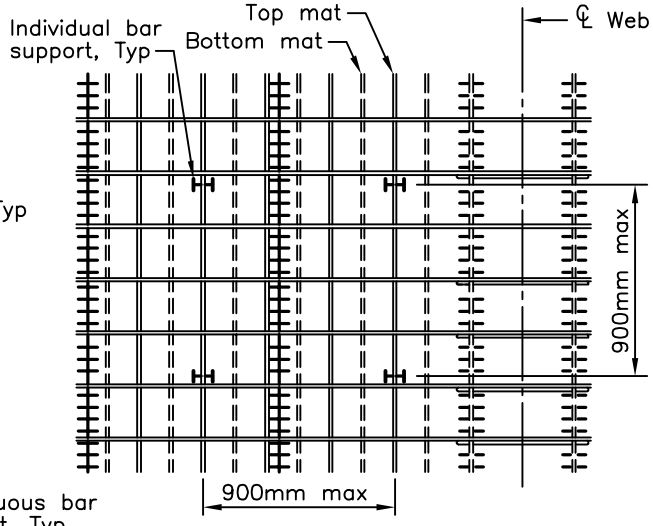
B Metal portions of continuous bar supports shall be plastic encased or approved equivalent.

C Individual bar supports shall be firmly fixed to reinforcing bars. Continuous bar supports shall be tied at every fourth intersection with mat bars and shall meet the cover requirements specified.

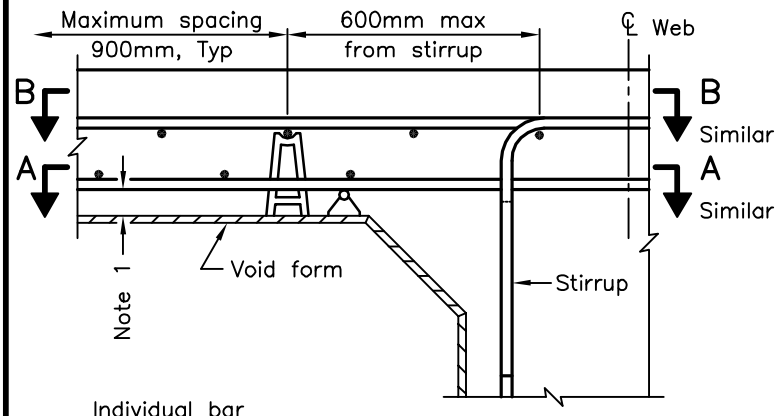
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| DECK, REINFORCEMENT<br>SUPPORTS FOR REINFORCING STEEL<br>FOR SLAB DEPTHS 300mm OR LESS | | | |
| | OPSD 3329.100 | | |

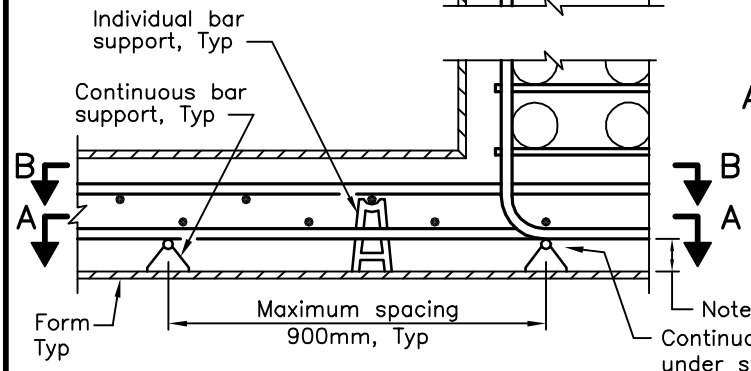



SECTION A–A

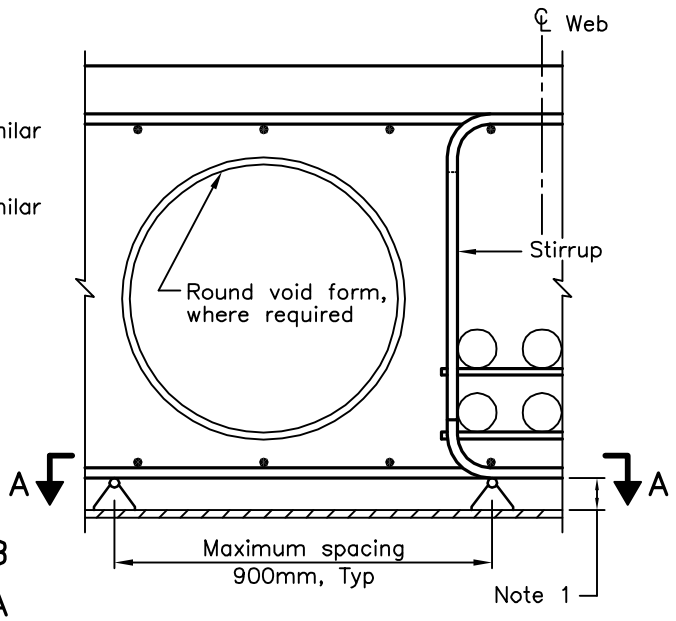



SECTION B–B




DECK WITH RECTANGULAR VOIDS




SOLID DECK OR WITH ROUND VOIDS

NOTES:

1 Dimension to suit specified nominal cover.

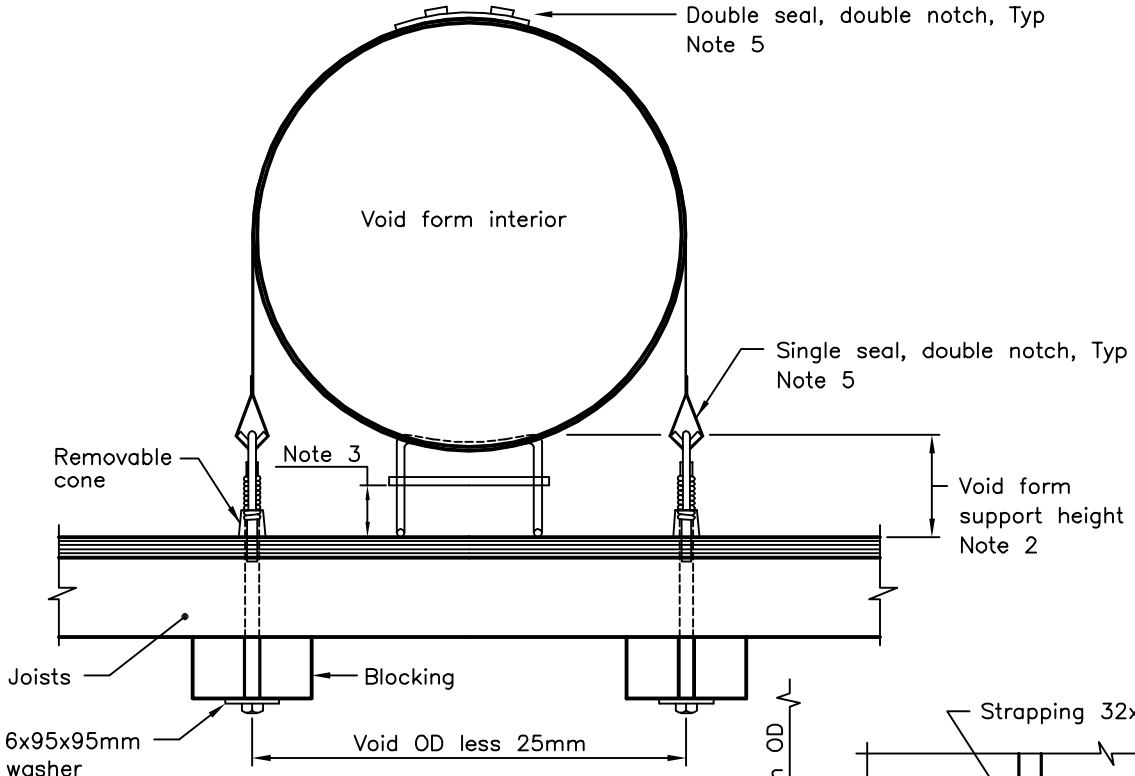
A Individual bar supports shall be placed on a grid of 900mm maximum, except at webs.

B Bar supports shall be Class D or Class E for maximum protection as detailed in the RSIC Reinforcing Steel Manual of Standard Practice.

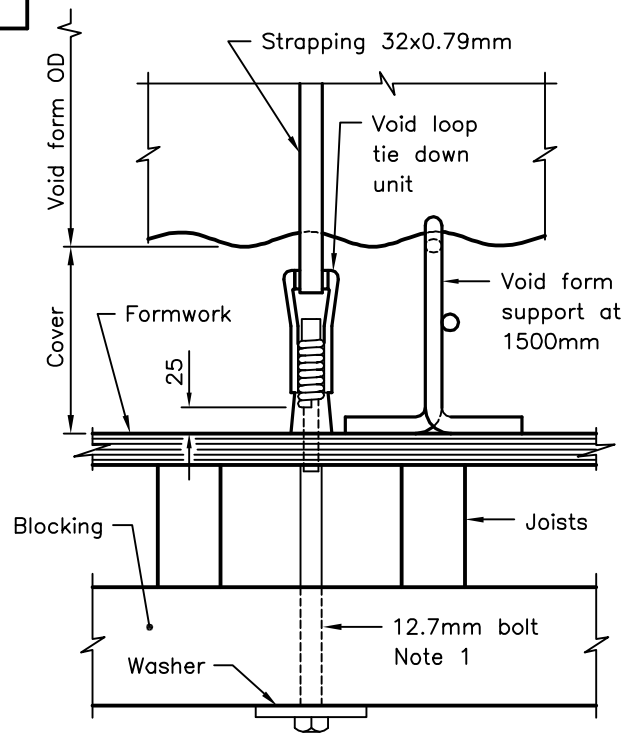
C Metal portions of continuous bar supports shall be plastic encased or approved equivalent.

D Individual bar supports shall be firmly fixed to reinforcing bars. Continuous bar supports shall be tied at every fourth intersection with mat bars and shall meet the cover requirements specified.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| DECK, REINFORCEMENT SUPPORTS FOR REINFORCING STEEL FOR SLAB DEPTHS GREATER THAN 300mm | | | |
| | OPSD 3329.101 | | |




## SECTION




## SIDE VIEW

| CORRUGATED METAL VOIDS OD | STRAPPING SPACING | UPLIFT FORCE TO BE RESISTED, Note 4 kN/m |
|---|---|---|
| 250 – 450 | 1500 | 5.3 |
| 475 – 600 | 1300 | 8.8 |
| 625 – 750 | 1200 | 13.2 |
| 775 – 900 | 1000 | 18.5 |
| 925 – 1050 | 800 | 24.7 |
| 1075 – 1200 | 600 | 31.8 |

NOTES:

1 Bolts shall be removed before post–tensioning operations.

2 Void form support height shall be such that the specified cover to the voids is provided.

3 Strut location shall be such that it does not interfere with reinforcement or ducts.

4 Approved alternative tie–down systems and spacing shall resist the uplift force.

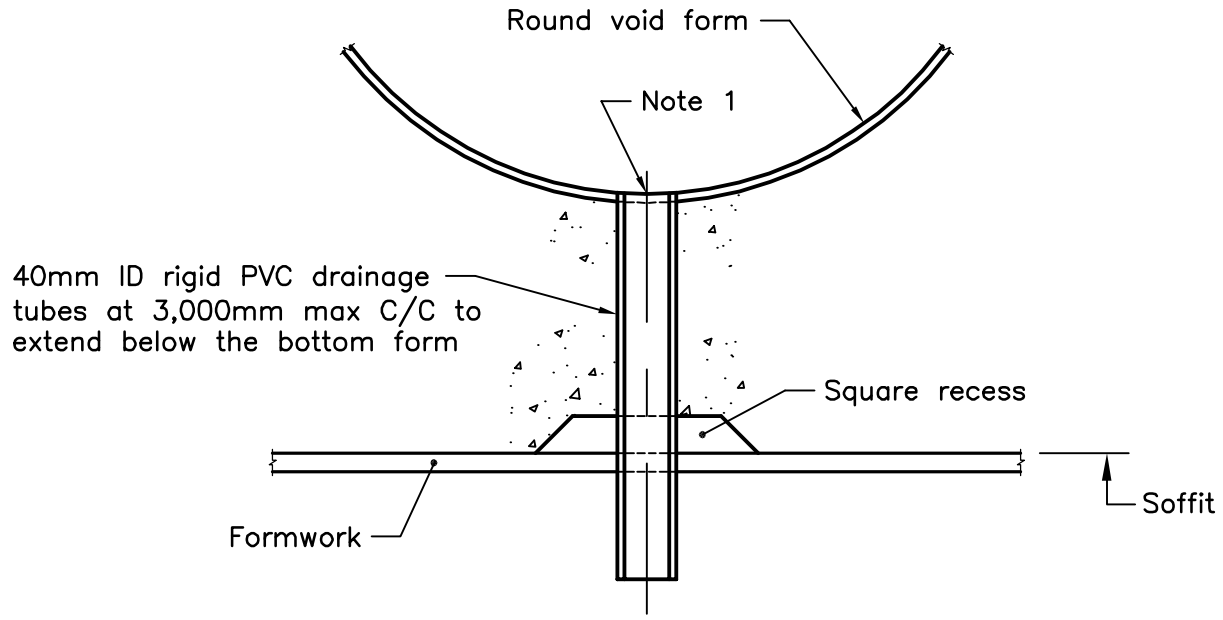
5 Strapping shall be according to CAN/CGSB 43.24M, Type 1, Grade 1.

A Void loop tie–down unit and strapping size and spacing shall suit void size.

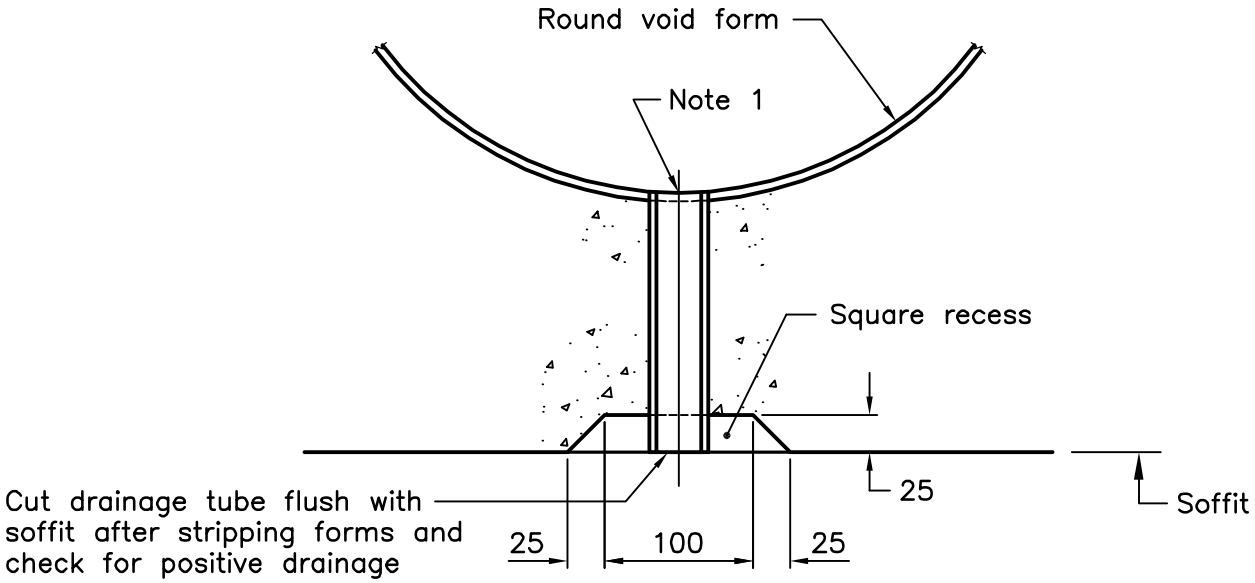
B Void form support size to suit spacing indicated and shall be hot dip galvanized according to CAN/CSA 164M.

C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| DECK<br>ROUND VOIDS<br>FORM SUPPORTS AND TIE–DOWNS | | | |
| | OPSD 3332.100 | | |




**TYPICAL DETAIL WITH FORMWORK IN PLACE**




**TYPICAL DETAIL WITH FORMWORK REMOVED**

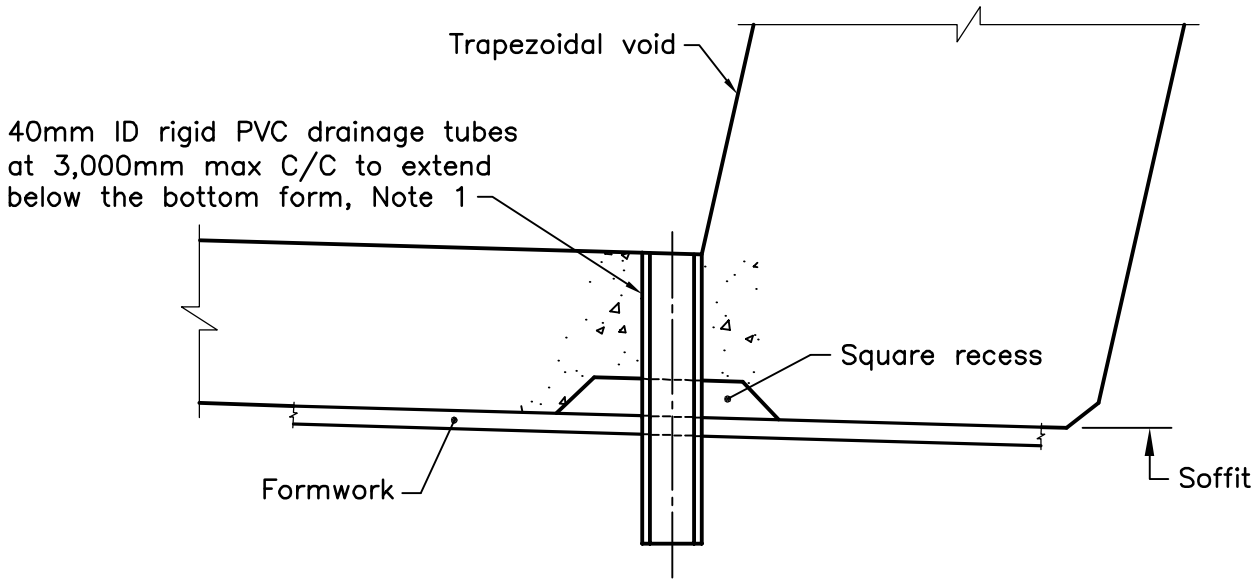
NOTES:

1 For corrugated voids, the drainage tubes shall be inserted at the lowest points of the corrugations and shall not protrude above the inside face of the void at those points.

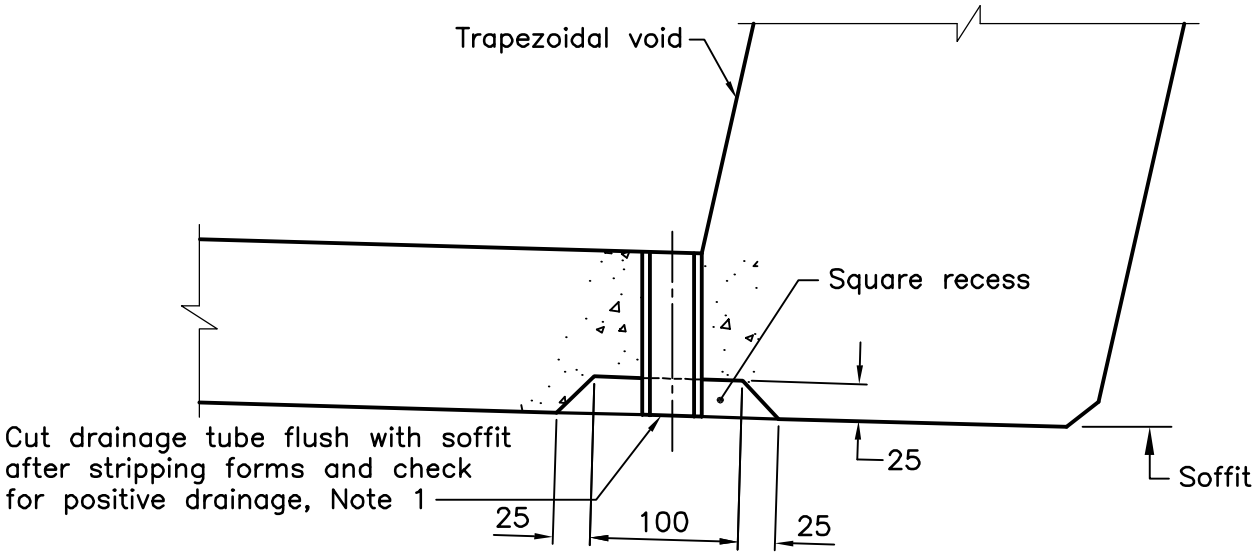
A One of the drainage tubes shall be placed maximum 300mm from the lower end of each void tube.

B All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| DECK<br>ROUND VOIDS<br>DRAINS | | | |
| | OPSD 3333.100 | | |




**TYPICAL DETAIL WITH FORMWORK IN PLACE**




**TYPICAL DETAIL AFTER FORMWORK REMOVED**

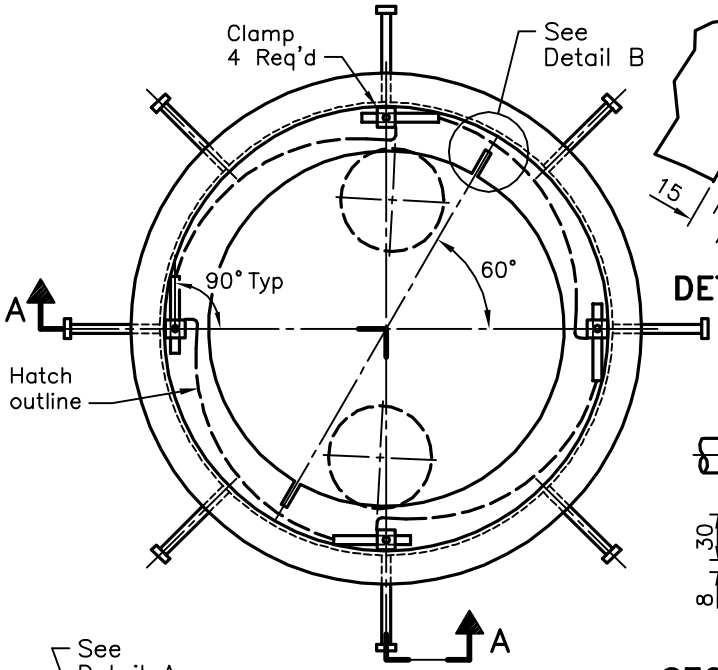
NOTES:

1 The drainage tubes shall be located at the lower side of each void and shall not protrude above the inside face of the void at those points.

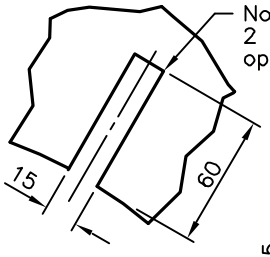
A One of the drainage tubes shall be placed 300mm maximum from the lower end of each void.

B All dimensions are in millimetres unless otherwise shown.

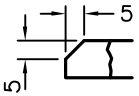
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev 1 | |
|---|---|---|---|
| DECK<br>TRAPEZOIDAL VOID<br>DRAINS | | | OPSD 3333.101 |



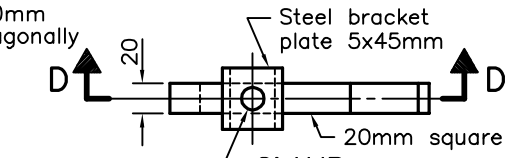

FRAME
PLAN



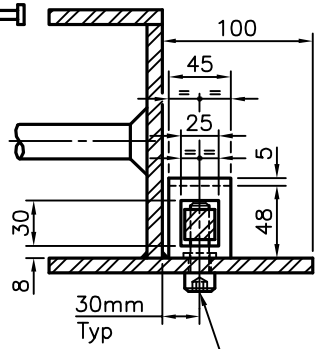

DETAIL B



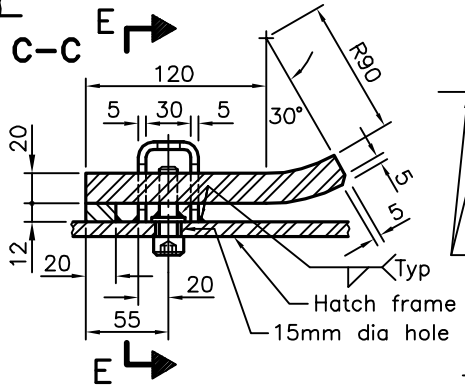

SECTION C–C



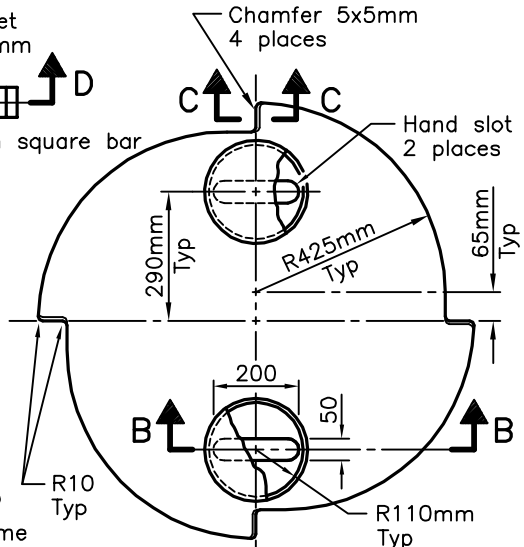

CLAMP
PLAN



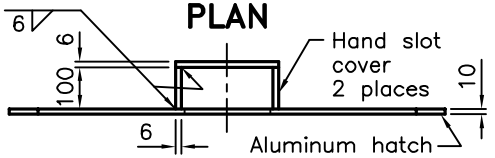

SECTION E–E



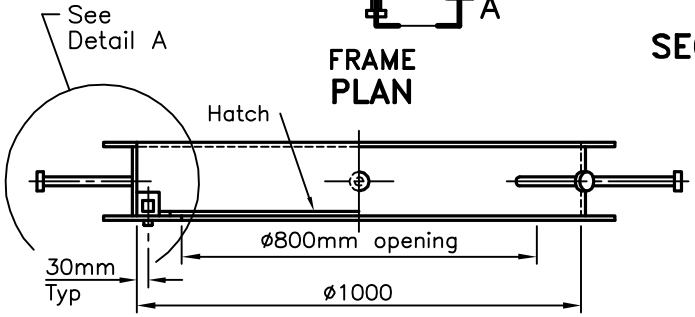

SECTION D–D



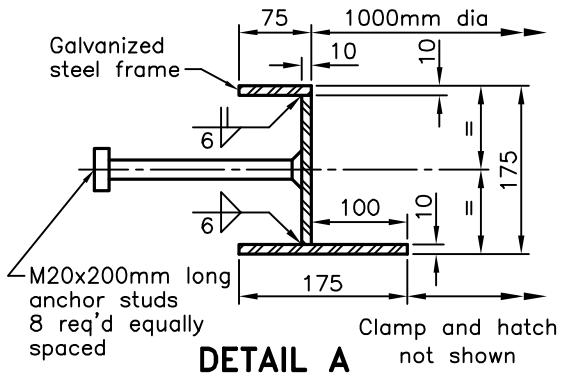

HATCH
PLAN




SECTION B–B




SECTION A–A




DETAIL A

Drill and tap square bar to suit M12x45mm long stainless steel hex socket head cap screw with stainless steel washer 13 ID x 22 OD x 3mm thick, 4 places

NOTES:

A All steel shall be according to CSA G40.20/G40.21, Grade 300W.

B All steel shall be hot dip galvanized after fabrication according to CAN/CSA G164M except for stainless steel.

C All welded construction shall be according to CSA W59 for steel and CSA W59.2 for aluminum. Any company undertaking welded fabrication or erection or both according to CSA W59 or CSA W59.2 shall be certified according to CSA W47.1, Division 2.1, or CSA W47.2, Division 2, respectively. All welding shall be carried out by welders having a CSA W47.1 or CSA W47.2 identification card valid for the type of welding to be done and for the duration of the welding work.

D Anchor studs shall be attached using a stud welding process.

E Access hatch components shall be aluminum according to CSA S157/S157.1 for Alloy 6061–T6 or T651.

F All sharp edges shall be rounded 2mm.

G All dimensions are in millimetres unless otherwise shown.

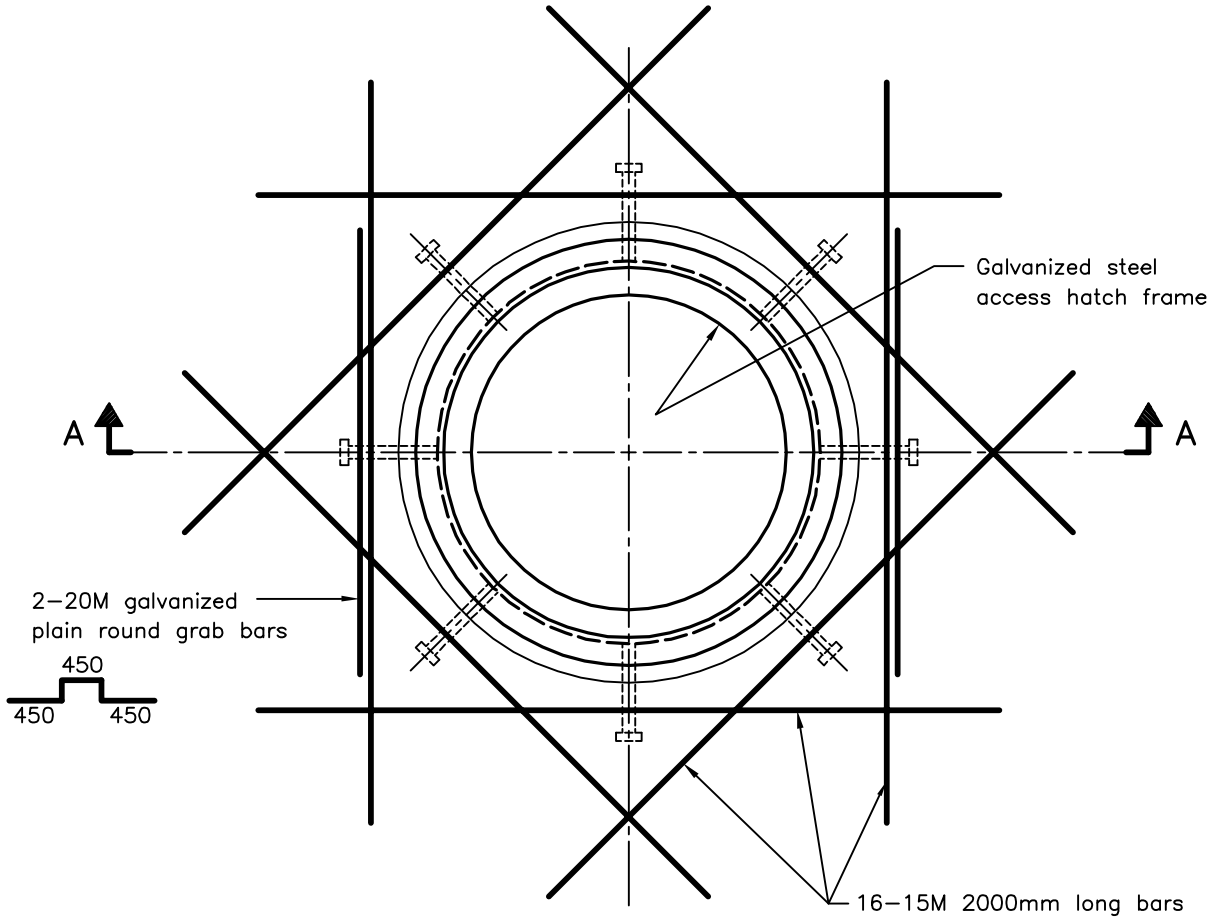
ONTARIO PROVINCIAL STANDARD DRAWING

# DECK, VOIDS
# ACCESS HATCH FOR CONCRETE BRIDGES
# ASSEMBLY

Nov 2011 | Rev 1

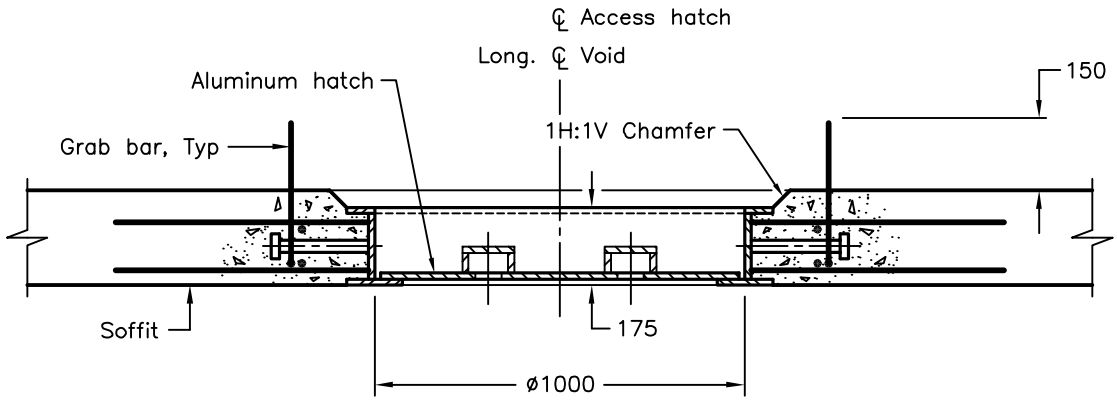
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · O P S

OPSD 3339.100




**PLAN**

Aluminum hatch not shown




**SECTION A–A**

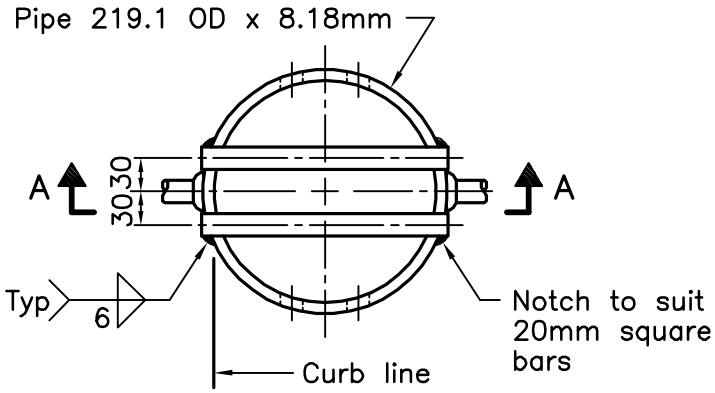
NOTES:

A This OPSD shall be read in conjunction with OPSD 3339.100.

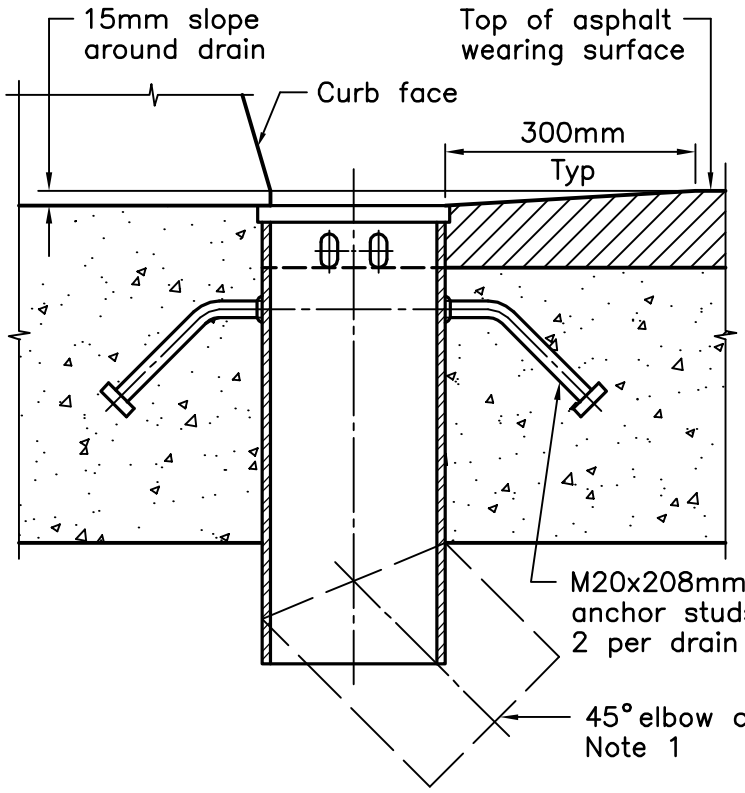
B Reinforcing steel shall be according to CSA G30.18, Grade 400W.

C All dimensions are in millimetres unless otherwise shown.

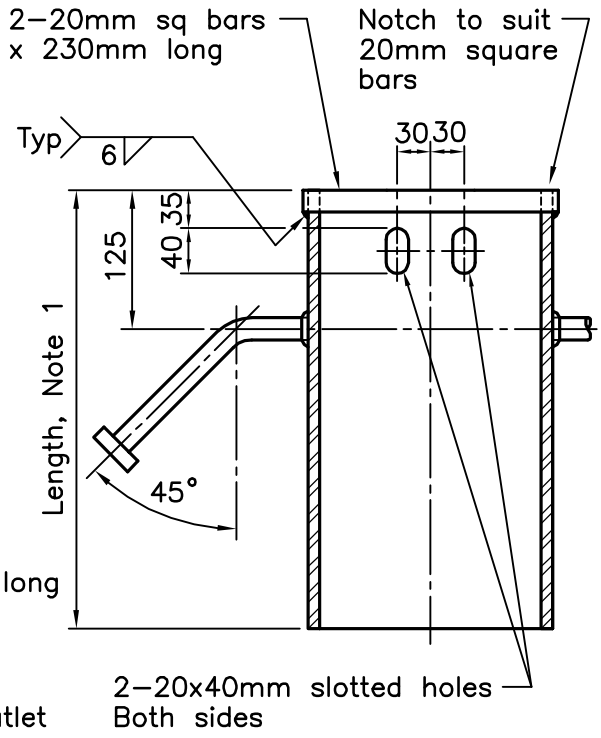
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| DECK, VOIDS<br>ACCESS HATCH FOR CONCRETE BRIDGES<br>INSTALLATION | | | |
| | OPSD 3339.101 | | |




**PLAN**




**SECTION A–A**




**DRAIN**

NOTES:

1 Length and shape of downspout as specified.

A Drains shall be hot dip galvanized after fabrication according to ASTM A 123.

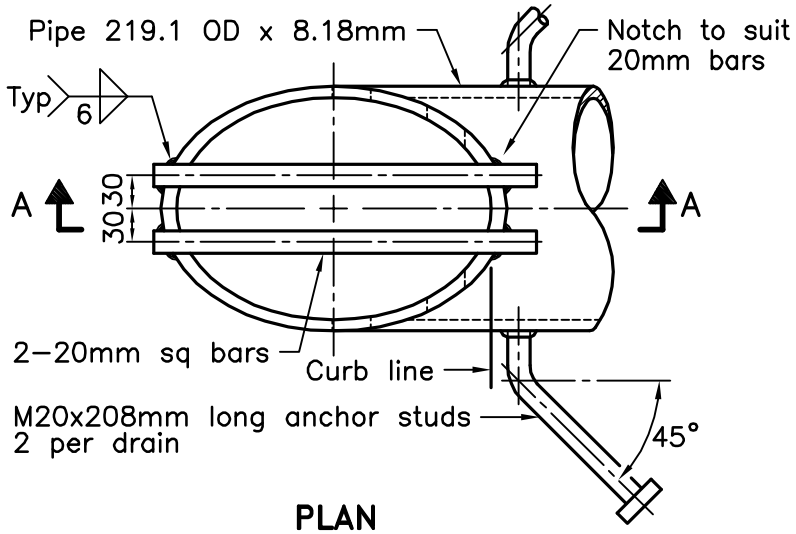
B Anchor studs shall be attached using fusion weld process.

C Pipe shall be according to ASTM A 53M, Grade B.

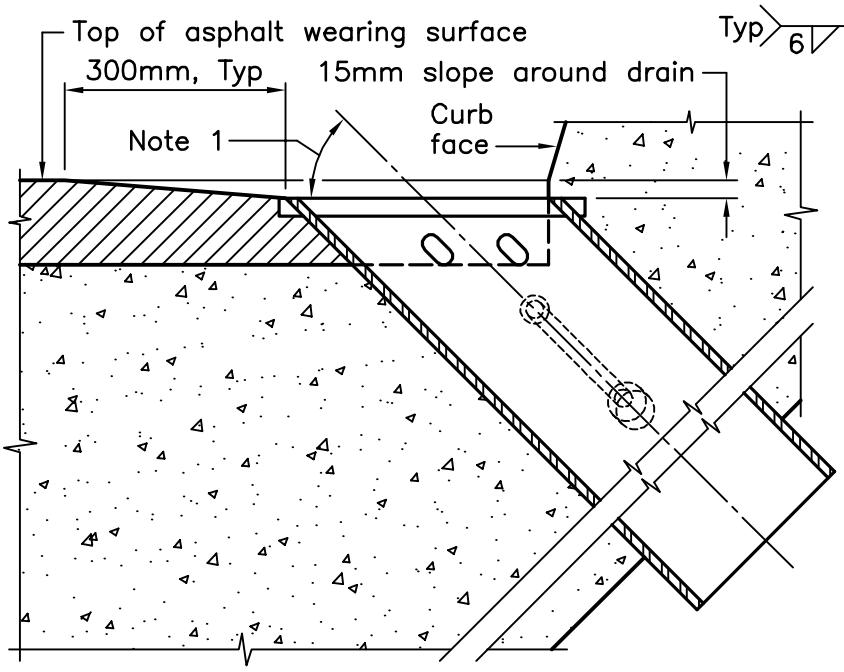
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

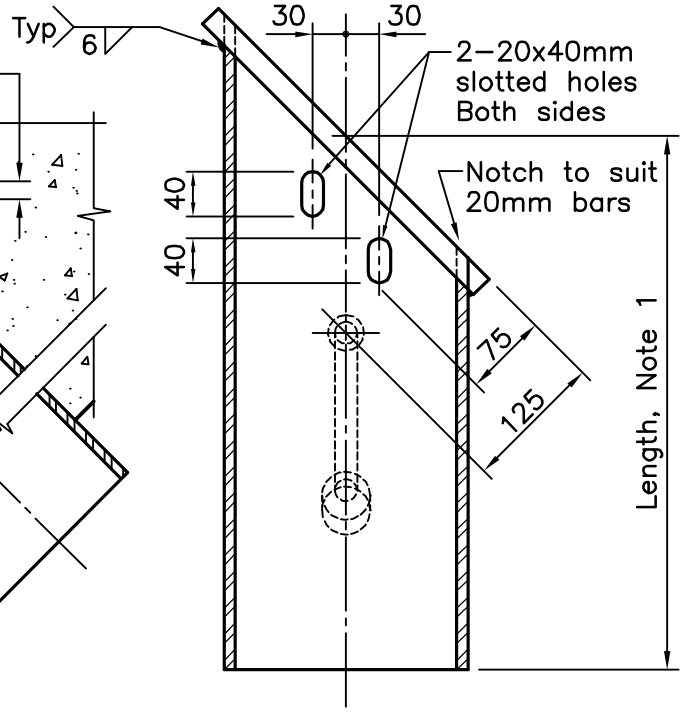
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| DECK<br>DRAINS<br>WITH DOWNSPOUT | | | |
| | OPSD 3340.100 | | |




**PLAN**




**SECTION A–A**




**DRAIN**

NOTES:

1 Placement and length of downspout as specified.

A Drains shall be hot dip galvanized after fabrication according to ASTM A 123.

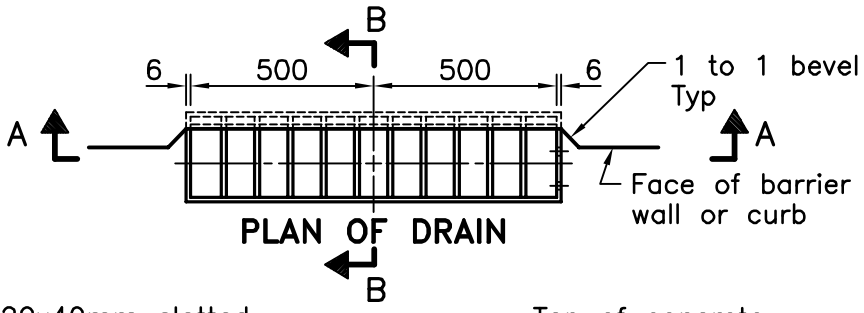
B Anchor studs shall be attached using fusion weld process.

C Pipe shall be according to ASTM A 53M, Grade B.

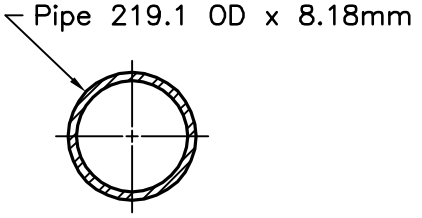
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

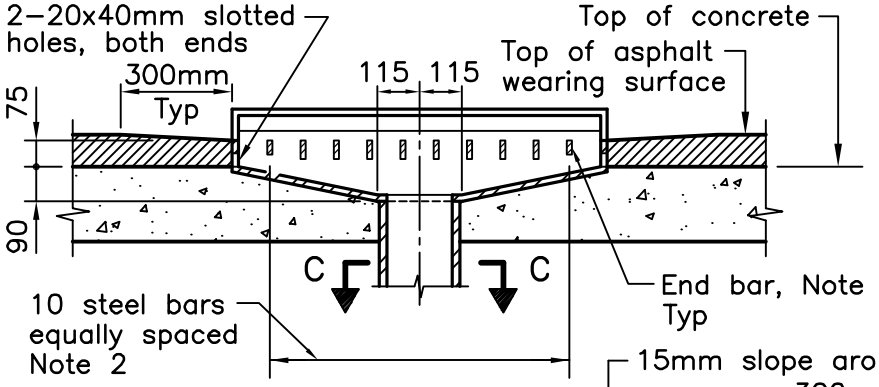
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2014 | Rev | 2 |
|---|---|---|---|
| DECK DRAINS WITH SLOPED DOWNSPOUT | | | |
| | OPSD 3340.102 | | |



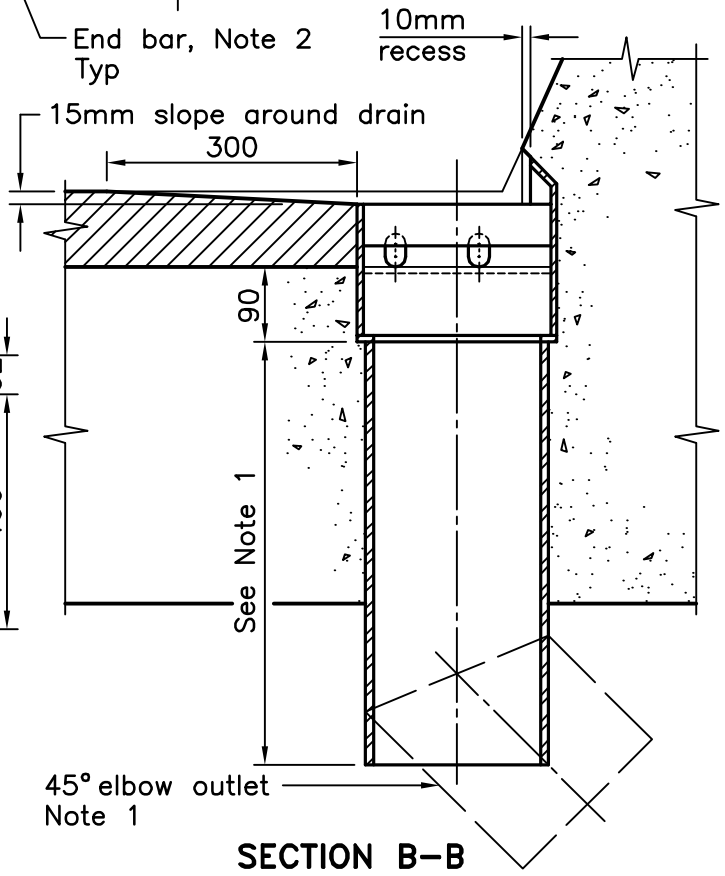

PLAN OF DRAIN



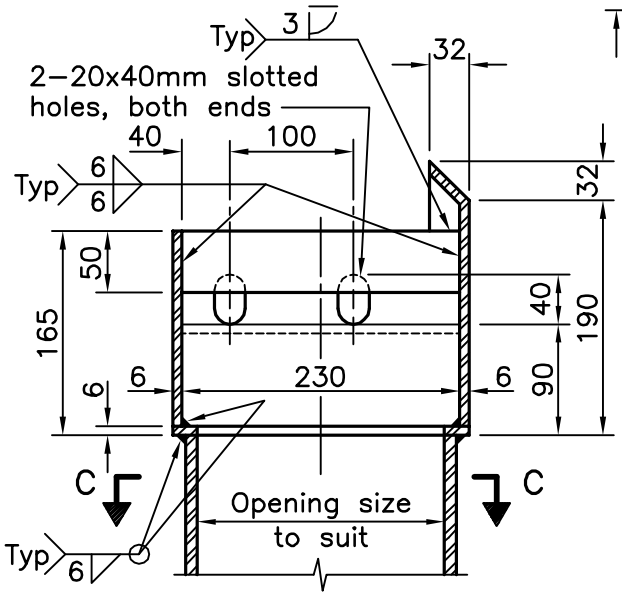

SECTION C–C




SECTION A–A




SECTION B–B




CATCH BASIN DETAILS

NOTES:

1 Shape and length of downspout as specified. When the drain location conflicts with end of barrier form, Contractor may move drain a maximum of 1.5m along length of barrier.

2 End bars shall be 12x38mm steel bar and centre bars shall be 12x50mm steel bar.

A After fabrication, drains shall be hot–dip galvanized according to ASTM A 123.

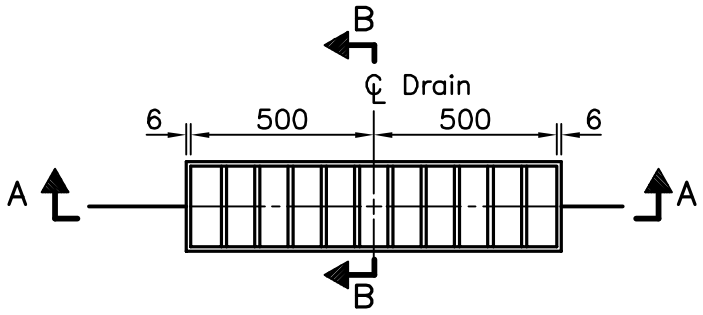
B Pipe shall be according to ASTM A 53M, Grade B.

C Steel bar shall be according to CSA G40.21, Grade 300W.

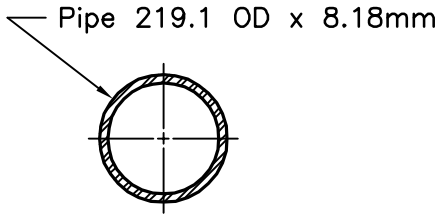
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

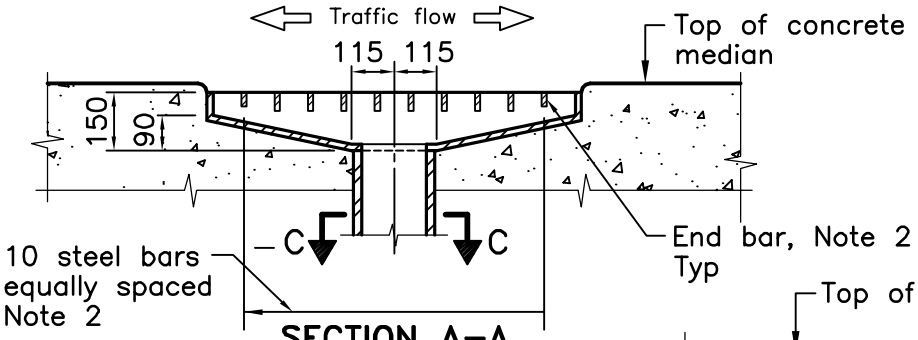
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| DECK<br>DRAINS<br>WITH TRANSVERSE BAR OPENINGS | | | |
| | OPSD 3340.150 | | |



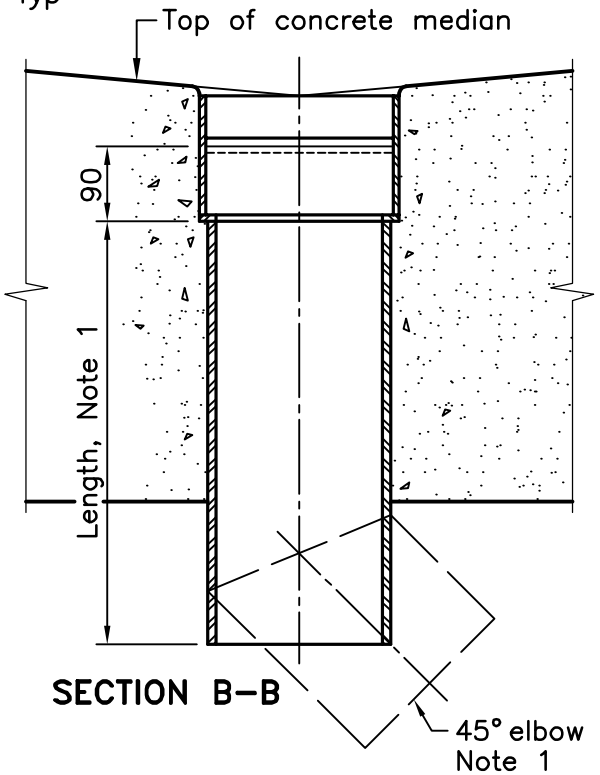

PLAN OF DRAIN



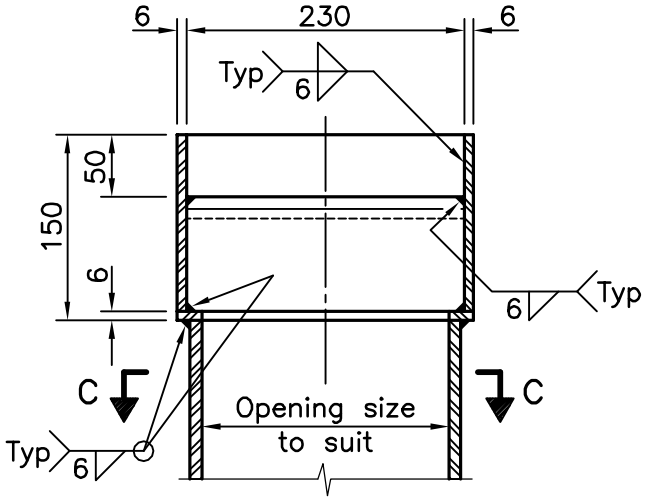

SECTION C–C




SECTION A–A




SECTION B–B




CATCH BASIN DETAILS

NOTES:

1 Shape and length of downspout as specified.

2 End bars shall be 12x38mm steel bar and centre bars shall be 12x50mm steel bar.

A After fabrication, drains shall be hot–dip galvanized according to ASTM A 123.

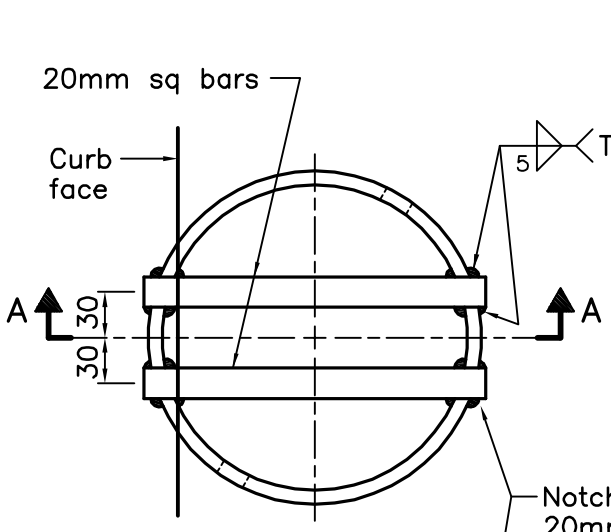
B Pipe shall be according to ASTM A 53M, Grade B.

C Steel bar shall be according to CSA G40.21, Grade 300W.

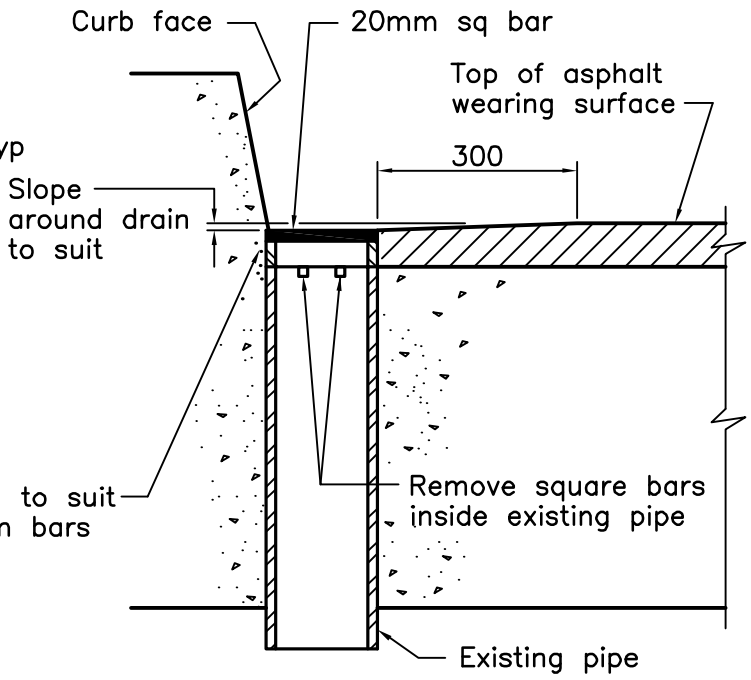
D All welding shall be of a low hydrogen classification and according to CSA W59.

E All dimensions are in millimetres unless otherwise shown.

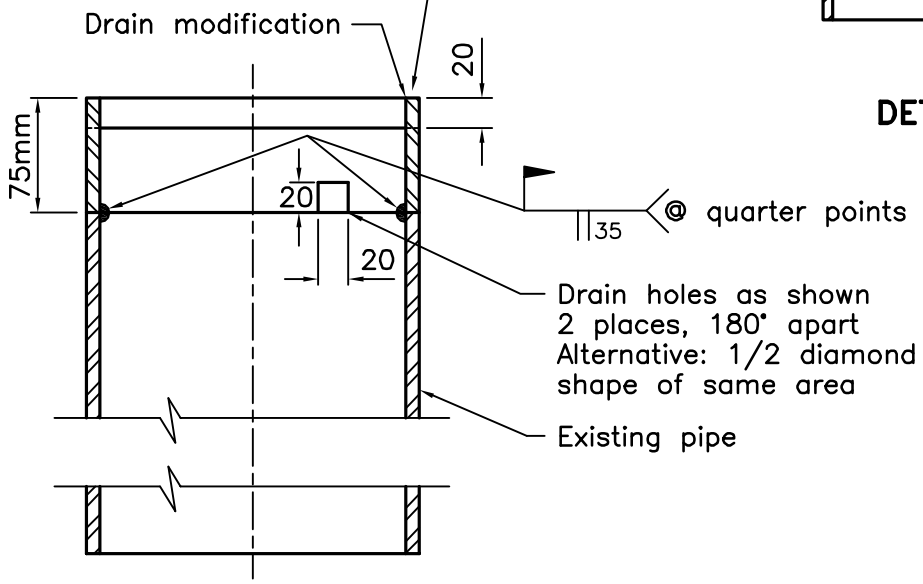
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| DECK<br>DRAINS<br>MEDIAN WITH TRANSVERSE BAR OPENINGS | | | |
| | OPSD 3340.153 | | |




PLAN OF DRAIN




DETAIL FOR SETTING




MODIFIED DRAIN
SECTION A–A

NOTES

A Dimensions of steel pipe extension shall match existing pipe dimensions.

B Steel pipe for drain modification shall be according to ASTM A 53M, Grade B.

C Steel bar shall be according to CSA G40.21, Grade 300W.

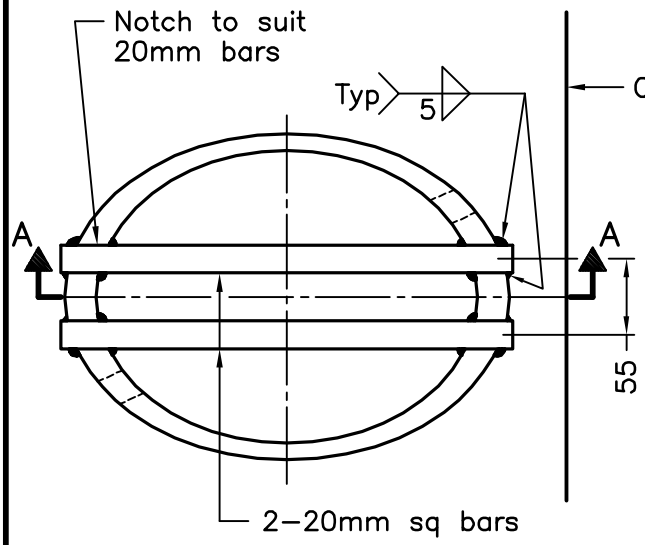
D Welding electrodes shall be of low hydrogen classification and according to CSA W59.

E After fabrication, modification assembly shall be hot–dip galvanized according to ASTM A 123.

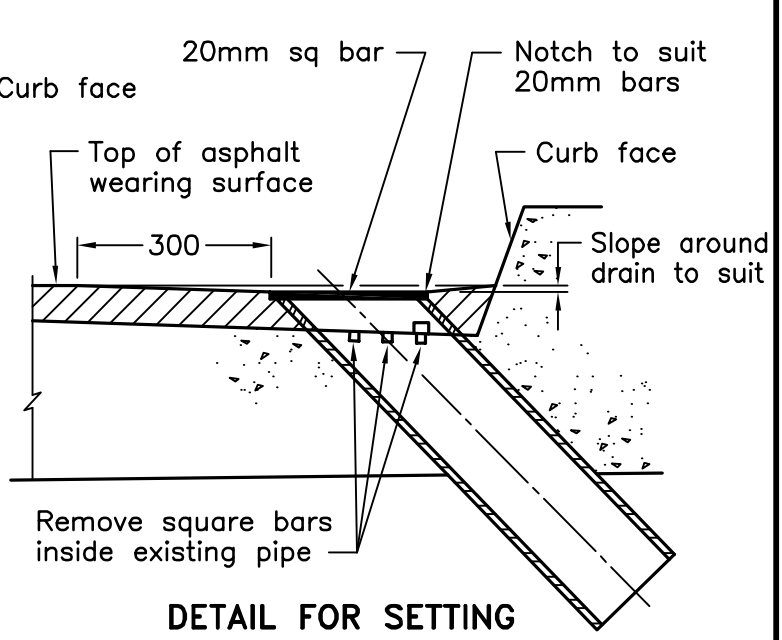
F Field welds shall be painted with an approved zinc rich paint.

G All dimensions are in millimetres unless otherwise shown.

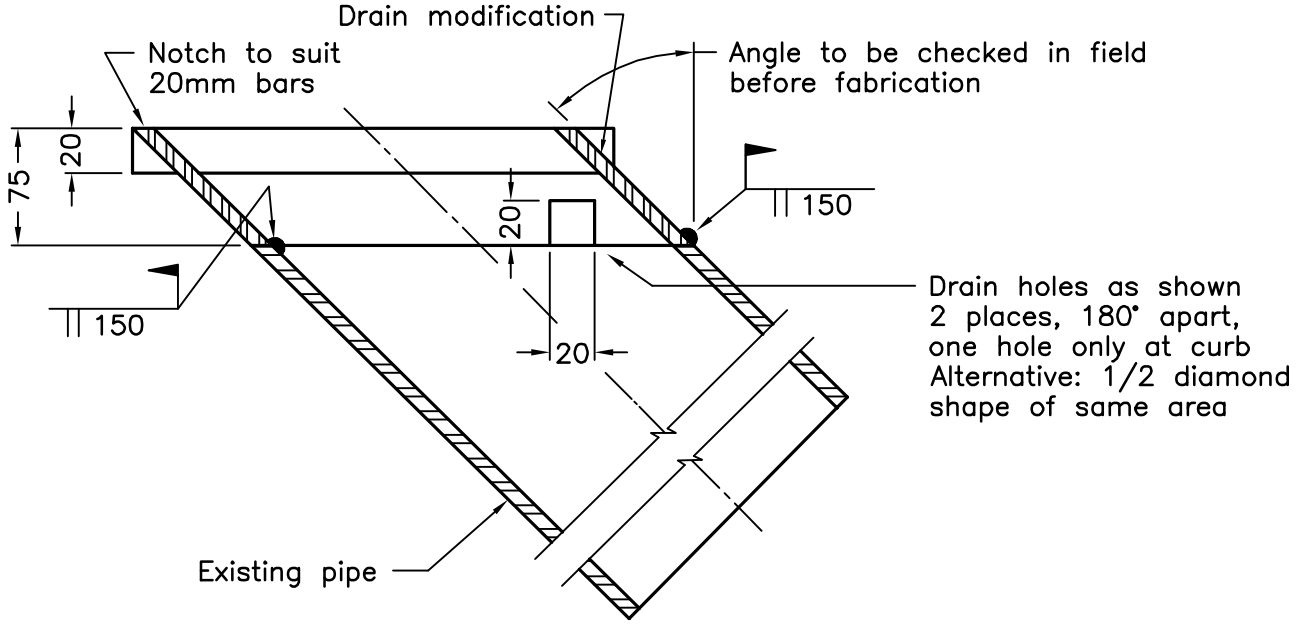
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| DECK DRAINS WITH DOWNSPOUT MODIFICATION FOR ADDITION OF ASPHALT TO EXISTING STRUCTURE | | | |
| | OPSD 3340.200 | | |




PLAN OF DRAIN




DETAIL FOR SETTING

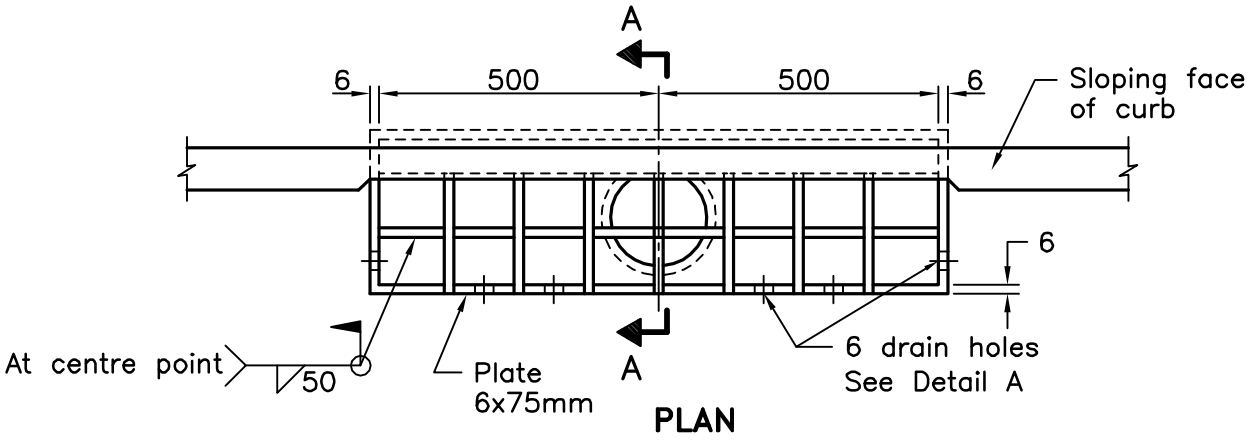



MODIFIED DRAIN
SECTION A–A

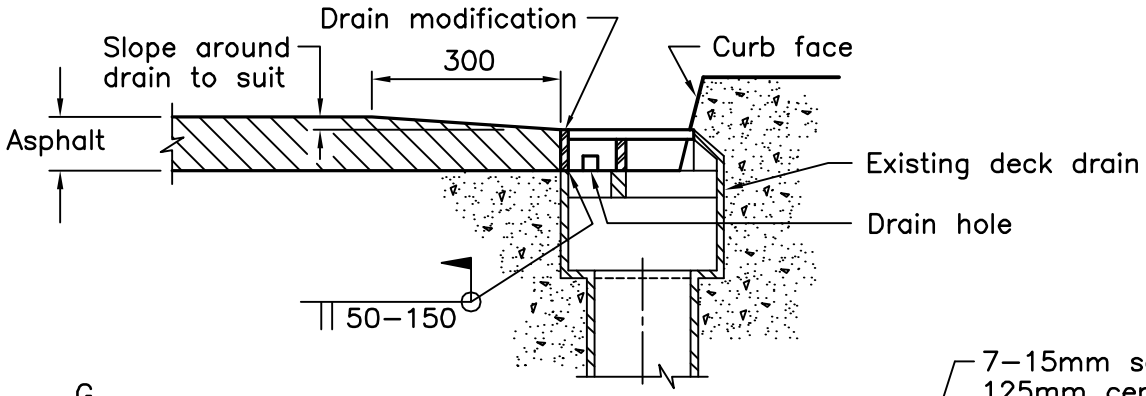
NOTES:

A The steel pipe for drain modification shall be according to ASTM A 53M, Grade B.
B Steel shall be according to CSA G40.21, Grade 300W.
C After fabrication, modification assembly shall be hot–dip galvanized according to ASTM A 123.
D Dimensions of steel pipe extension shall match existing pipe dimensions.
E Field welds shall be painted with an approved zinc rich paint.
F All welding shall be of a low hydrogen classification and according to CSA W59.
G All dimensions are in millimetres unless otherwise shown.

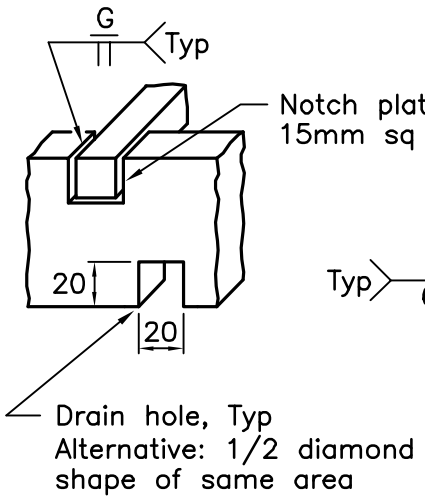
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| DECK<br>DRAINS<br>WITH SLOPED DOWNSPOUT MODIFICATION FOR<br>ADDITION OF ASPHALT TO EXISTING STRUCTURE | | | |
| | OPSD 3340.201 | | |



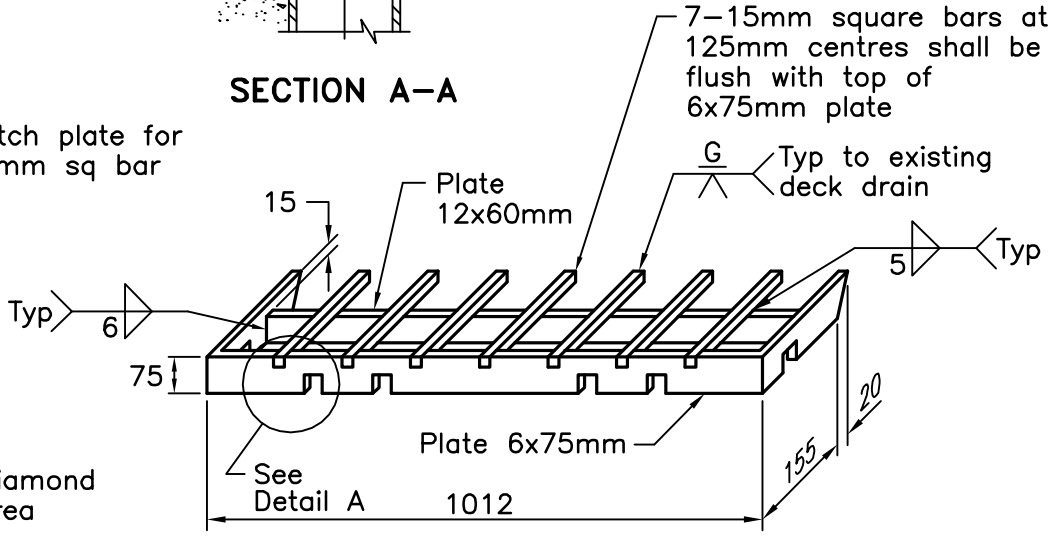

**PLAN**




**SECTION A–A**




**DETAIL A**




**ISOMETRIC VIEW OF MODIFICATION ASSEMBLY**

NOTES:

A Steel shall be according to CSA G40.21, Grade 300W.

B After fabrication, modification assembly shall be hot–dip galvanized according to ASTM A 123.

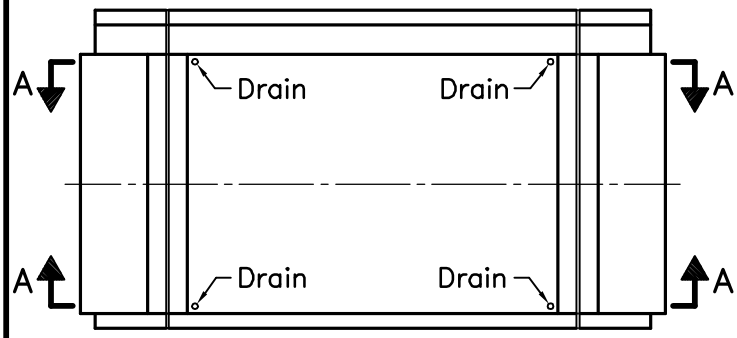
C Dimensions of steel extension shall match existing dimensions.

D Field welds shall be painted with an approved zinc rich paint.

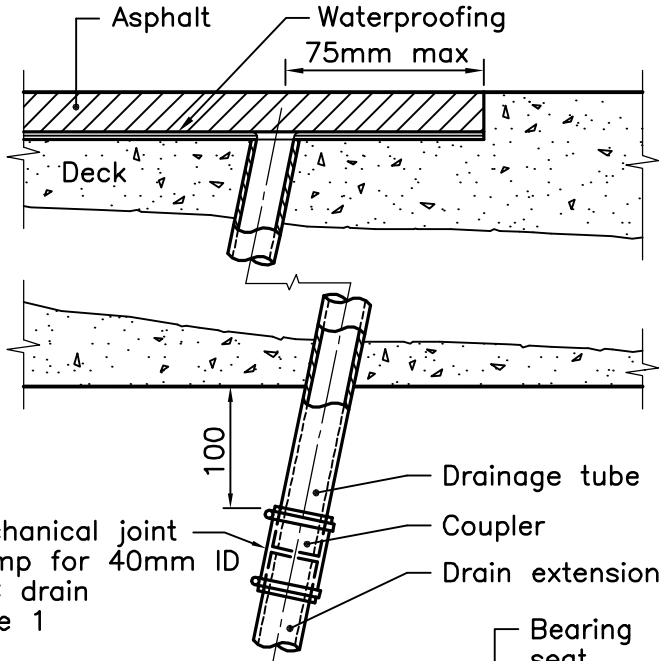
E All welding shall be of a low hydrogen classification and according to CSA W59.

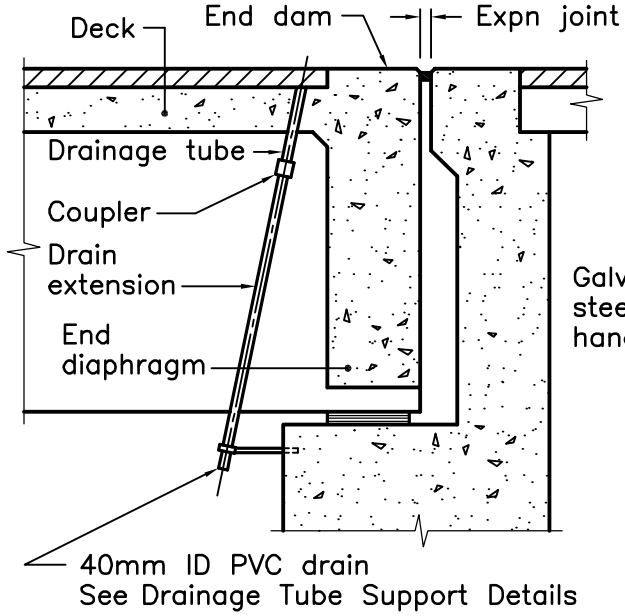
F All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| **DECK DRAINS** WITH TRANSVERSE OR LONGITUDINAL BAR OPENINGS MODIFICATION FOR ADDITION OF ASPHALT TO EXISTING STRUCTURE | | | |
| | **OPSD 3340.250** | | |

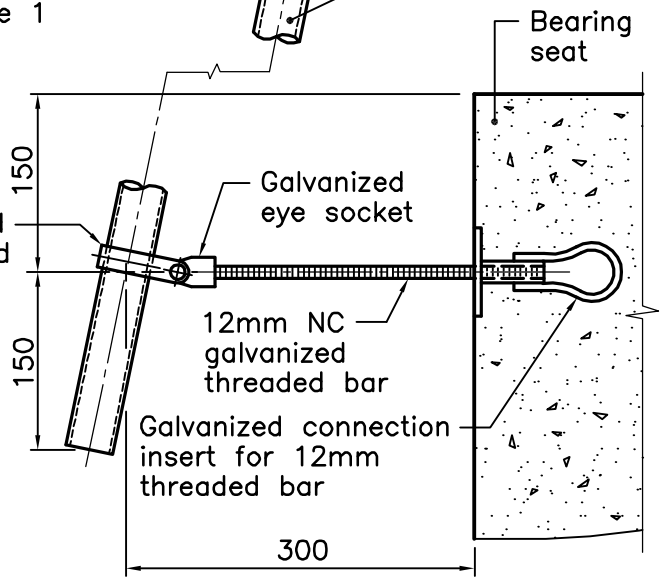



TOP DECK PLAN




SECTION A–A




DRAINAGE TUBE SUPPORT DETAILS

NOTES:

1 Top of drain shall be installed flush with top of concrete deck. Coupler and drain extension shall be installed after removal of deck formwork. All metal parts shall be galvanized according to ASTM A 123.

A PVC drainage tubes shall be rigid type.

B Drainage tubes shall be placed at low points of the bridge deck to prevent ponding of water.

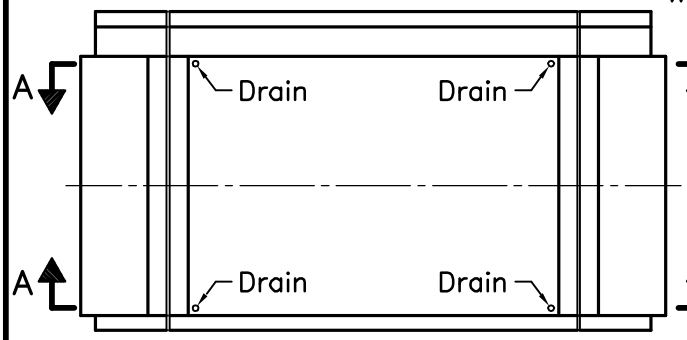
C No waterproofing compound shall be allowed to seal the drainage tubes. Drainage tubes shall be cleaned out prior to placing asphalt.

D Drain extension shall be securely fastened to substructure as shown.

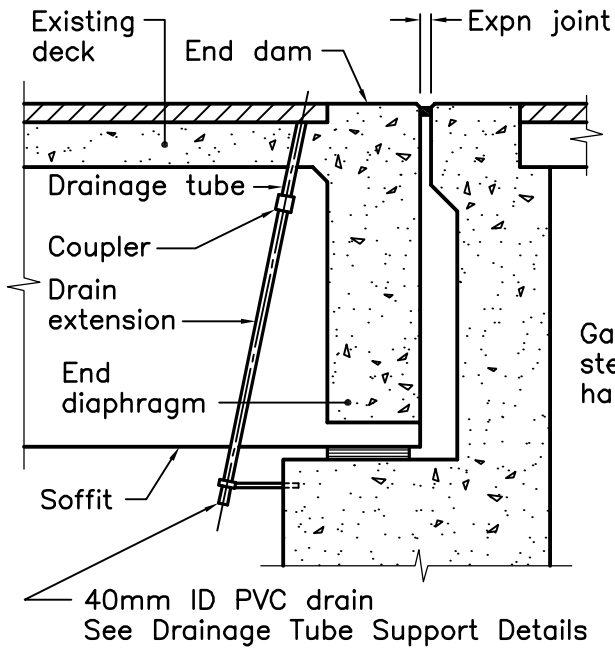
E Drainage tubes shall be straight and shall be positioned to avoid any interference with beams, end diaphragms, stressing cables, voids, and to prevent discharge onto bearing seats of piers or abutments.

F All dimensions are in millimetres unless otherwise shown.

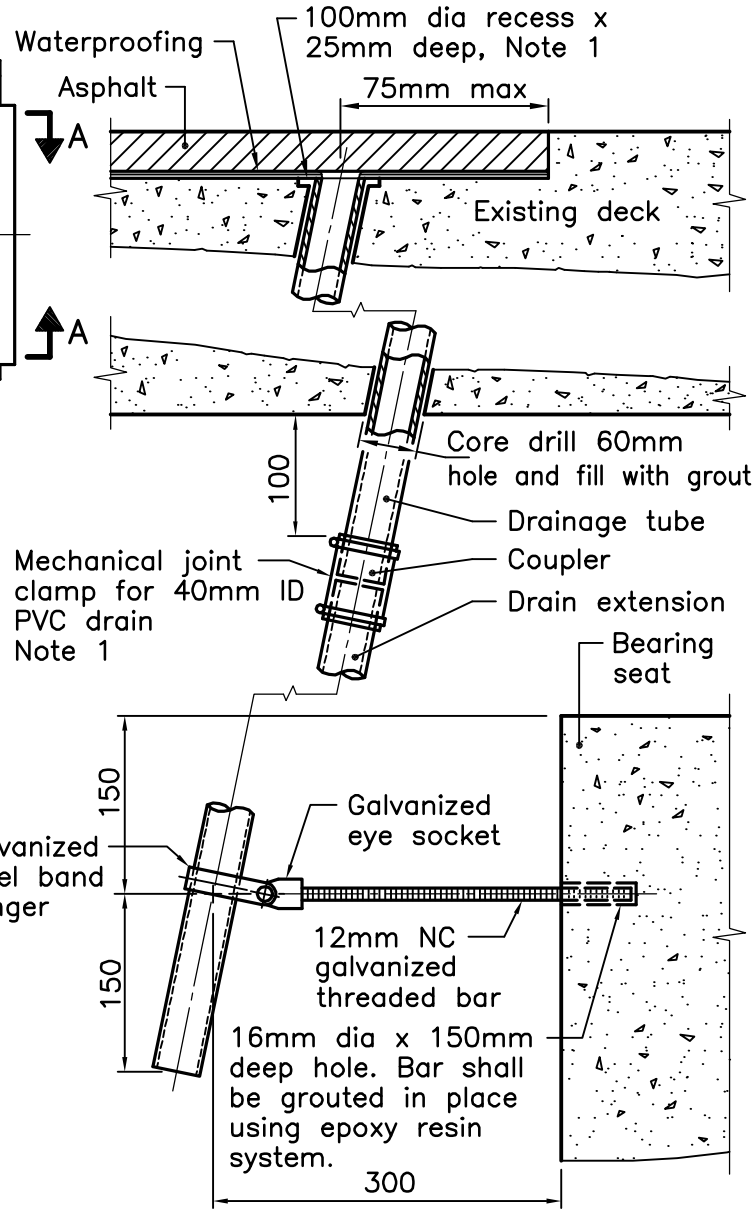
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| DECK, DRAINS<br>DRAINAGE OF NEW DECK<br>BELOW ASPHALT WEARING SURFACE | | | |
| | OPSD 3349.100 | | |




**TOP DECK PLAN**




**SECTION A–A**




**DRAINAGE TUBE SUPPORT DETAILS**

NOTES:

1 Top of drain shall be installed flush with top of concrete deck. Coupler and drain extension shall be installed after removal of any deck formwork. All metal parts shall be galvanized according to ASTM A 123,

A Drains and accessories shall be supplied and placed by the Contractor, PVC drainage tubes shall be rigid type.

B Drainage tubes shall be placed at low points of the bridge deck to prevent ponding of water.

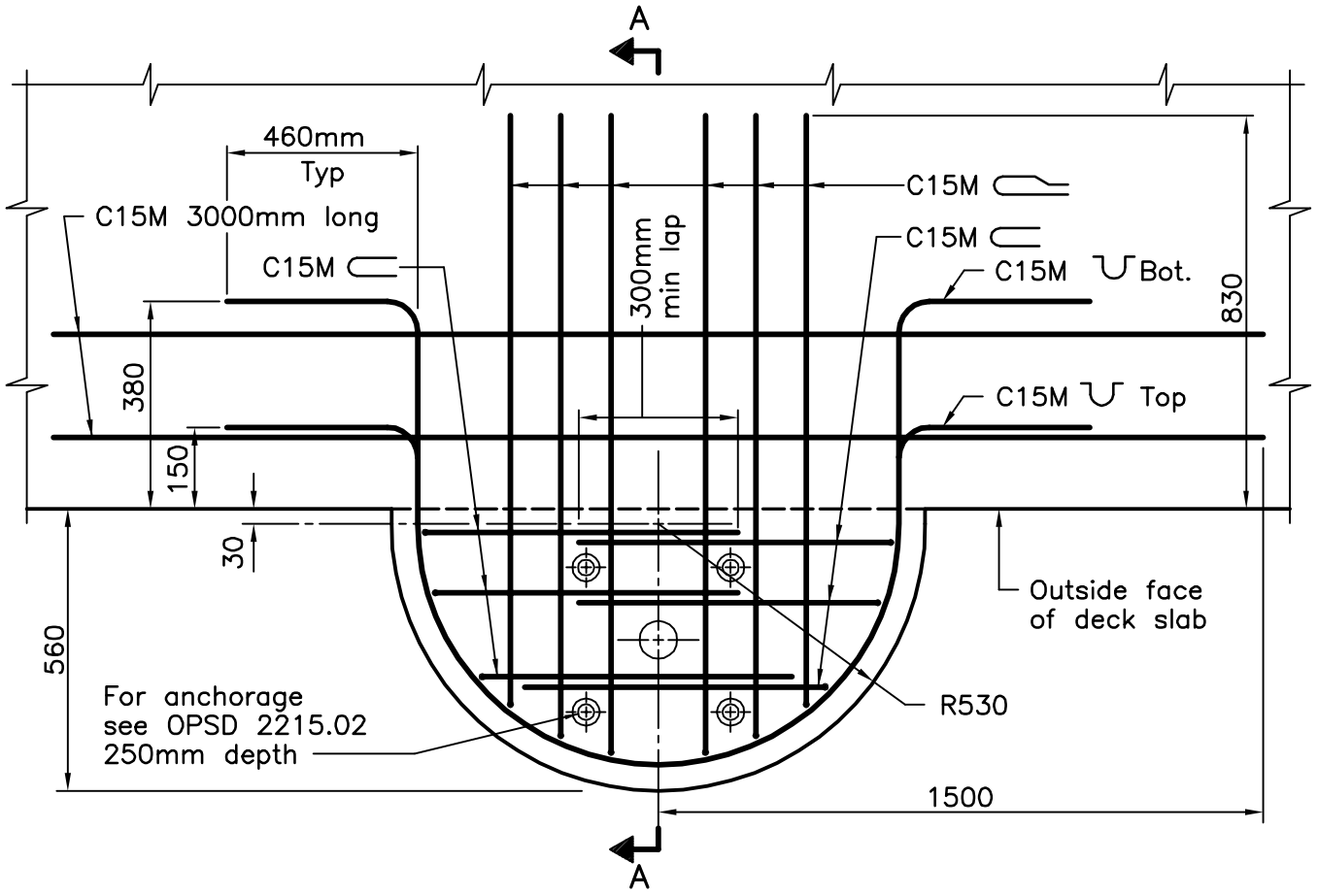
C No waterproofing compound shall be allowed to seal the drainage tubes. Drainage tubes shall be cleaned out prior to placing asphalt.

D Drain extension shall be securely fastened to substructure as shown.

E Drainage tubes shall be straight and shall be positioned to avoid any interference with beams, end diaphragms, stressing cables, voids, and to prevent discharge onto bearing seats of piers or abutments.

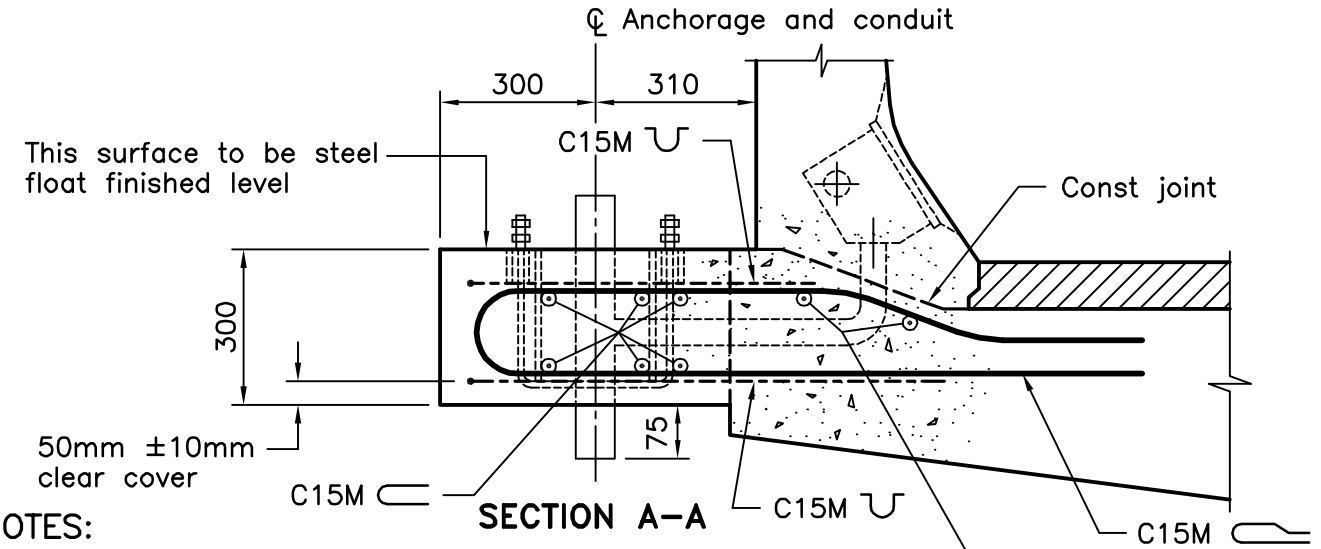
F All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 2 |
|---|---|---|---|
| DECK, DRAINS<br>DRAINAGE OF EXISTING DECK<br>BELOW ASPHALT WEARING SURFACE | | | |
| | OPSD 3349.101 | | |




**PLAN**

Barrier wall not shown




**SECTION A–A**

NOTES:

A Reinforcing steel for deck and barrier wall not shown.

B Cover to reinforcing steel 70mm ±20mm, except as noted.

C Read in conjunction with bridge electrical details.

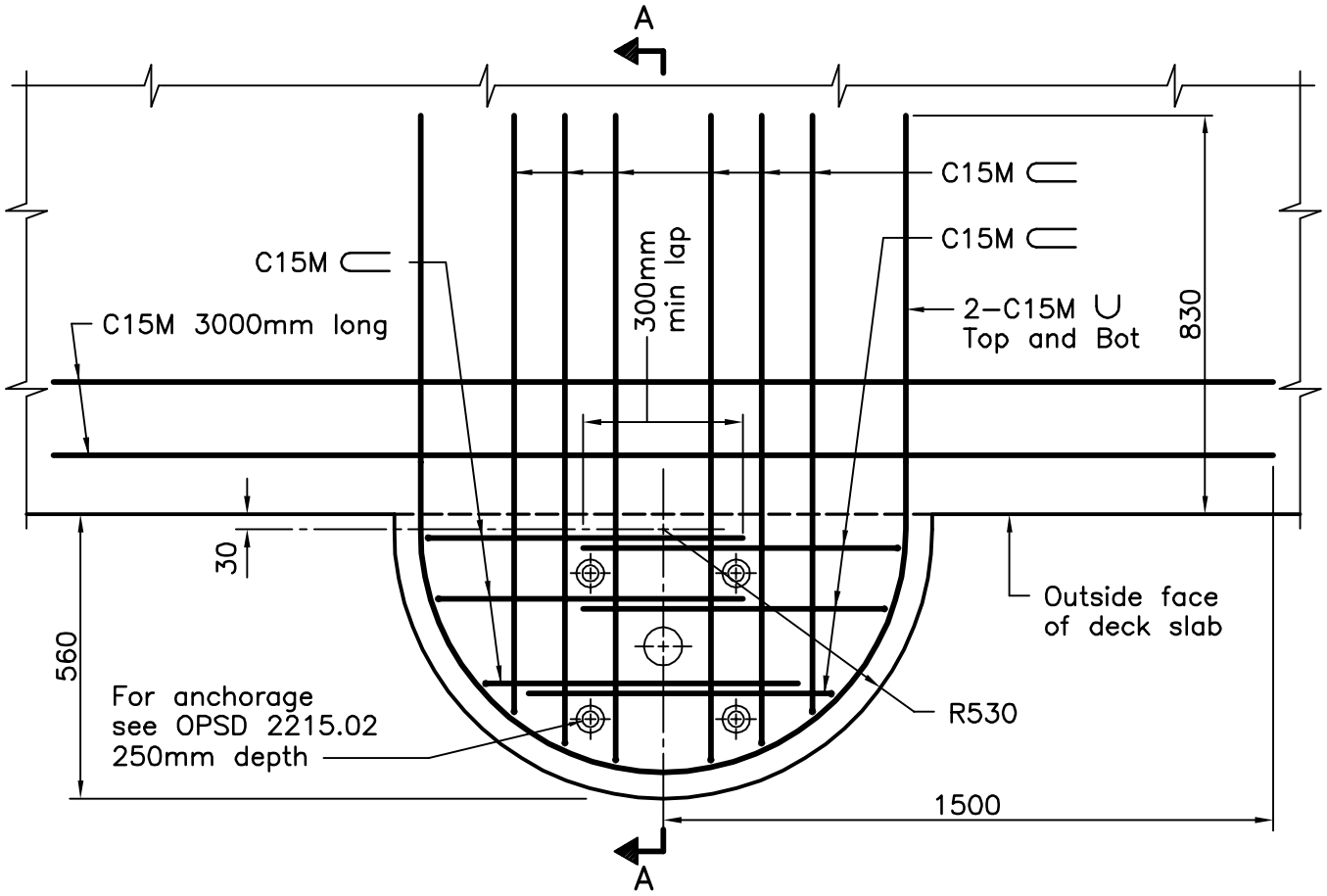
D Anchorage based on 4–32mm dia studs on 406mm bolt circle diameter.

E All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| DECK<br>LIGHT POLE BASES<br>STRUCTURES WITH BARRIER WALLS | | | |

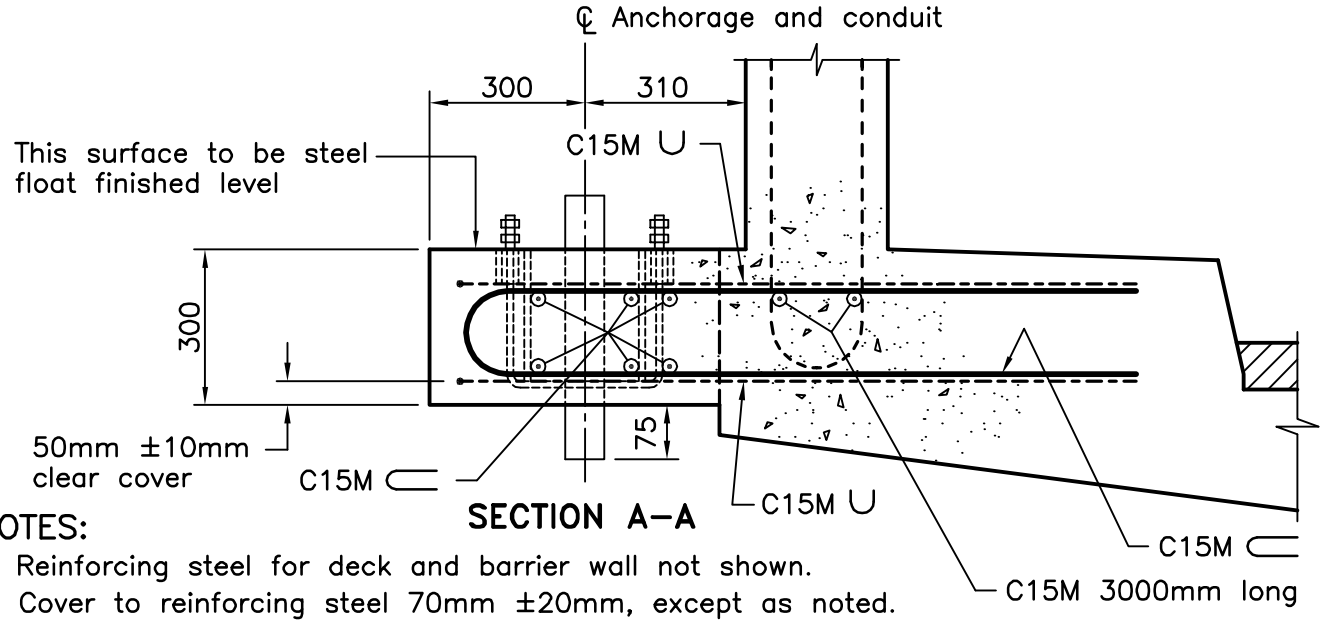
ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

OPSD 3360.100




**PLAN**

Parapet wall not shown




**SECTION A–A**

NOTES:

A Reinforcing steel for deck and barrier wall not shown.

B Cover to reinforcing steel 70mm ±20mm, except as noted.

C Read in conjunction with bridge electrical details.

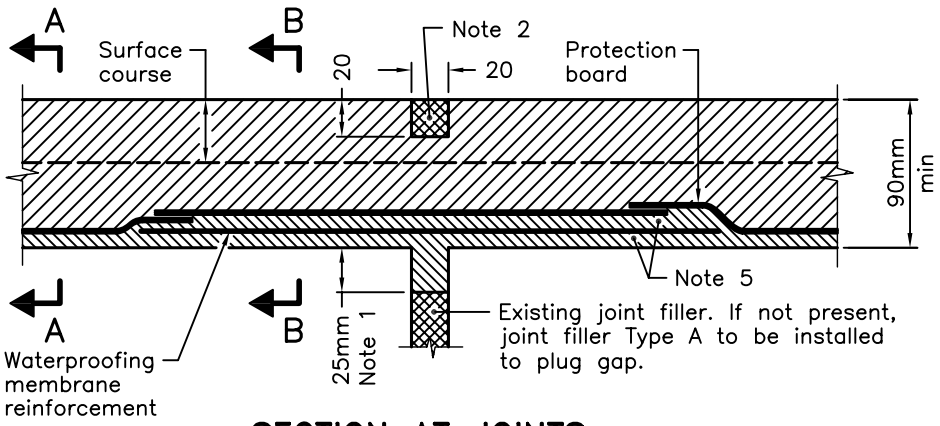
D Anchorage based on 4–32mm dia studs on 406mm bolt circle diameter.

E All dimensions are in millimetres unless otherwise shown.

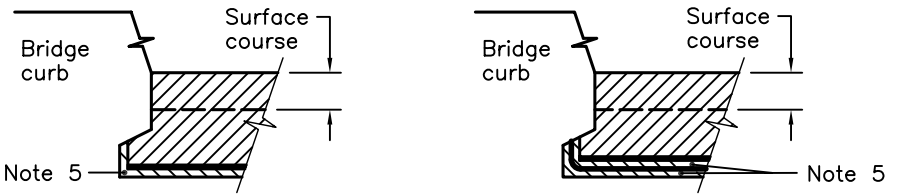
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| DECK<br>LIGHT POLE BASES<br>STRUCTURES WITH PARAPET WALLS | | | |

ONTARIO STANDARDS · MUNICIPAL – PROVINCIAL · OPS

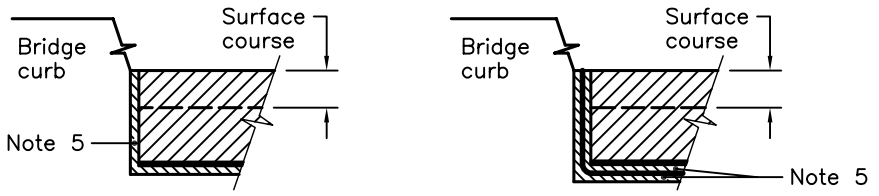
OPSD 3360.200



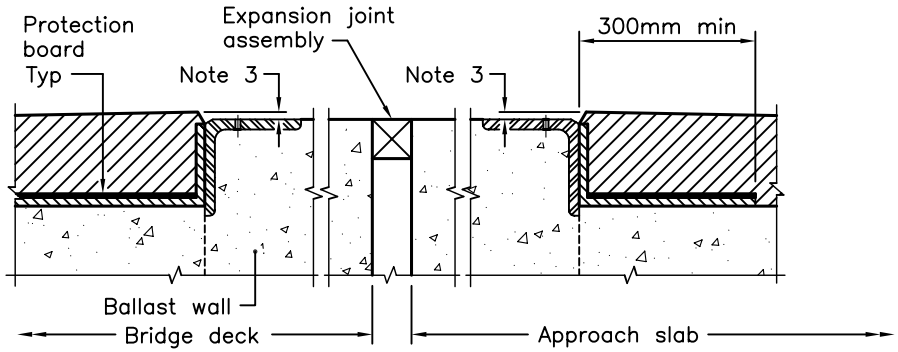

## SECTION AT JOINTS EXCEPT AT EXPANSION JOINT ASSEMBLIES



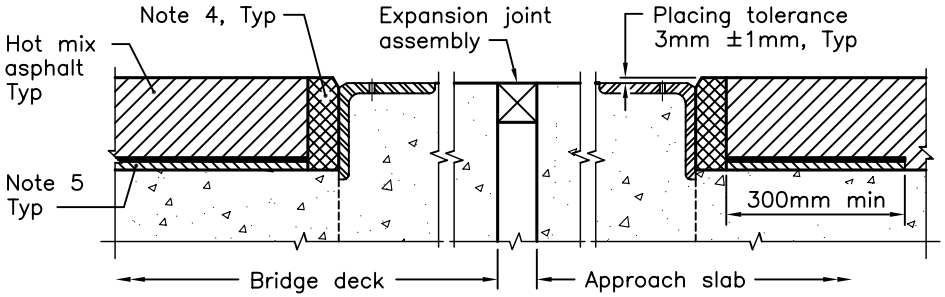

## SECTIONS WITH CHASE




## SECTIONS WITHOUT CHASE




## SECTION AT EXPANSION JOINT ASSEMBLY INSTALLED BEFORE PAVING




## SECTION AT EXPANSION JOINT ASSEMBLY INSTALLED AFTER PAVING

NOTES:

1 Existing joint filler to be removed as shown. Depth may vary when removing a neoprene joint filler at expansion joint.
2 Saw cut groove in pavement to be centred over joint and filled with hot–poured rubberized asphalt joint sealing compound.
3 5mm ±1mm thickness of asphalt to be tapered to zero in a distance not less than 1.0m from concrete dams.
4 20mm wide full depth saw cut groove in hot mix asphalt to be filled with hot–poured rubberized asphalt joint sealing compound.
5 5mm ±1mm hot applied asphalt membrane.

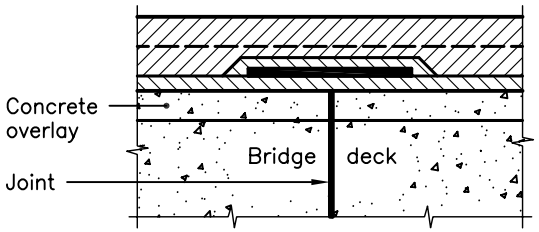
A Joint filler Type A as specified.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

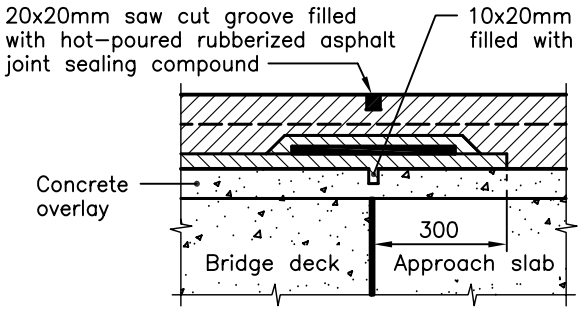
# DECK, WATERPROOFING HOT APPLIED ASPHALT MEMBRANE WITH PROTECTION BOARD

Nov 2008 | Rev 2

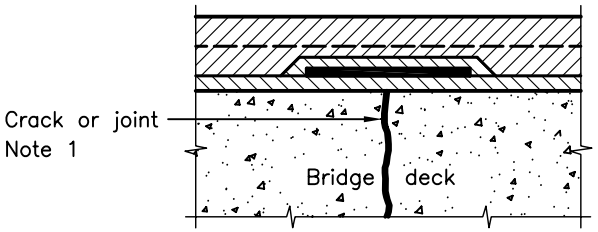
OPSD 3370.100



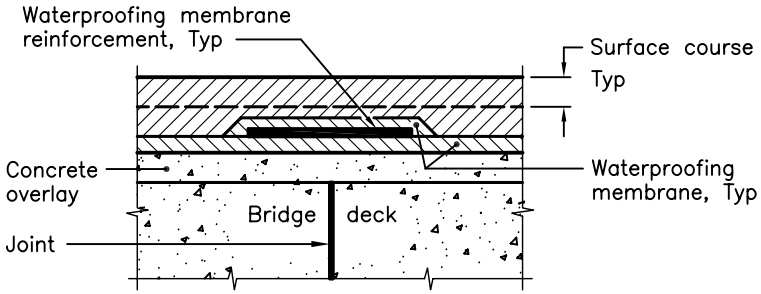

JOINT IN CONCRETE OVERLAY
DIRECTLY ABOVE JOINT
IN BRIDGE DECK



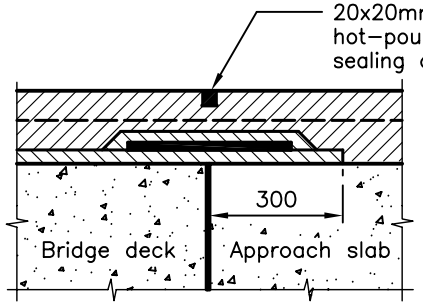

JOINT BETWEEN BRIDGE DECK
AND APPROACH SLAB
WITH CONCRETE OVERLAY



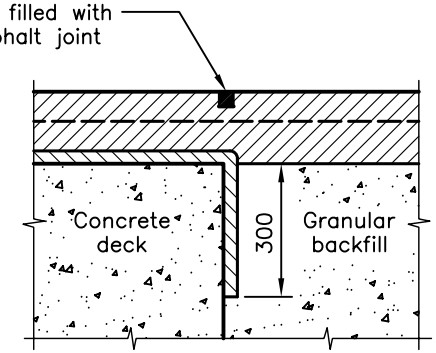

JOINT OR ACTIVE WIDE CRACK
IN BRIDGE DECK



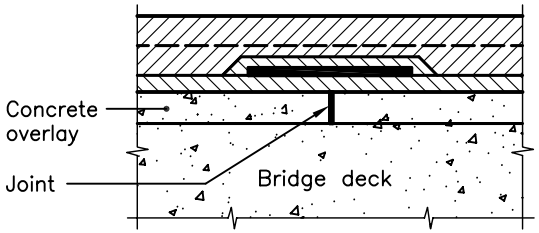

NO JOINT IN CONCRETE OVERLAY
JOINT IN BRIDGE DECK




JOINT BETWEEN BRIDGE DECK
AND APPROACH SLAB
WITHOUT CONCRETE OVERLAY




JOINT BETWEEN CONCRETE DECK
AND GRANULAR BACKFILL




JOINT IN CONCRETE OVERLAY
NO JOINT IN BRIDGE DECK

NOTES:

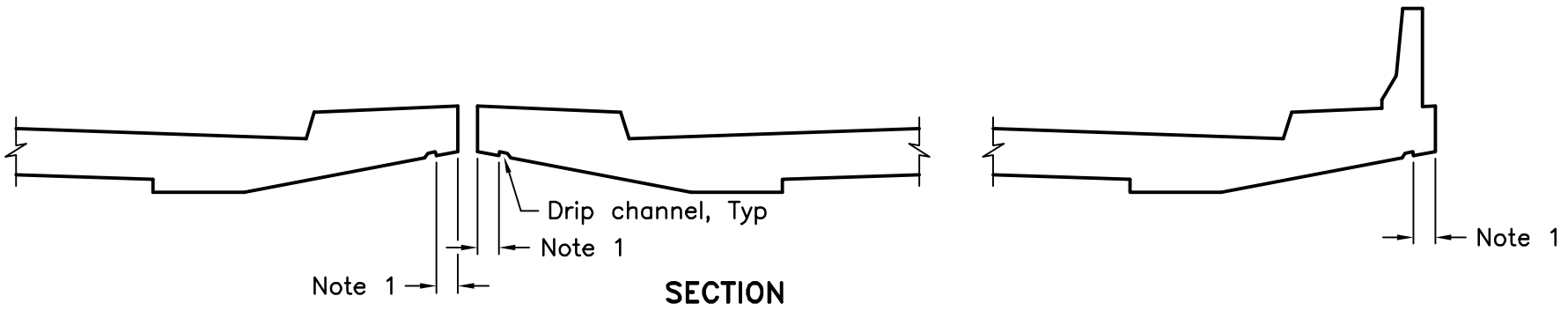
1 Cracks in concrete to be repaired as specified.

A This OPSD is to be read in conjunction with OPSD 3370.100.

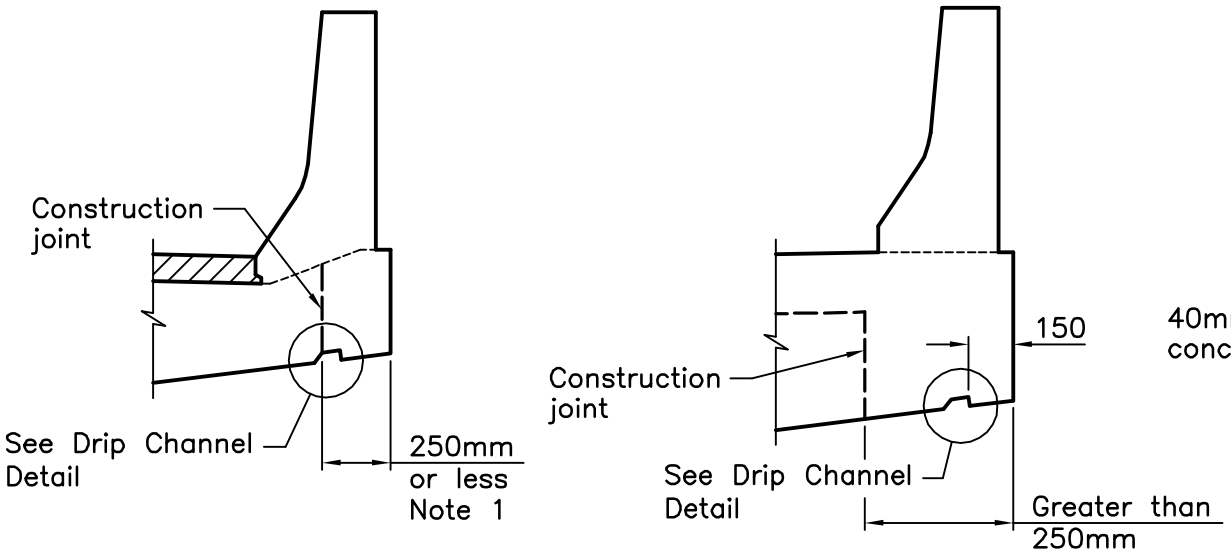
B Protection board is not shown for clarity.

C All dimensions are in millimetres unless otherwise shown.

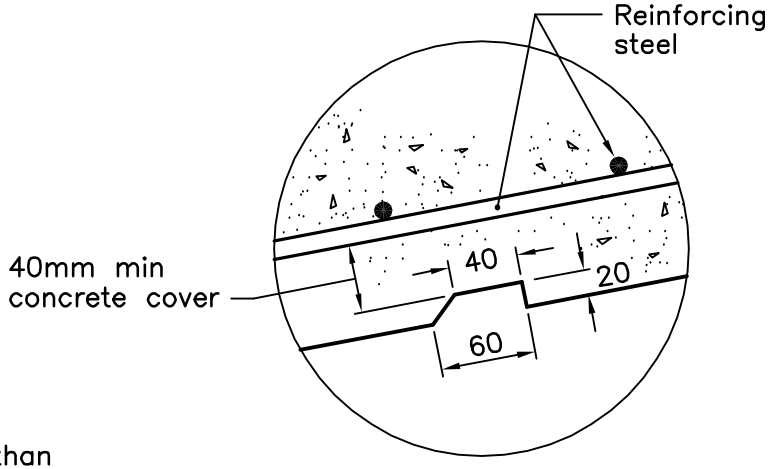
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2008 | Rev 2 |
|---|---|---|
| DECK, WATERPROOFING<br>HOT APPLIED ASPHALT MEMBRANE<br>AT ACTIVE CRACKS GREATER THAN 2mm<br>WIDE AND CONSTRUCTION JOINTS | | |
| | | OPSD 3370.101 |




SECTION




LOCATION OF DRIP CHANNEL WITH CONSTRUCTION JOINT




DRIP CHANNEL DETAIL

NOTES:

1 This dimension shall be 150mm, unless a vertical construction joint is within 250mm of the edge of structure, as shown.

A Drip channel detail applies to all types of concrete deck slabs.

B Drip channel shall be continuous along soffit.

C All dimensions are in millimetres unless otherwise shown.

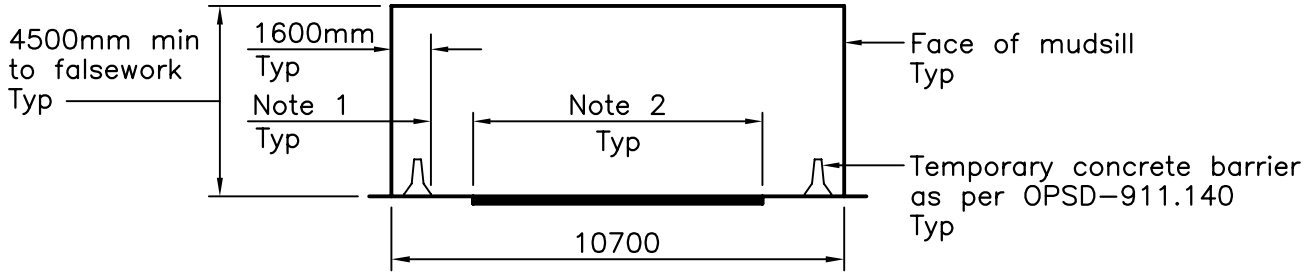
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012 | Rev 2

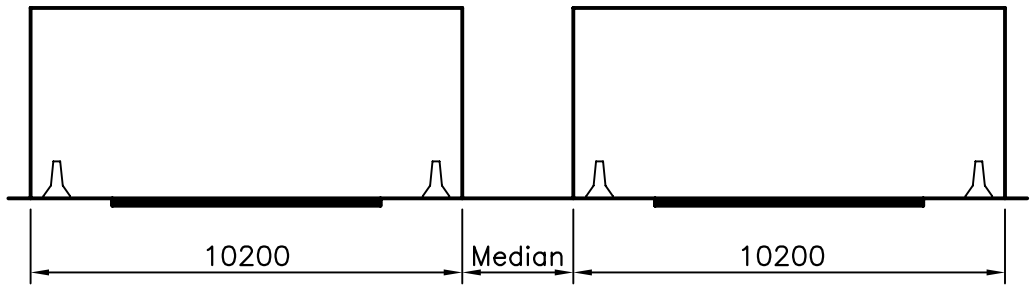
# DECK

# DRIP CHANNEL

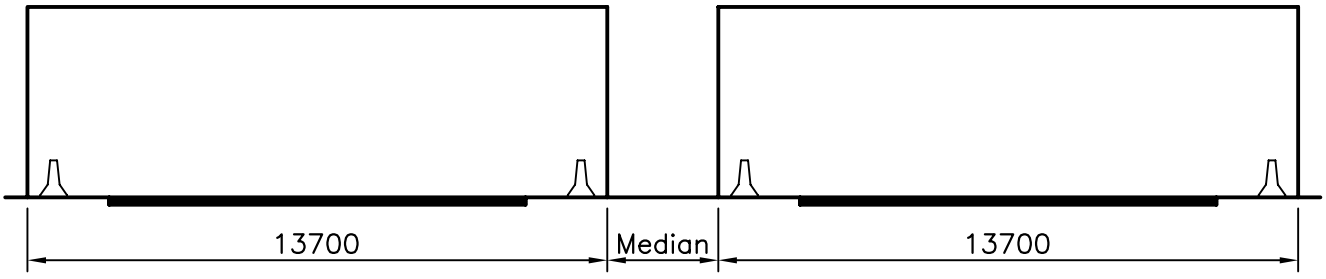
OPSD 3390.100




**2 LANE FACILITY**
**1 LANE IN EACH DIRECTION**




**4 LANE FACILITY**
**2 LANES IN EACH DIRECTION**




**6 LANE FACILITY**
**3 LANES IN EACH DIRECTION**

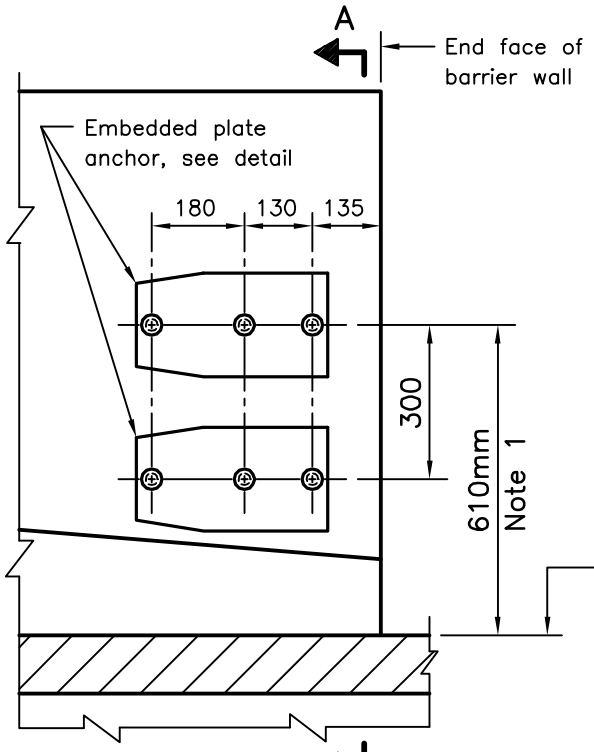
NOTES:

1 Shoulder width shall be as specified.

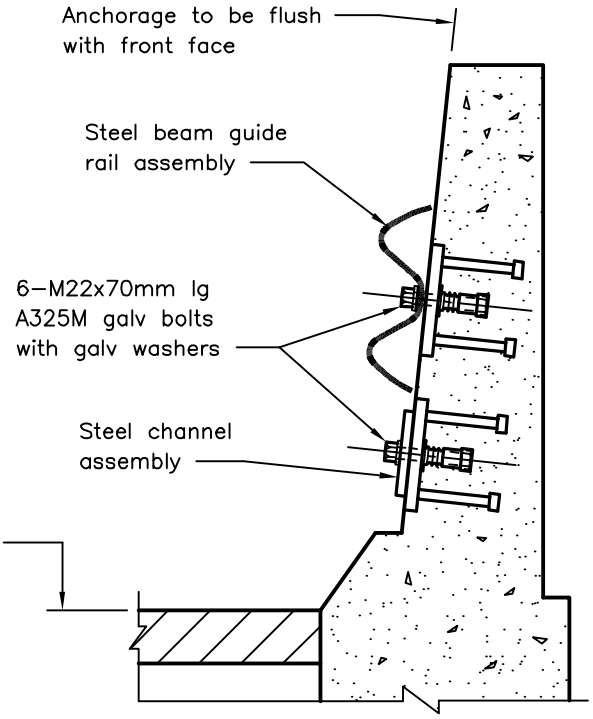
2 Lane widths shall be as specified.

A All dimensions are in millimetres unless otherwise shown.

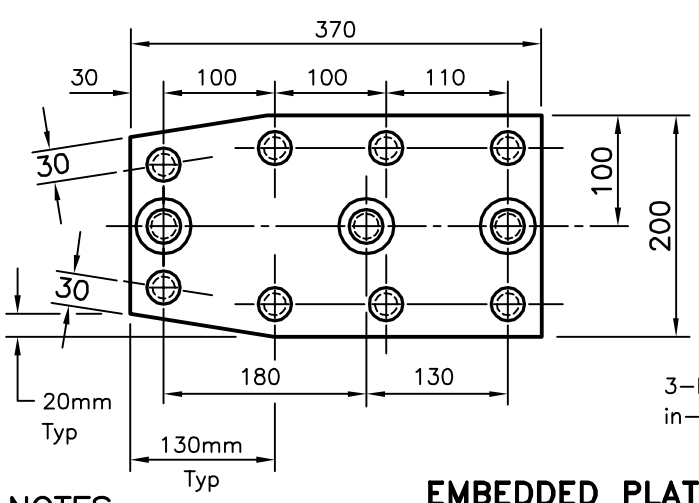
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2005 | Rev | 0 |
|---|---|---|---|
| FALSEWORK CLEARANCE TO TRAFFIC LANES | | | |
| | OPSD – 3390.150 | | |

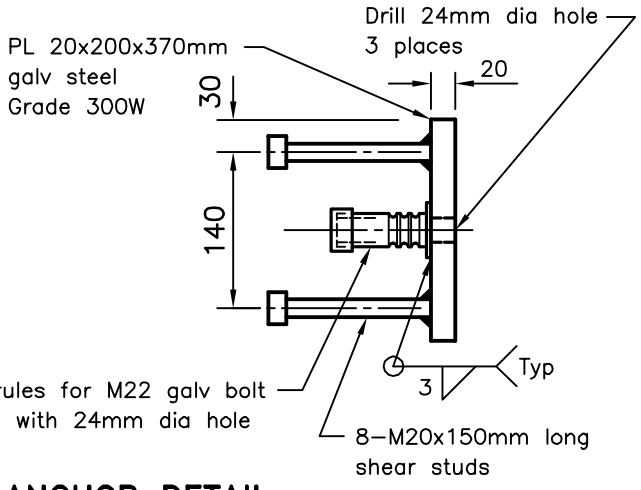



ELEVATION




SECTION A–A




## EMBEDDED PLATE ANCHOR DETAIL

NOTES:

1 If curb or sidewalk in front of the barrier wall is 300mm or greater in width, the mounting height shall be measured vertically to the top of the concrete surface.

A This OPSD to be read in conjunction with OPSD 912.401 and 912.430.

B Steel according to CSA G40.21, Grade 300W.

C Studs to be welded using fusion weld process.

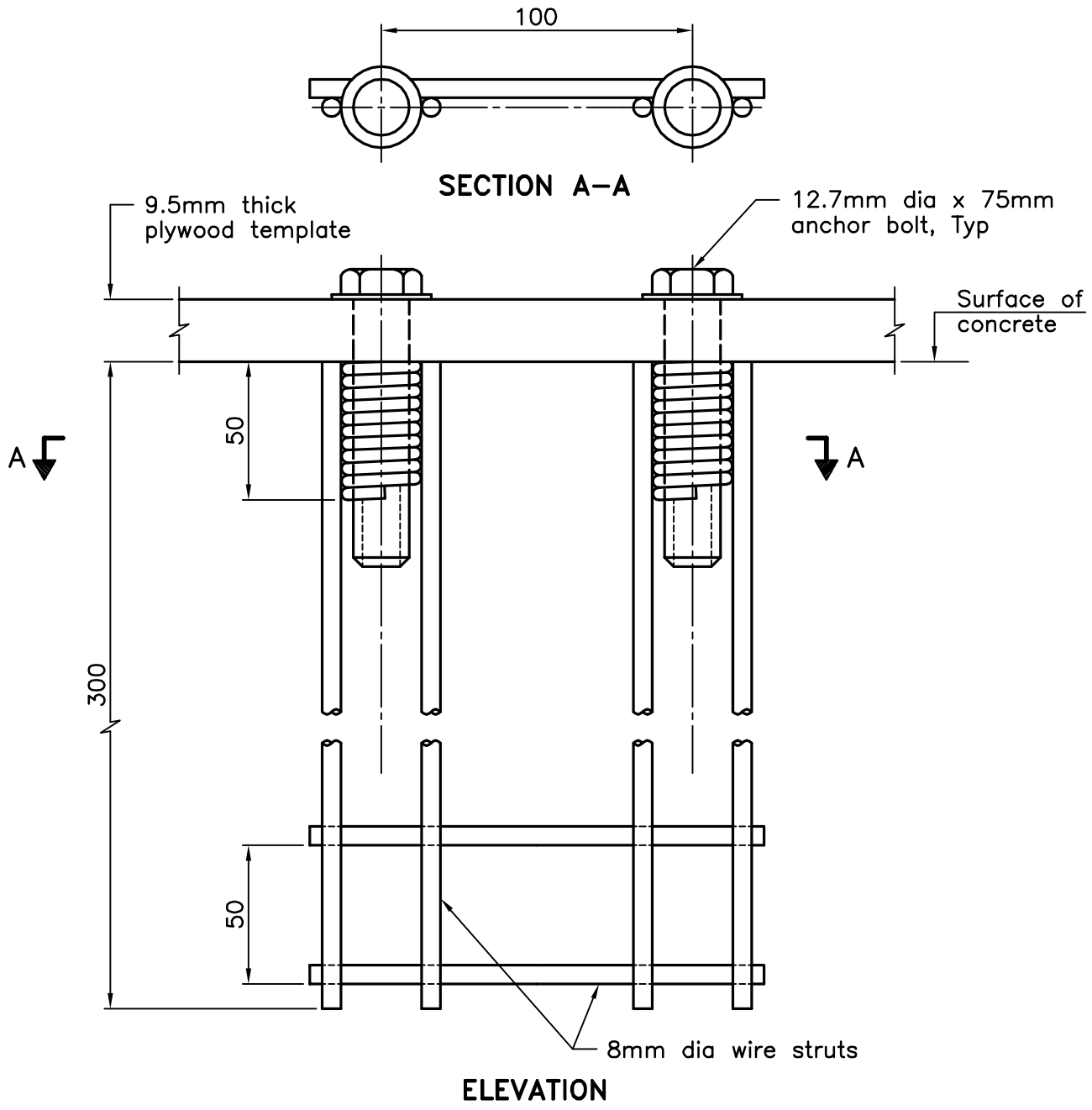
D Welding shall be of a low hydrogen classification according to CSA W59 with E480xx electrodes.

E Anchor to be hot dip galvanized after fabrication according to CAN/CSA G164.

F All bolts shall be liberally coated with antiseize compound meeting US Military Specification MIL–A–907D.

G All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| BARRIERS AND RAILINGS<br>STEEL BEAM<br>GUIDE RAIL AND CHANNEL ANCHORAGE | | | |
| | OPSD 3419.100 | | |




NOTES:

A Wire struts shall be SAE 1030 steel. Coils shall be SAE 1018 steel.

B Anchor bolts and hardened steel washers shall be according to ASTM A 325.

C All welding shall be according to CSA W59.

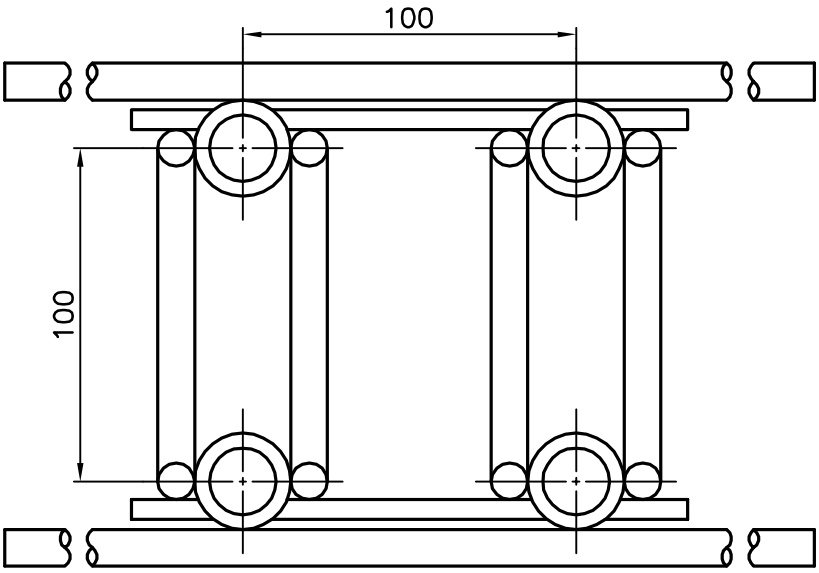
D The complete anchorage assembly including bolts, nuts, and washers shall be hot dip galvanized according to CAN/CSA G164M.

E Bolts shall be given a liberal coating of white non–staining grease.

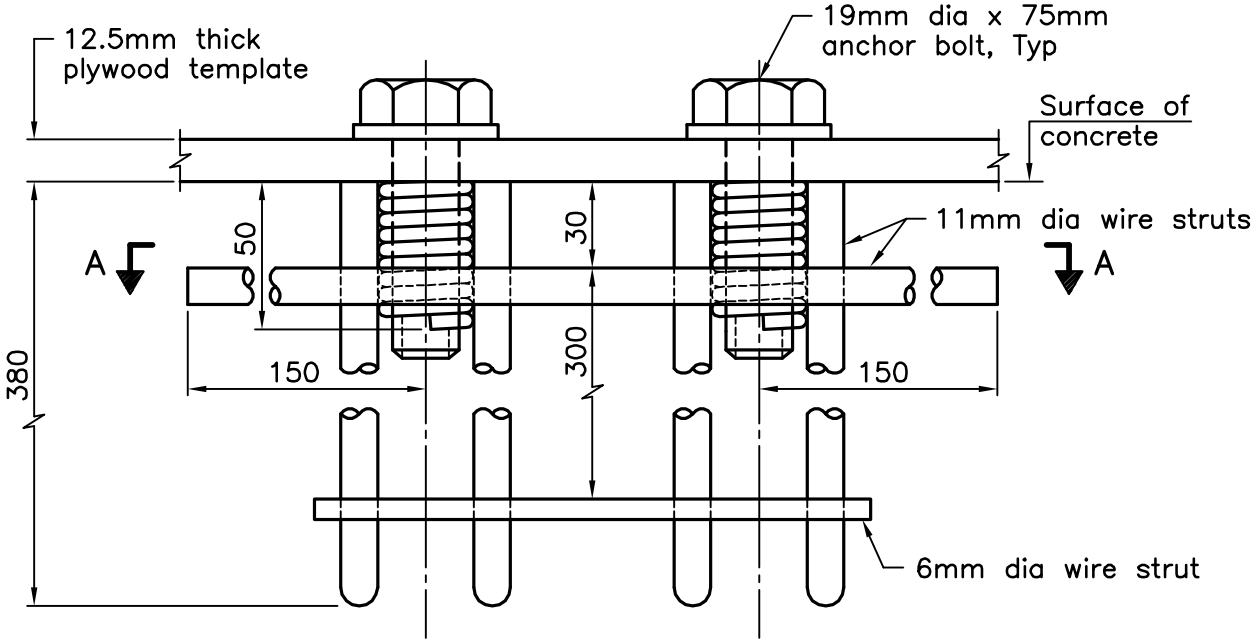
F A plywood setting template shall be provided for accurate positioning of anchorage within the concrete form.

G All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| BARRIERS AND RAILINGS<br>STEEL<br>SINGLE RAILING ANCHORAGE | | | |
| | OPSD 3419.150 | | |




SECTION A–A




ELEVATION

NOTES:

A Wire struts shall be SAE 1030 steel. Coils shall be SAE 1018 steel.

B Anchor bolts and hardened steel washers shall be according to ASTM A 325.

C All welding shall be according to CSA W59.

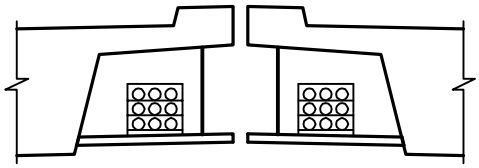
D The complete anchorage assembly including bolts, nuts, and washers shall be hot dip galvanized according to CAN/CSA G164M.

E Bolts shall be given a liberal coating of white non–staining grease.

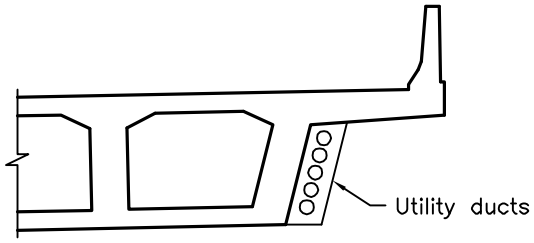
F A plywood setting template shall be provided for accurate positioning of anchorage within the concrete form.

G All dimensions are in millimetres unless otherwise shown.

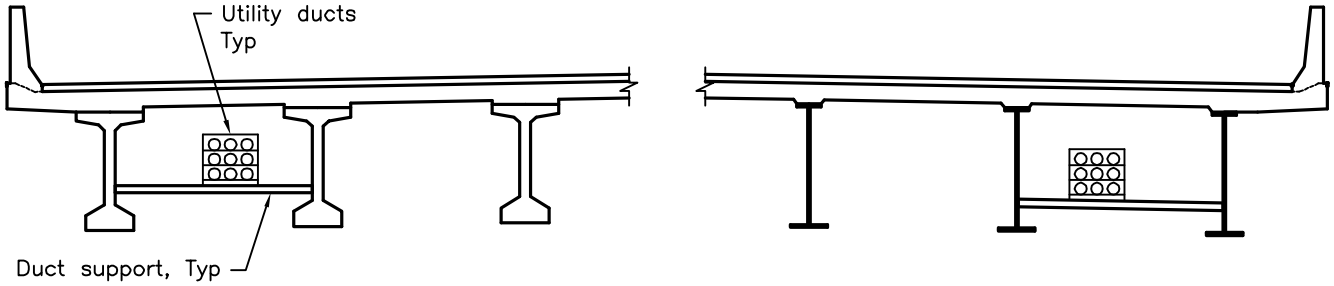
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 1 |
|---|---|---|---|
| BARRIERS AND RAILINGS<br>STEEL<br>DOUBLE RAILING ANCHORAGE | | | |
| | OPSD 3419.155 | | |



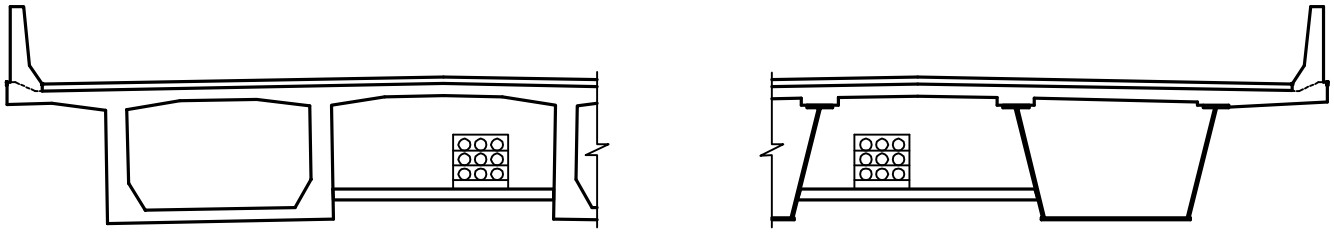
TWINNED CONCRETE VOIDED
POST–TENSIONED DECKS




TRAPEZOIDAL CONCRETE BOX
POST–TENSIONED DECK




SLAB–ON–CONCRETE OR STEEL I TYPE GIRDERS



SLAB–ON–CONCRETE OR STEEL BOX GIRDERS

NOTE:

A Polypropylene pull rope shall be installed in ducts.

B Expansion and deflection fitting assembly shall be provided to accommodate design movements.

C Ends of ducts shall be sealed using plastic caps.

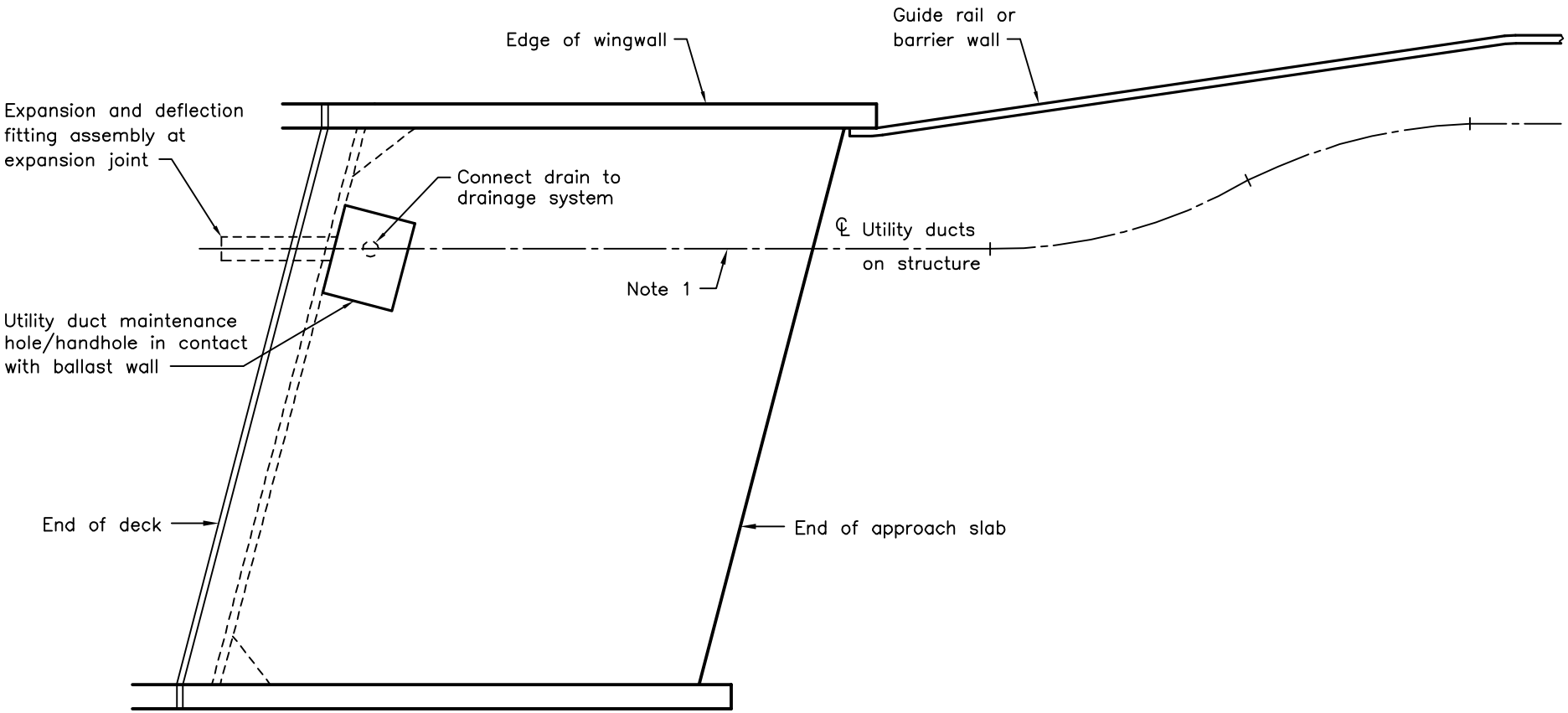
D Utility shall supply ducts, wobble joints, plastic caps, pull rope, duct seal, and epoxy impregnated tape, unless otherwise specified.

E Location, number, and details of ducts and duct supports shall be as specified.

F Location of ducts and duct supports shall allow access for future inspection of girders and deck.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2012 | Rev | 1 |
|---|---|---|---|
| UTILITIES<br>DUCT LOCATION | | | |

OPSD 3900.100




**PLAN**

NOTE:
1 Duct layout shall be as specified.

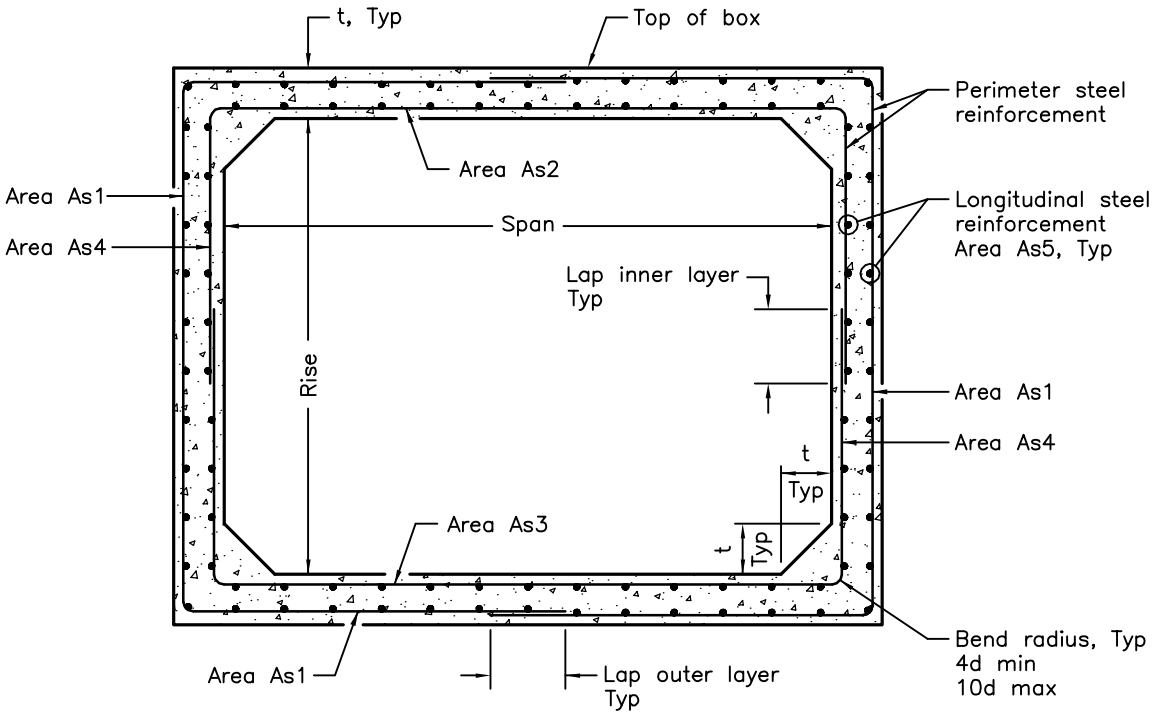
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2011 | Rev 1

# UTILITIES

# DUCT TERMINATION AT BRIDGE APPROACHES

OPSD 3900.150




**BOX UNIT CROSS–SECTION**

NOTES:

1 For box units reinforced with WWF As1 to As5 shall be as specified.

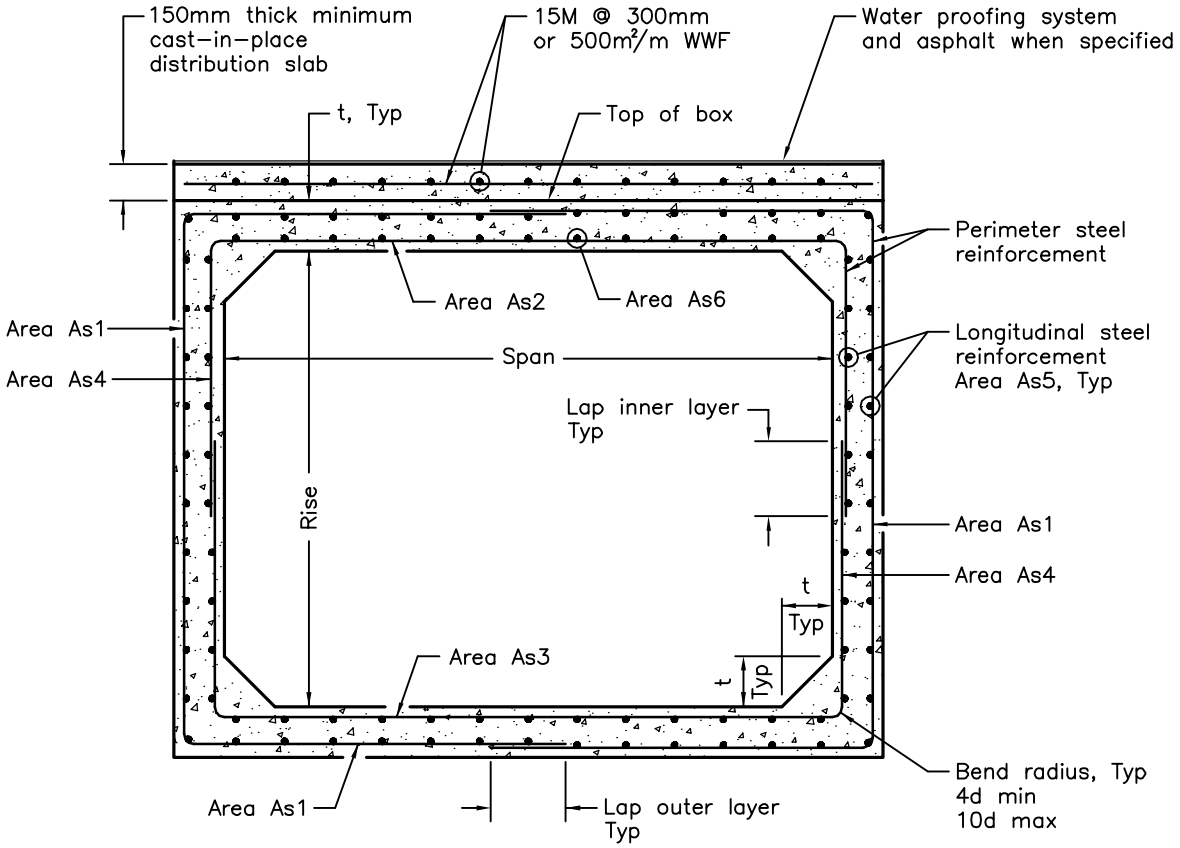
2 As1 to As4 refer to minimum reinforcement areas required at indicated faces.

3 t = thickness of walls and slabs.

4 d = diameter of perimeter steel reinforcement.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| PRECAST REINFORCED CONCRETE BOX CULVERT WITH HEIGHT OF FILL ≥ 0.6M | _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ | | |
| | OPSD 3920.100 | | |

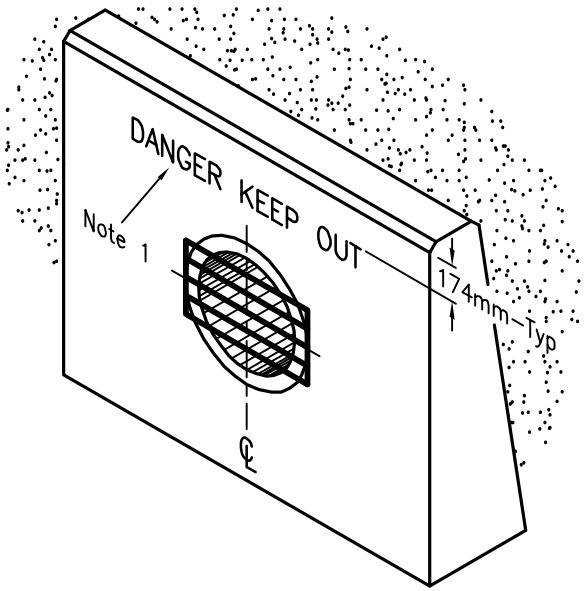


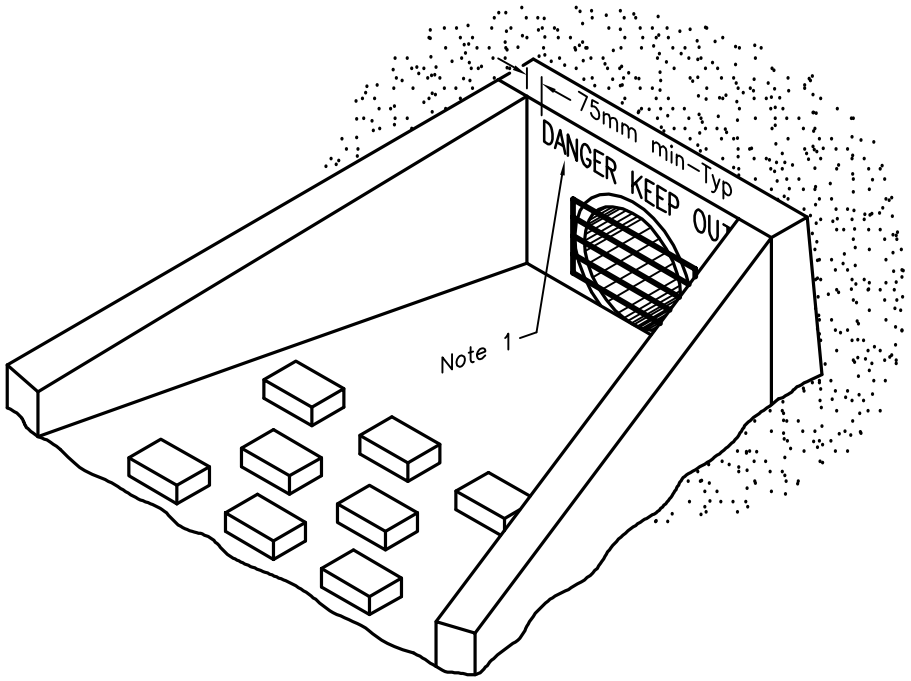

## BOX UNIT CROSS–SECTION

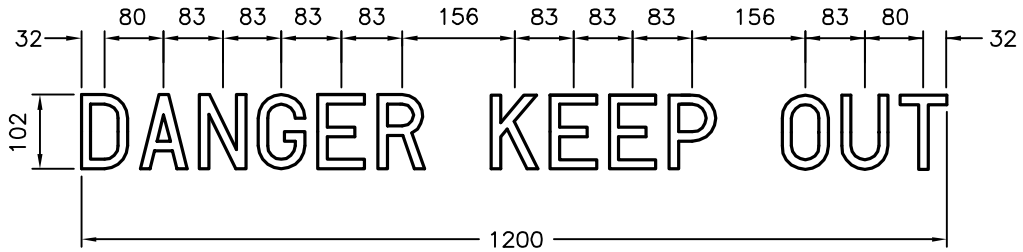
NOTES:

1 For box units reinforced with WWF As1 to As6 shall be as specified.
2 As1 to As4 refer to minimum reinforcement areas required at indicated faces.
3 t = thickness of walls and slabs.
4 d = diameter of perimeter steel reinforcement.
A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2015 | Rev | 0 |
|---|---|---|---|
| PRECAST REINFORCED CONCRETE BOX CULVERT WITH HEIGHT OF FILL < 0.6M | | | |
| | OPSD 3920.110 | | |




**SPACING FOR LETTERING**

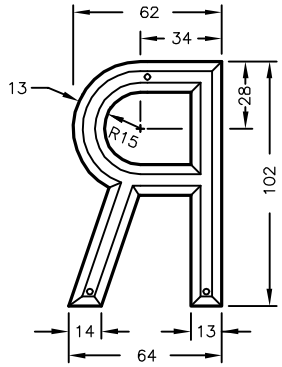
NOTES:

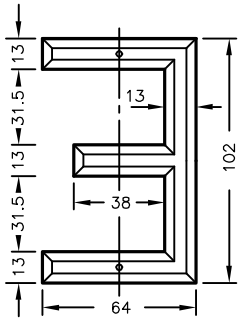
1 Centre warning message over centreline of pipe. Adjust layout of message to suit. Lettering to be set in concrete.

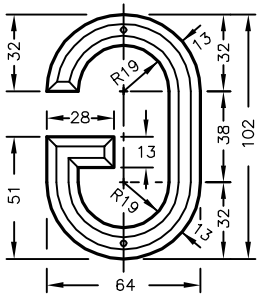
A This OPSD to be read in conjunction with OPSD 3940.151.

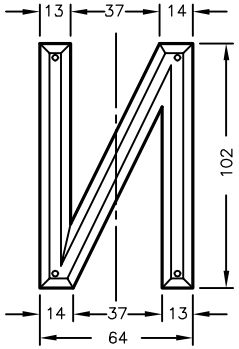
B All dimensions are in millimetres unless otherwise shown.

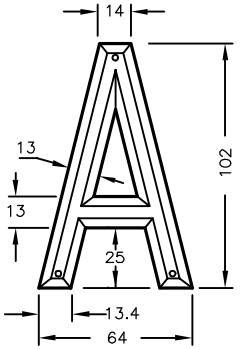
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| FIGURES IN CONCRETE<br>WARNING MESSAGE<br>LAYOUT | | | |
| | OPSD 3940.150 | | |

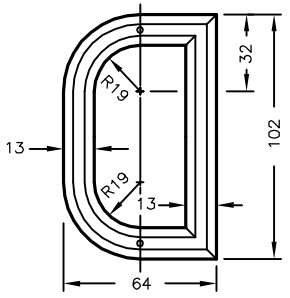


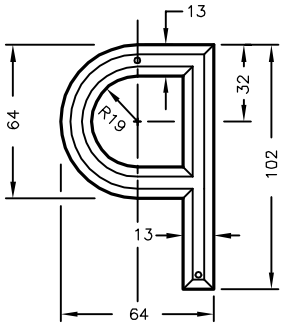



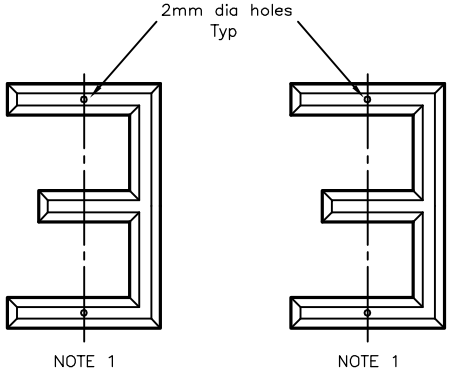



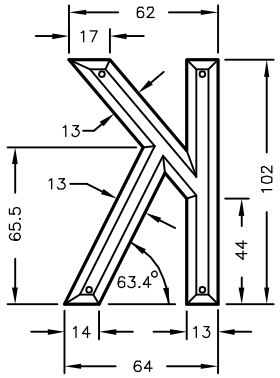



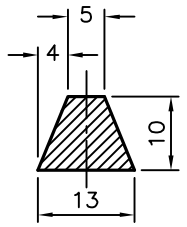



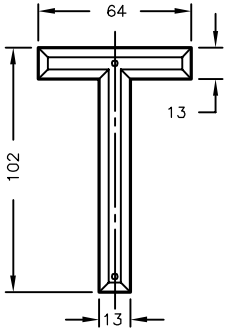



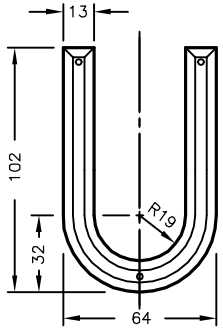



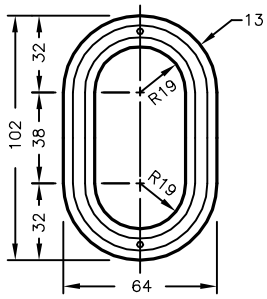




**TYPICAL CROSS SECTION**




NOTES:

1 See first occurrence of letter E for dimensions.

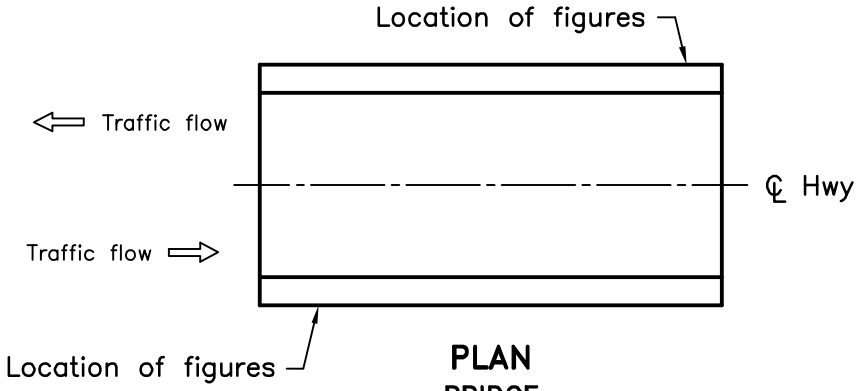
A This OPSD to be read in conjunction with OPSD 3940.150.

B The letters shall be formed from cast acrylic sheet or high impact styrene that shall not stain the concrete.

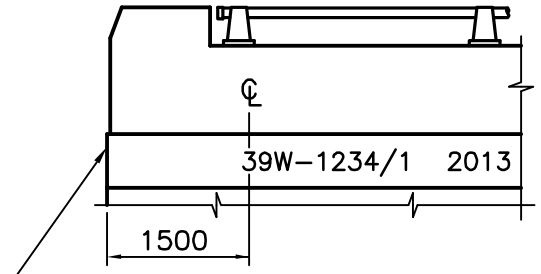
C 2mm dia holes for fastening letters shall be provided in locations shown.

D All dimensions are in millimetres unless otherwise shown.

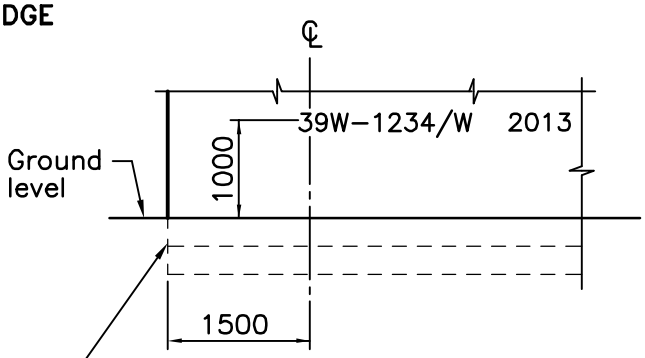
| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2010 | Rev | 2 |
|---|---|---|---|
| FIGURES IN CONCRETE<br>WARNING MESSAGE<br>LETTERS | | | |
| | | OPSD 3940.151 | |



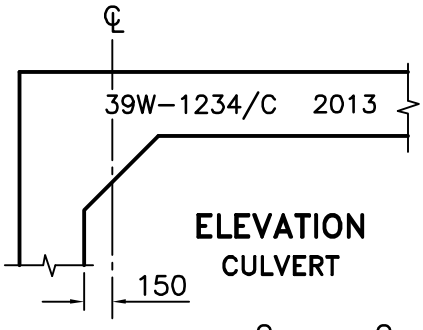

**PLAN**
**BRIDGE**



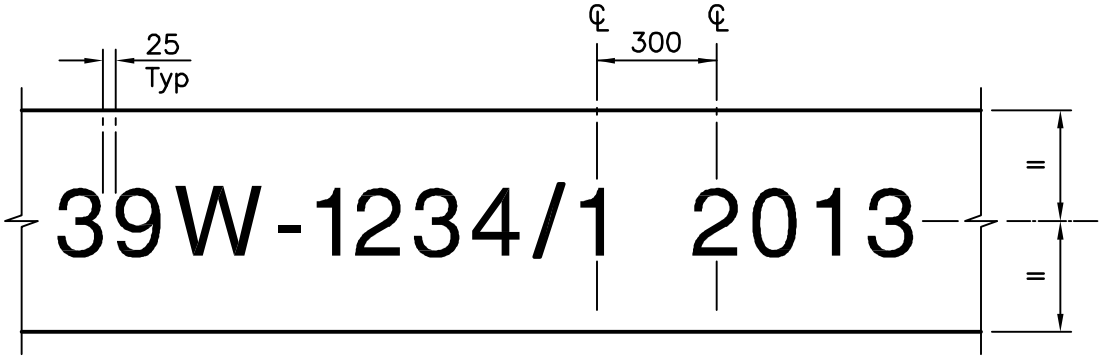

**ELEVATION**
**BRIDGE**




**ELEVATION**
**RETAINING WALL**




**ELEVATION**
**CULVERT**




**DETAIL**

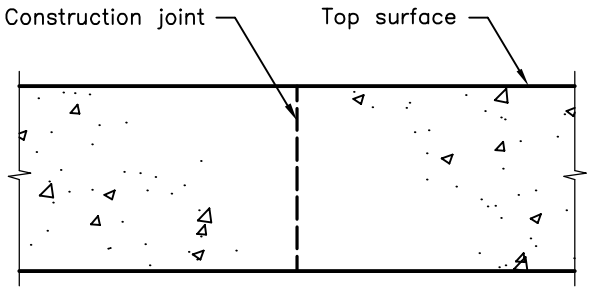
NOTES:

A Figure forms shall be cast on the bridge fascia or face of culvert top slab or outside face of retaining wall.

B "DATE" shall be the original year of construction.

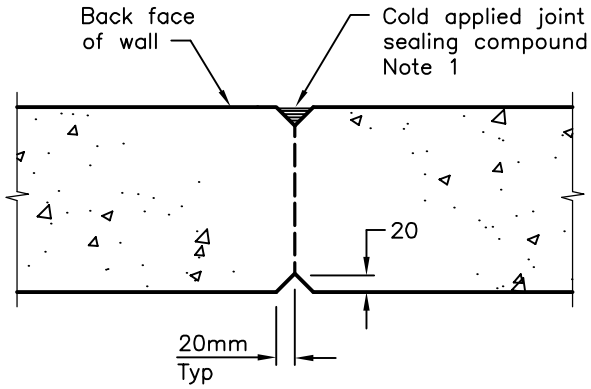
C All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2013 | Rev | 2 |
|---|---|---|---|
| FIGURES IN CONCRETE<br>SITE NUMBER AND DATE<br>LAYOUT | | | |
| | OPSD 3941.200 | | |



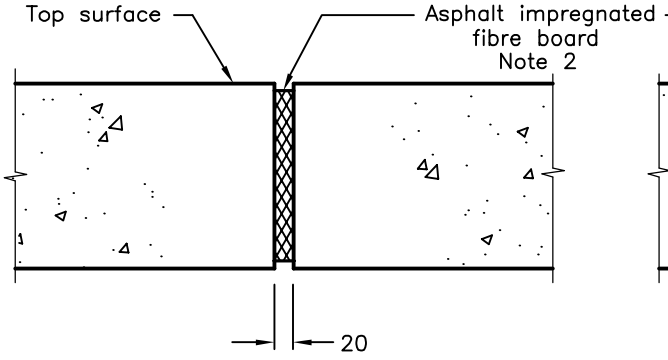

ELEVATION

CONSTRUCTION JOINT IN DECK



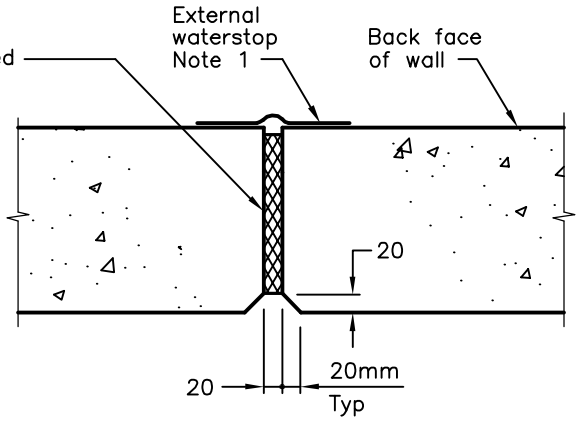

PLAN

CONSTRUCTION JOINT IN WALL




ELEVATION

EXPANSION JOINT IN FOOTINGS




PLAN

EXPANSION JOINT IN WALL

NOTES:

1 Cold applied joint sealing compound and external waterstop shall be as specified.

2 Asphalt impregnated fibre boards shall be held in place with galvanized nails.

A All dimensions are in millimetres unless otherwise shown.

| ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2011 | Rev | 1 |
|---|---|---|---|
| JOINTS<br>CONCRETE EXPANSION AND CONSTRUCTION ON STRUCTURE | | | |
| | OPSD 3950.100 | | |